ARCADIS SUBMITTAL # PC-005-R1

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 351200-02-A
Date of Submittal: May 20, 2011
Contractor: Weeks
Contract No.: B0009964.001
Subject of Submittal: Navigation Aids

Specification No. 35 12 00
Par. No. 1.2.1, 1.2.2 and 1.2.3
Drawing No. G-12

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☒ Shop Drawings ☐ Progress Schedules ☐ Testing Procedure ☒ First Submission ☐ Third Submission

☐ Sample ☐ O&M Manual ☐ Contact List ☐ Second Submission ☐ ______ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
1.2.1 Manufacturer's Data Sheet for Navigation Aids	1

☐ **REVIEWED** ☐ **REVIEWED & NOTED**

REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

SIGNATURE

5/25/11
Date

Office Location

☒ **RESUBMIT** ☐ **REJECTED**

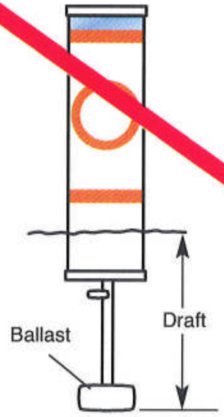
Complete either (a) or (b) and ©, in the
a (X) The Contractor verified that the r
shown, or indicated in the Contract Do
b ( ) The Contractor has verified that th
shown, or indicated in the Contract Do

NAVIGATION L

c ( ) The Contractor has stamped or w
certifying that the Contractor has satis
requirements of Article 6 of the Gener

Signed (By the Contractor): ______
Claud

Can Buoys • General Purpose



Standard cans widely used by the U.S. Army Corps of Engineers.

Model		B1251	B1352	B1452	B2445	B246[illegible]
Can Dia. & Ht.	In.	12x51	13x52	[illegible]	24x45	24x60
Overall Ht.	In.	73.5	76	86	97	116
Daymark w/36" Exposure	Sq. Ft.	3.0	[illegible]	3.5	6.0	—
Exposure w/o Tackle	In.	[illegible]	40	40	38	—
Mooring Tackle Allowable for 36" Exposure	Lbs.	7	18	22	18	—
Draft	In.	36	35	44	57	59
Submerged Buoyancy	Lbs.	155	190	220	624	780
Net Wt.	Lbs.	71	79	90	138	240
Shipping Wt.	Lbs.	80	86	96	148	330

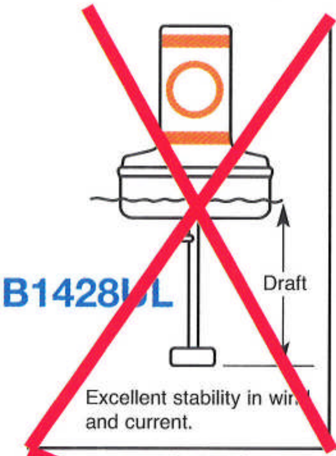
Features

- Easy reconditioning of weather worn buoys with excellent adhesion of restoration materials. See page 18.
- ABS exterior, completely urethane foam filled and ultraviolet inhibited.
- Self-righting without tackle.
- Standard bands, symbols and messages included. See page 1 for information.
- Ballast attached by a galvanized steel pipe.
- 3" silver reflective band at top.
- Concrete ballast encased in ABS.

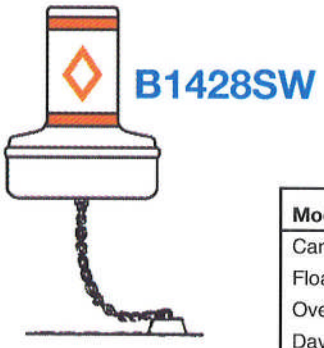
Available Options

- Solar Lights (see page 11).
- Pickup eye built into top (except B1428FW).
- Non-standard messages.
- Agency and name identification.
- Swivel eyes or pipe thru for side attachment.
- Yellow cans, centering black and white or red and white.
- All cans available as green channel markers (see page 8). Also red channel markers with nun tops (see page 7).

FLOAT COLLAR CANS ABS
For heavy-duty applications



Excellent stability in wind and current.



Ideal for shallow, deep or still waters.

Ideal for barrier systems.

Features

- Galvanized harware.
- Heavy-duty applications.
- 3" orange reflective band at top (float collar buoys).

B1428SW [redacted]

- Stainless steel hardware available.

Model		B1428SW	B1428FW	B1428UL
Can Dia. & Ht.	In.	14x30	[illegible]	[illegible]
Float Collar Dia. & Ht.	In.	28x12	28x12	28x12
Overall Ht.	In.	49	49	39
Daymark w/36" Exposure	Sq. Ft.	4.1	4.1	4.1
Mooring Tackle Allowable for 36" Exposure	Lbs.	29	40	29
Draft	In.	under 9	under 6	51
Submerged Buoyancy	Lbs.	320	[illegible]	[illegible]
Net Wt.	Lbs.	105	93	120
Shipping Wt.	Lbs.	135	135	145

~~**B1428FW**—Internal ballast – side attachment~~

B1428SW—Internal ballast – bottom attachment

~~**B1428UL**—Heavy duty – external ballast~~

Solar Lights

STANDARD FEATURES

Light source- LEDs
Colors – Amber, clear, green & red
Estimated battery life – 3-5 years
Std flash rates – 15, 30, 60 FPM (Flashes per minutes)
Easy installation – just bolt down
Sun switch detects daylight & turns off
Low/no maintenance

ONE MILE #101 SERIES

Features

- High performance & reliability
- Factory programmable
- Rugged construction & solid state components, very durable
- Lights are repairable

PART NO.

B381A—Amber
B381C—Clear
B381G—Green
B381R—Red

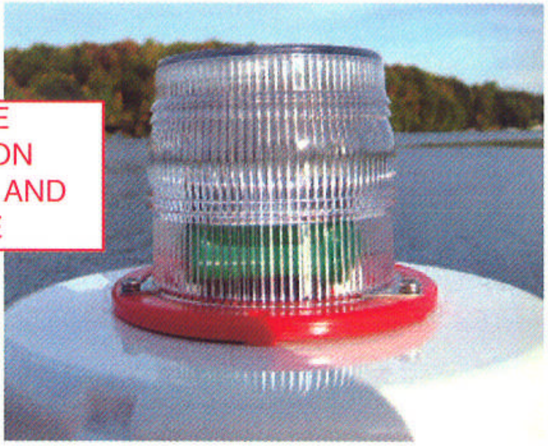
T-81 ONE & T-82 TWO MILE

2 MILE TO BE INSTALLED ON MONOPILES AND ENCLOSURE

Features

- Stainless steel/polycarbonate construction
- Factory programmable
- Lights are repairable

TWO MILE PART NO.	ONE MILE PART NO.	COLOR
B382A	B381A	Amber
B382C	B381C	Clear
B382G	B381G	Green
B382R	B381R	Red



ONE MILE #502

Features

- High performance
- Rugged construction & reliability
- Factory programmable
- Lights are sealed, not repairable

PART NO.	COLOR
B345A	Amber
B345C	Clear
B345G	Green
B345R	Red

1 MILE TO BE INSTALLED FLOAT COLLARS

ACCESSORIES

B345SLA—Adapter for 502 light
B341SLA—Adapter for T-81 light
B340SLA—Adapter for T-82 light
B101SLA—Adapter for 101 light
B21911—1" TP Screws
B21912—1½" TP Screws
B1762WN—Rubber Insert
B197293SS—SS Washer
B21910S—TP Screwdriver
B381BATP—T-81 Battery Pack
B382BAT—T-82 Battery

Chain • Cable • Hardware • Anchors

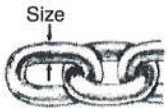
PERMAFLEX® CABLE

Lightweight
High strength
Safe to handle
Tough, durable, bright yellow, waterproof plastic covering is highly resistant to alkalis and salt

Covering O.D.	Part No.	Cable Dia.	Construction ①	Weight Lb./Ft.	Breaking Strength Lbs.	Standard Reel Size②	Reel Wt. Lbs.
5/32"	B1934	1/8"	7 x 7	.028	920	1000'	28
1/4"	B1936	3/16"	7 x 7	.065	3700	500'	37
5/16"	B1931	1/4"	7 x 7	.12	6100	500'	60
15/32"	B1933	3/8"	7 x 19	.28	14400	500'	180

Permaflex Cable – Galvanized steel wire rope coated & Impregnated with yellow polypropylene plastic.

CHAIN



	Size	Part No.	Weight Lb./Ft.	Working Load Limit Lbs.	Standard Drum Size①
Proof Coil Heavy Duty	1/4"	B1828	.42	1300	400'
Steel Chain	3/8"	B1829	1.36	2650	200'
Hot Dipped Galv.	1/2"	B18210	2.3	4500	100'

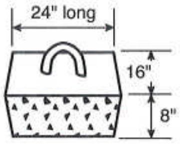
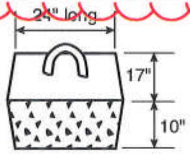
NOTES: ① Chain may also be purchased by the foot. Subject to cut charge.

GALVANIZED HARDWARE

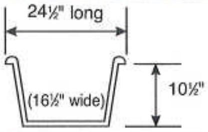
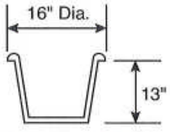
	Size	Part No.	Weight Lb./Ft.
CABLE THIMBLES Standard Electro Galvanized	3/16"	B2311	.03
	1/4"	B2312	.04
	5/16"	B2313	.05
	1/2"	B2316	.15
Heavy Duty Hot Dipped Galvanized	1/4"	B2324	.08
	5/16"	B2321	.11
	1/2"	B2323	.47
CABLE CLAMPS Standard Electro Galvanized	3/16"	B1831	.2
	1/4"	B1832	.3
	5/16"	B1833	.4
	1/2"	B1835	.5
Heavy Duty Hot Dipped Galvanized	3/16"	B2331	.11
	1/4"	B2332	.16
	5/16"	B2333	.28
	1/2"	B2335	.82
CONNECTING LINKS Electro Galvanized	1/4"	B1891	.10
	3/8"	B1892	.25
	1/2"	B1893	.54
QUICK LINKS Electro Galvanized	1/4"	B1801	.10
	3/8"	B1803	.19
	1/2"	B1804	.38
ANCHOR SHACKLES Hot Dipped Galvanized	5/16"	B1900	.25
	3/8"	B1901	.30
	1/2"	B1902	.75
SWIVELS Hot Dipped Galvanized	1/4"	B1921	.21
	3/8"	B1922	.61
	1/2"	B1923	.93

ANCHORS

TYPICAL ANCHORS CONCRETE TO BE INSTALLED

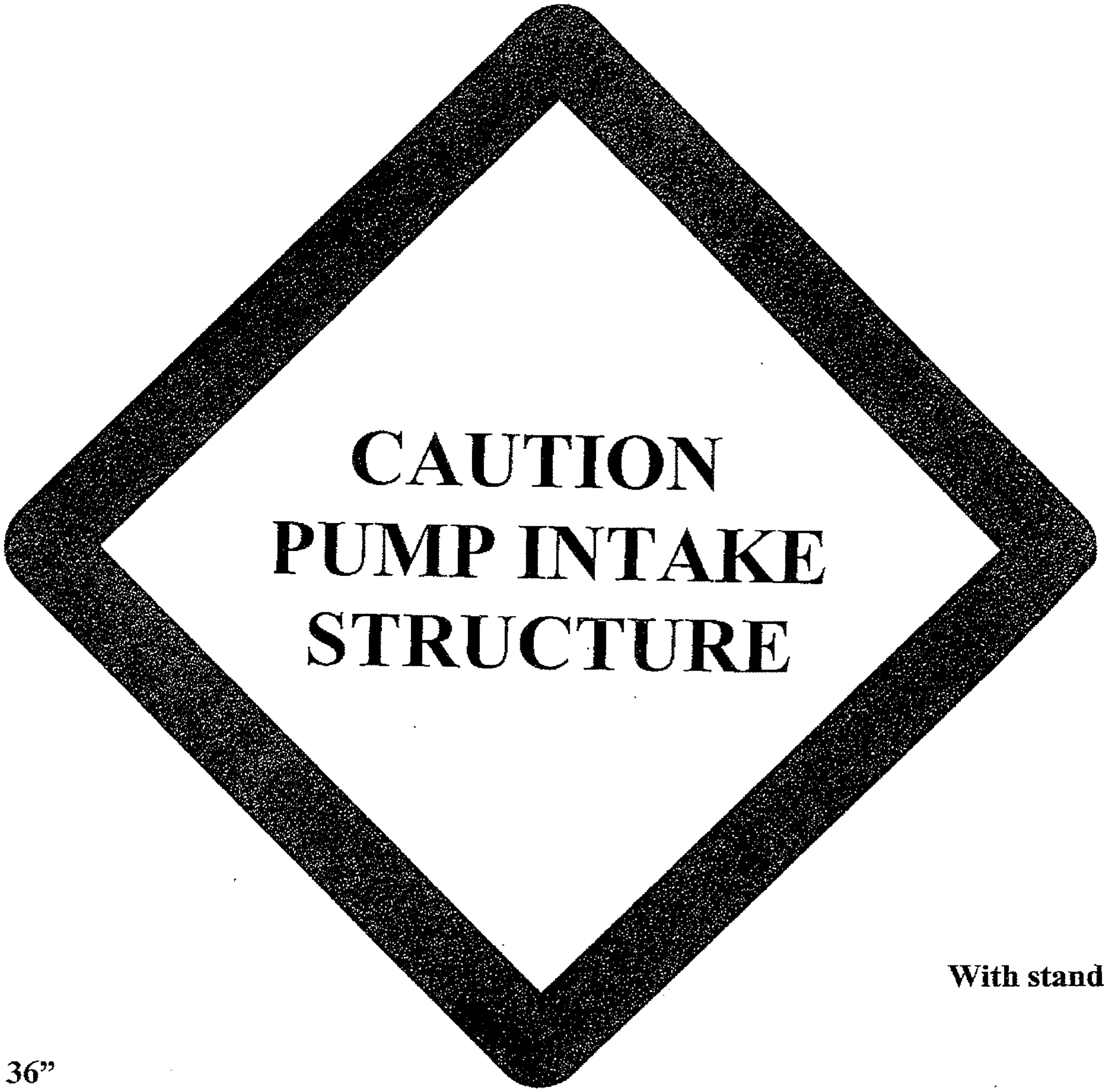
ANCHORS CONCRETE		Avg. Wt. Lbs.	Under-water Wt. Lbs.
	Galvanized		
 24" long 16" 8"	B21620 ½" Round Steel Eye Hot Dipped Galvanized	200	164
 24" long 17" 10"	B2152 ½" Round Steel Eye Hot Dipped Galvanized	300	180

ANCHOR KITS

 24½" long (16½" wide) 10½"	**B2161** Tough, high-density polyethylene anchor form. Cast up to 300 lb. concrete anchors.
 16" Dia. 13"	**B2163** Plastic anchor form for 90 lb. concrete anchors.
	**B2162** 1/2" Steel anchor eye and steel wire mesh.

Stainless steel hardware available.
Call for pricing.

1 EA



With standard mounting holes

Aluminum sign
.125 Ga. X 36" X 36"
2" Orange border
White reflective background
3" Black letters
Radius corners

12-12-60

ROLYAN BUOYS
W68N158 EVERGREEN BLVD
CEDARBURG WI 53012
TOLL FREE 1 888-269-2869
FAX 866-790-3298

ARCADIS SUBMITTAL # PC-005-R2

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 351200-02-B
Date of Submittal: May 26, 2011
Contractor: Weeks
Contract No.: B0009964.001
Subject of Submittal: Navigation Aids

Specification No. 35 12 00 Par. No. 1.2.1, 1.2.2 and 1.2.3
Drawing No. G-12

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☒ Shop Drawings ☐ Progress Schedules ☐ Testing Procedure ☐ First Submission ☐ Third Submission

☐ Sample ☐ O&M Manual ☐ Contact List ☒ Second Submission ☐ _____ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
Identify messages and quantities for 28-inch diameter float collar buoys;	1
Include 2-mile solar lights to be installed on dolphins	1
Include reflective material on dolphins and fendering (3M 3155 Reflective Tape approved by USCG)	1
see below comments	

☒ **REVIEWED** ☐ **REVIEWED & NOTED**

REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

SIGNATURE

6/15/11
Date

Office Location

☐ **RESUBMIT** ☐ **REJECTED**

Complete either (a) or (b) and ©, in th
a (X) The Contractor verified that the
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The 3M reflect
The 2 miles lights will be ins

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requirements of Article 6 of the Gener

Signed (By the Contractor):

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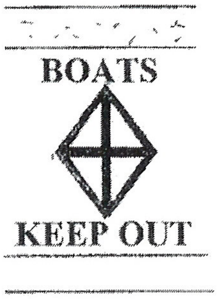
QUANTITY: 4



3" ORANGE REFLECTIVE BAND AT TOP
2' ORANGE REFLECTIVE BAND AT BOTTOM
ORANGE 11" x 14" RESTRICTED SYMBOLS TWO SIDES
3" BLACK LETTERS TWO SIDES

MODEL B1428SW BUOY

~~3~~ EA.

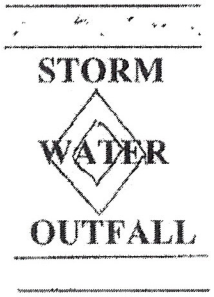
4 EA 5-23-2011

Weeks
5-23-2011
5-16-11

WEEKS MARINE INC.
PO #226041

ROLYAN BUOYS
W68N158 EVERGREEN BLVD
CEDARBURG WI 53012
TOLL FREE 1 888-269-2869
FAX 866-790-3298

QUANTITY: 2



3" ORANGE REFLECTIVE BAND AT TOP
2' ORANGE REFLECTIVE BAND AT BOTTOM
ORANGE 11" x 14" HAZARD SYMBOLS TWO SIDES
3" BLACK LETTERS TWO SIDES

MODEL B1428SW BUOY

2 EA.

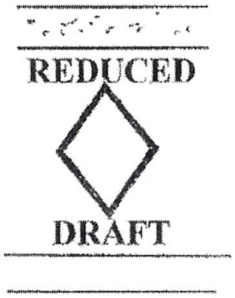
WEEKS MARINE INC.
PO #226041

5.23.2011

5-16-11

ROLYAN BUOYS
W68N158 EVERGREEN BLVD
CEDARBURG WI 53012
TOLL FREE 1 888-269-2869
FAX 866-790-3298

QUANTITY: 7



3" ORANGE REFLECTIVE BAND AT TOP
2' ORANGE REFLECTIVE BAND AT BOTTOM
ORANGE 11" x 14" HAZARD SYMBOLS TWO SIDES
3" BLACK LETTERS TWO SIDES

MODEL B1428SW BUOY

7 EA.

WEEKS MARINE INC.
PO #226041

Weeks

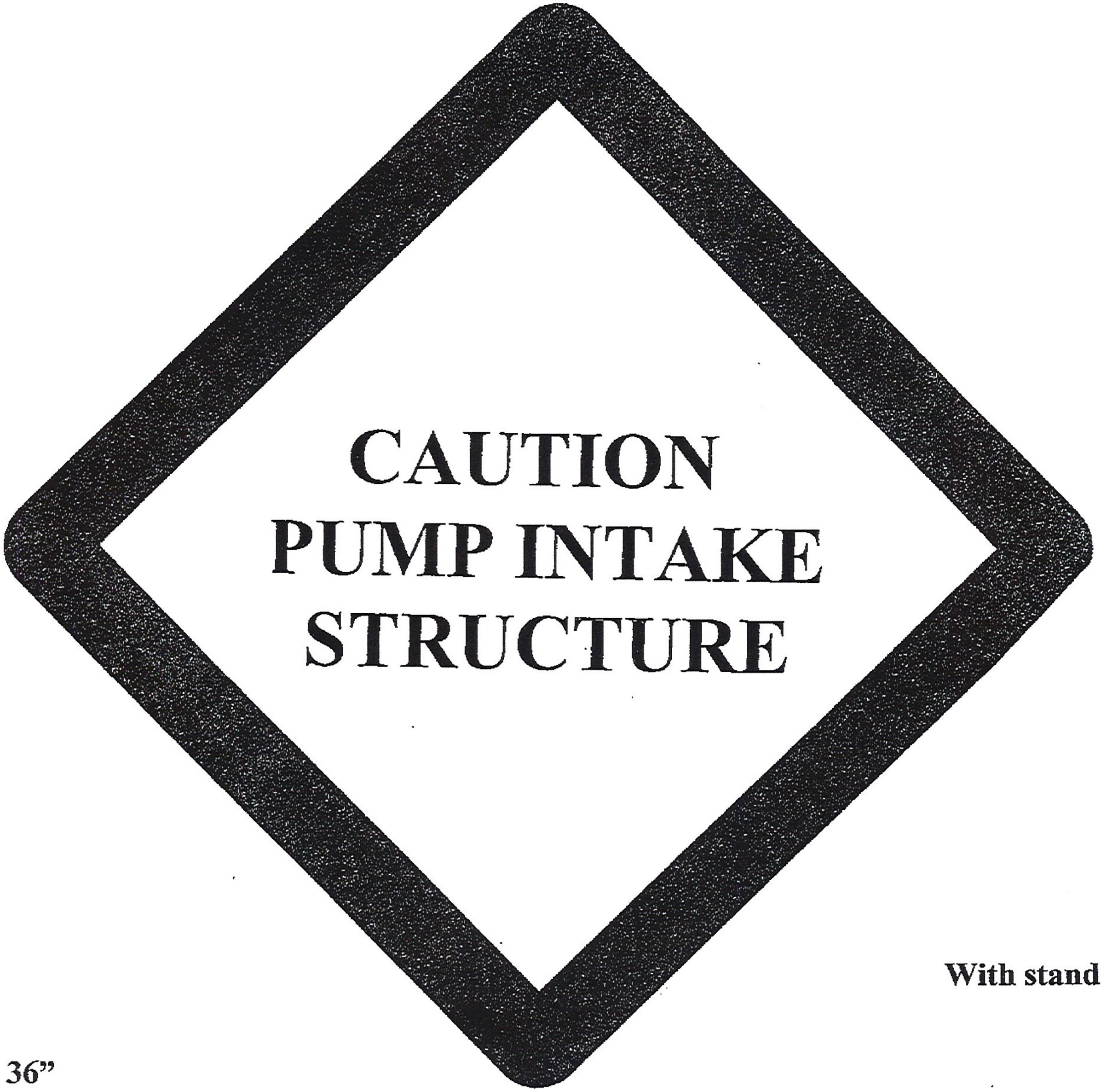
5-23-2011

5-16-11

ROLYAN BUOYS
W68N158 EVERGREEN BLVD
CEDARBURG WI 53012
TOLL FREE 1 888-269-2869
FAX 866-790-3298

1 EA

QUANTITY: 1



With standard mounting holes

Aluminum sign
.125 Ga. X 36" X 36"
2" Orange border
White reflective background
3" Black letters
Radius corners

12-12-10

ROLYAN BUOYS
W68N158 EVERGREEN BLVD
CEDARBURG WI 53012
TOLL FREE 1 888-269-2869
FAX 866-790-3298

TOPHAT
Solar LED Lights

Tophat Series Solar Lights

The most versatile, low-cost, solar solution for stand-alone locations. McDermott Tophats combine solar power with LED technology to provide years of maintenance-free operation.

2 Miles Quantity 8

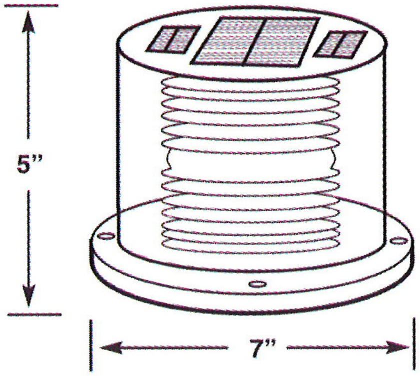
SPECIFICATIONS:

Range:	1-3 miles available
Mount:	Magnetic, Flat or Pipe Mount
Lamp Source:	High-power LEDs
Material:	High-impact polycarbonate
Power Supply:	NI-MH
Autonomy:	10 nights with no sun
Flash Rates:	15, 24, 30, 60 flashes per minute
Weight:	2 lbs.
Dimensions:	5"h x 7"dia.

TOPHAT-FLAT

TOPHATX

TOPHAT



TOPHAT-BUNY

TOPHAT-PLAT

(800) 842-5708

3M Scotchlite™

Reflective Material
SOLAS Grade Products

Technical Data Sheet

Technical Data Sheet **September 2005**

Description

3M™ Scotchlite™ Reflective Material – SOLAS (Safety of Life at Sea) Grade Products are intended for life support equipment such as life vests, life rings, jackets, and rafts. These products conform to Marine Equipment Directive 96/98/EC and International Maritime Organization (IMO) Resolution A.658 (16) Annex 2. In addition, they are approved by the U.S. Coast Guard to meet 46 CFR part 164, Subpart 164.018 requirements for Type I and II retroreflective materials. Scotchlite reflective material – SOLAS grade products help enhance visibility of life-saving equipment in nighttime, or low-light conditions when illuminated by a spotlight or other light source.

3M™ Scotchlite™ Reflective Material – SOLAS Grade Series 3100 products are silver, flexible reflective materials with a pressure sensitive adhesive. 3M™ Scotchlite™ Reflective Material – SOLAS Grade 6755 is a silver, flexible reflective material with a sewable fabric backing while 3M™ Scotchlite™ Reflective Material – SOLAS Grade 6750-I has a sewable 4 mil polyester film backing.

All products are comprised of an encapsulated lens optical design that provides high reflectivity over a wide range of entrance angles, whether dry or wet. Scotchlite reflective material – SOLAS grade products have a European mark of conformance. All products are silver in color under daytime viewing conditions and reflect a bright white.

Retroreflective Performance

The coefficient of retroreflection (R_A, in cd/lux/m^2) is measured by methods traceable to either of the following retroreflective intensity testing procedures:

ASTM E809 and E810 (R_A)
CIE 54: 1982 (R')

The following table contains the minimum R_A values as measured at the listed specific entrances and observations angles. Based on tests performed by 3M in accordance with IMO procedures and verified by an outside third party, Scotchlite reflective material – SOLAS grade products meet or exceed these values.

Entrance Angle	Observation Angle			
	0.1	0.2	0.5	1.0
5	180	175	72	14
30	140	135	70	12
45	85	85	48	9.4

Color

3M™ Scotchlite™ Reflective Material		
Product Number	**Daytime Color**	**Reflected Color**
~~3150-A~~, 3155, ~~6750-I, 6755~~	~~Silver~~	White

Performance

While the use of 3M™ Scotchlite™ Reflective Material – SOLAS Grade Products enhances visibility, no reflective material can guarantee absolute visibility, particularly in adverse weather conditions. Performance will vary depending upon actual use, exposure conditions and maintenance. Users should test Scotchlite reflective material – SOLAS grade products to satisfy conformance to their own requirements.

Reduction in durability will occur when the usage requirements are particularly severe, such as work life jackets and rubber rafts that are used to maintain harbor facilities, coastal waterways and industrial equipment in the water or on decks; life-saving appliances with continuous outdoor exposure; heavy wear and tear; and chemical exposure and washing.

All current certificates issued by external organizations are available on the 3M website (http://www.3M.com/Scotchlite). EC MED Declaration of Conformity is available by request and requires invoice number and date information for issuance. Requests for Certifications may be submitted either through your 3M Customer Service Representative or may be faxed directly to (325) 646-3778 [USA].

Application Instructions

Whenever two or more pieces of 3M™ Scotchlite™ Reflective Material are used together on a single surface or as a set, they should be matched to ensure uniform color and reflectivity.

NOTE: Do not attach to highly elastic materials.

Applying 3M™ Scotchlite™ Reflective Material – SOLAS Grade Series 3100 products:

The application of Scotchlite reflective material – SOLAS grade series 3100 products should be carefully evaluated for adhesion by the user to assure suitability for the intended use.

3M™ Scotchlite™ Reflective Material – SOLAS Grade 3150-A is recommended on the following marine market substrates:

Smooth surfaces	Glass reinforced polyester
Rubber film	Vinyl or PVC films
Polyurethane film (varies with treatment)	Aluminum

3M™ Scotchlite™ Reflective Material – SOLAS Grade 3155 is recommended on the following marine substrates:

Rough surfaces	Glass reinforced polyester
Aluminum	Rubber coated cloth
Rubber film	Vinyl or PVC films
Polyurethane film (varies with treatment)	Polyester fabric
Nylon fabric (thicker weave)	Cotton drill

The coated fabric must be clean, dry, and substantially free of contamination. If necessary, wipe the substrate surface with a mild solvent, such as VM & P Naphtha or mineral spirits (test the solvent first on a small area of the fabric to make sure the surface is not damaged).

The minimum application temperature is 60°F (15°C). Whenever possible, remove flotation material or deflate equipment, and smooth out wrinkles.

1. Hand cut, die-cut, or guillotine the reflective material to the desired size one layer at a time. Do not cut in multi-layers. Use sharp dies or blades made of steel or magnesium.
2. Separate approximately 1" of liner paper from reflective material. Bend liner back onto itself.
3. When everything is properly aligned, press down the exposed adhesive area by using a squeegee starting from the inside and working towards end.
4. Slowly remove the rest of the liner as the squeegee application is made, keeping material away from fabric until pressure is applied. Squeegee down entire reflective area in this manner.
5. On all vinyl applications, use talcum powder around edges after material application to prevent tackiness.

It is recommended, to improve adhesion, to allow 48 hours (above 60°F) before handling, inflating, or packaging.

Note: Since plastics vary greatly in type, composition, and manufacture, a general recommendation cannot be given for their use as application surfaces.

Commercial users have made successful applications; however, many plastics contain release agents, unreacted monomers,

Application Instructions, continued

plasticizers, dyes, oils, gasses and other migrating constituents that contaminate the adhesive and result in premature failure. In addition, colorants may bleed to the surface and cause discoloration of the reflective materials. Applications should be carefully evaluated by the user to assure that they are acceptable for intended use.

The use of heat and pressure to aid in adhesion must be evaluated to ensure the material is not damaged. For silicone based fabrics use 3M™ Scotchlite™ Reflective Material – SOLAS Grade Series 6700 products.

Sewing 3M™ Scotchlite™ Reflective Material - SOLAS Grade 6755 and 3M™ Scotchlite™ Reflective Material - SOLAS Grade 6750-I:

1. Hand cut, die-cut, or guillotine reflective material to desired size. Use sharp dies or blades made of steel or magnesium. To ensure smooth edges, limit the layers of SOLAS while cutting.
2. Sew in place with 7-9 stitches per inch and not less than 5/64" from the edge of the material. Thread recommendation: #69 nylon (Quality Thread & Notions 1-800-521-4308) or other UL approved threads. Stitch: 3/16" (4.75 mm) lockstitch.

Screen Printing: Below are inks that can be used for printing on the surface of 3M™ Scotchlite™ Reflective Material – SOLAS Grade Products. All inks should be continuously tested to ensure acceptable adhesion in the event of changes occurring in the manufacturing process or composition of the ink. Prior to printing, wiping the surface with a soft cloth lightly dampened with alcohol may help ink adhesion.

Ink	Ink Type	Manufacturer
3M™ Scotchlite™ Process Color Series 990	Transparent (990-05 Black is opaque)	3M Traffic Control Materials Division 1-800-553-1380
3M™ Scotchlite™ Process Color Series 700	Transparent	3M Traffic Control Materials Division 1-800-553-1380

Care and Maintenance Instructions

Wash by hand with a sponge or soft cloth using warm water and detergent. Rinse thoroughly.

Important: Test each application according to appropriate care instructions required for the finished product. Actual life of Scotchlite reflective material – SOLAS grade products depends on cleaning methods and wear conditions.

Wash:
Do not machine wash

Dry:
Do not tumble dry

Dry-clean:
Do not dry-clean

Bleach:
Do not bleach

Iron:
Do not iron

Product Availability

Scotchlite reflective material – SOLAS grade products are available in rolls with the following standard widths and lengths:

3M™ Scotchlite™ Reflective Material				
Product Number	**Roll Width Unless Noted**	**Width Tolerance**	**Splices Allowed**	**Standard Roll Length**
3150-A, 3155, 6750-I, & 6755	13 mm < X < 150 mm	+/- 1 mm	4 per 50 m roll	50 m
3150-A, 3155, 6750-I, & 6755	150 mm ≤ X ≤ 1220 mm	+/- 2 mm	4 per 50 m roll	50 m

Order and Product Information

To order 3M™ Scotchlite™ Reflective Material, contact 3M Personal Safety Products Customer Service at 800-328-7098, Ext. 2.

Storage and Shelf Life

Store in a cool, dry area and use within one year after date of receipt. Store rolls or panels in original shipping cartons. Return partially used rolls to the carton or suspend horizontally through the core.

Important Notice to User

LIMITED WARRANTY: In the event any 3M™ Scotchlite™ Reflective Material is found to be defective in material, workmanship, or not in conformation with any express warranty, 3M's only obligation and your exclusive remedy shall be to replace or refund the purchase price, at 3M's option, of such product upon timely notification thereof and substantiation that the product has been stored, maintained and used in accordance with 3M's written instructions.

EXCLUSIONS TO WARRANTY: THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHER WARRANTY OF QUALITY, EXCEPT OF TITLE AND AGAINST PATENT INFRINGEMENT.

LIMITATION OF LIABILITY: Except as provided above, 3M shall not be liable in contract or tort for any loss or damage, whether direct, indirect, incidental, special or consequential, (including, without limitation, lost profits, goodwill and business opportunity) arising out of the sale, use or misuse of the product, or the user's inability to use the product. **THE REMEDIES SET FORTH HEREIN ARE EXCLUSIVE.**

Because of the unlimited variety of potential applications for these products, BEFORE production use, the user (which may be a product designer, product specifier, converter or end product manufacturer or others) must determine that the Products are suitable for the intended use and are compatible with other component materials. User is solely responsible for determining the proper amount and placement of Products. While reflective products enhance visibility, no reflective product can ensure visibility or safety under all possible conditions.

3M may change the product, specifications and availability of the product as improvements are made; therefore, user should contact 3M for latest information before specifying the product.

3M

Personal Safety Products
3M Occupational Health and
Environmental Safety Division
3M Center, Building 0235-02-F-06
St. Paul, MN 55144-1000
800-328-7098, Ext. 2

3M Canada
P. O. Box 5757
London, Ontario, Canada N6A 4T1
800-364-3577

Printed in USA

75-0500-6811-5

ARCADIS SUBMITTAL # PC-008-R1

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 017600-02-A
Date of Submittal: June 2, 2011
Contractor: Weeks
Contract No.: B0009964.001
Subject of Submittal: Monopiles Location

Specification No. 01 76 00
Par. No. N/A
Drawing No. G-12

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings ☐ Progress Schedules ☐ Testing Procedure ☒ First Submission ☐ Third Submission

☐ Sample ☐ O&M Manual ☐ Contact List ☐ Second Submission ☐ ______ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
16" Dia. Pipe Piles Location West End of the Enclosure	1
16" Dia. Pipe Piles Location East End of the Enclosure	1

☐ **REVIEWED** ☐ **REVIEWED & NOTED**

REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

SIGNATURE

6/15/11
Date

Office Location

☒ **RESUBMIT** ☐ **REJECTED**

Complete either (a) or (b) and ©, in the c
a (X) The Contractor verified that the ma
shown,, or indicated in the Contract Doc
b ( ) The Contractor has verified that the
shown, or indicated in the Contract Doc

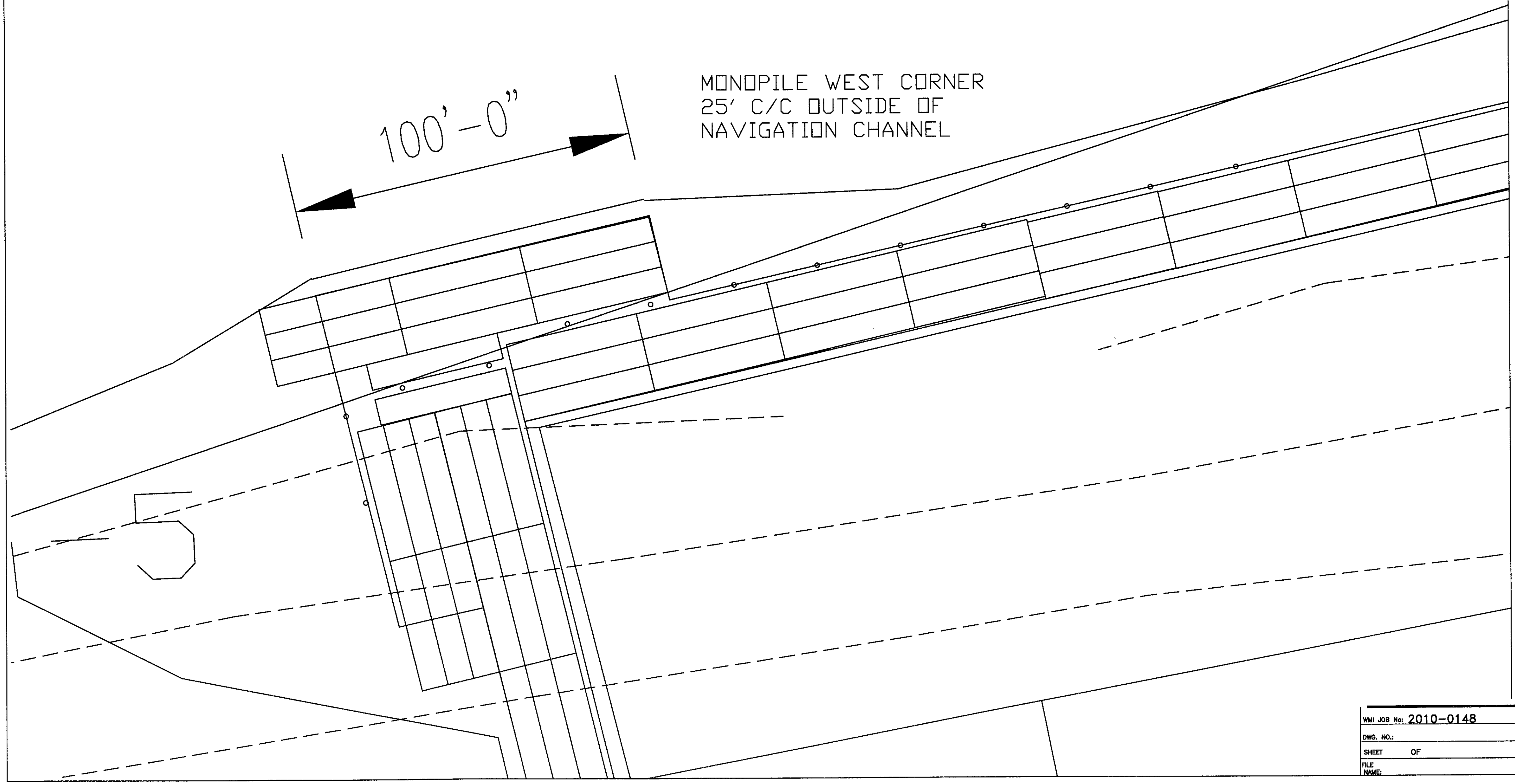
c (X) The Contractor has stamped or wri
certifying that the Contractor has satisfie
requirements of Article 6 of the General

Signed (By the Contractor): ____________
Claude

PC-008-R1

RESUBMIT:

- General note: Additional clarification is requested for partial submittals;
- In the cover letter, Weeks indicates submittal addresses Paragraph 1.4, which is all submittals required per the specification. This appears to only satisfy partial submittal of 1.4.3 which also requires materials, weights and connections. Please provide the additional submittal's required in Paragraph 1.4 or clarify which section submittal covers; and
- For the plan view, there appears to be mats on both ends stacked on-top of each other (see attached). Adjacent mats should not overlap each other.



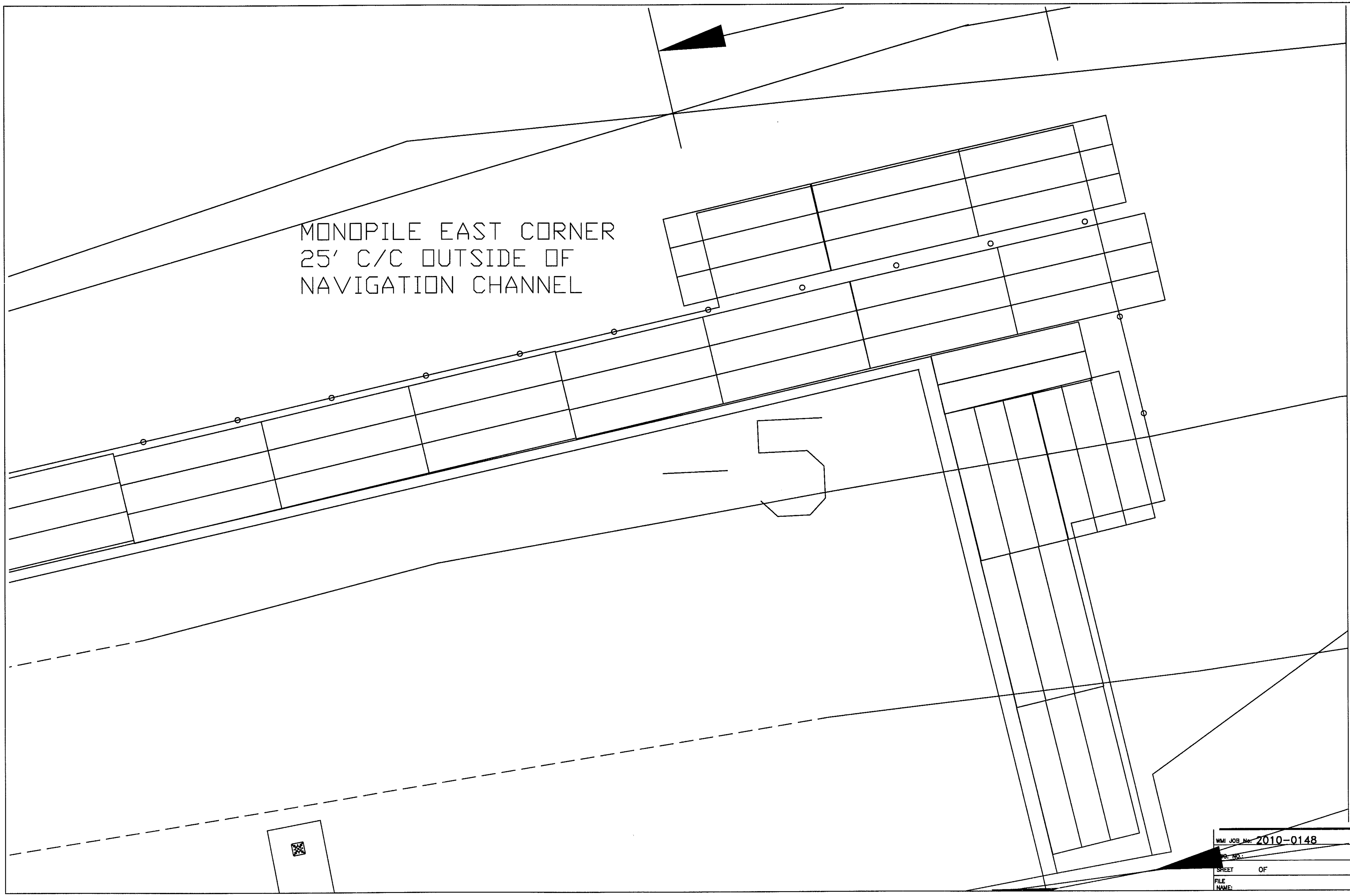
NO.	REFERENCE DWG NUMBER	DATE	DESCRIPTION	BY
1				
2				

DRAWN BY: C. Dion
APPROVED BY:
DATE: 1/25/2011
SCALE: N/A
PAPER SIZE B

Passaic River
Newark, NJ
Lower Passaic River Study

WEEKS MARINE, INC.
4 COMMERCE DRIVE
CRANFORD, NJ 07016-3598
(908) 272-4010

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:



NO.	REFERENCE DWG NUMBER	DATE	DESCRIPTION	BY
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DRAWN BY: C. Dion
APPROVED BY:
DATE: 1/25/2011
SCALE: N/A
PAPER SIZE B

Passaic River
Newark, NJ
Lower Passaic River Study

WEEKS MARINE, INC.
4 COMMERCE DRIVE
CRANFORD, NJ 07016-3598
(908) 272-4010

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:

ARCADIS SUBMITTAL # PC-008-R2

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 017600-02-B
Date of Submittal: June 17, 2011
Contractor: Weeks
Contract No.: B0009964.001
Subject of Submittal: Monopiles Location

Specification No. 01 76 00
Par. No. N/A
Drawing No. G-12

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings ☐ Progress Schedules ☐ Testing Procedure ☐ First Submission ☐ Third Submission

☐ Sample ☐ O&M Manual ☐ Contact List ☒ Second Submission ☐ ______ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
This submittal was requested by Arcadis to provide location of the monopile only.	1
This location plan was provided under specification 01 76 00 Protection Installed Contruction	1
As requested in your PC-009-R1 please find below the # and drawing show the location	
13- 16" Dia. Pipe Piles Location West End of the Enclosure	
13- 16	
Note that Weeks b	
that 5	
Note the monopil	

Complete either (a) or (b) and ©, in t
a (X) The Contractor verified that the
shown,, or indicated in the Contract
b ( ) The Contractor has verified that
shown, or indicated in the Contract D

c (X) The Contractor has stamped or
certifying that the Contractor has sati
requirements of Article 6 of the Gene

Signed (By the Contractor):
Clau

☐ REVIEWED ☐ REVIEWED & NOTED

REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

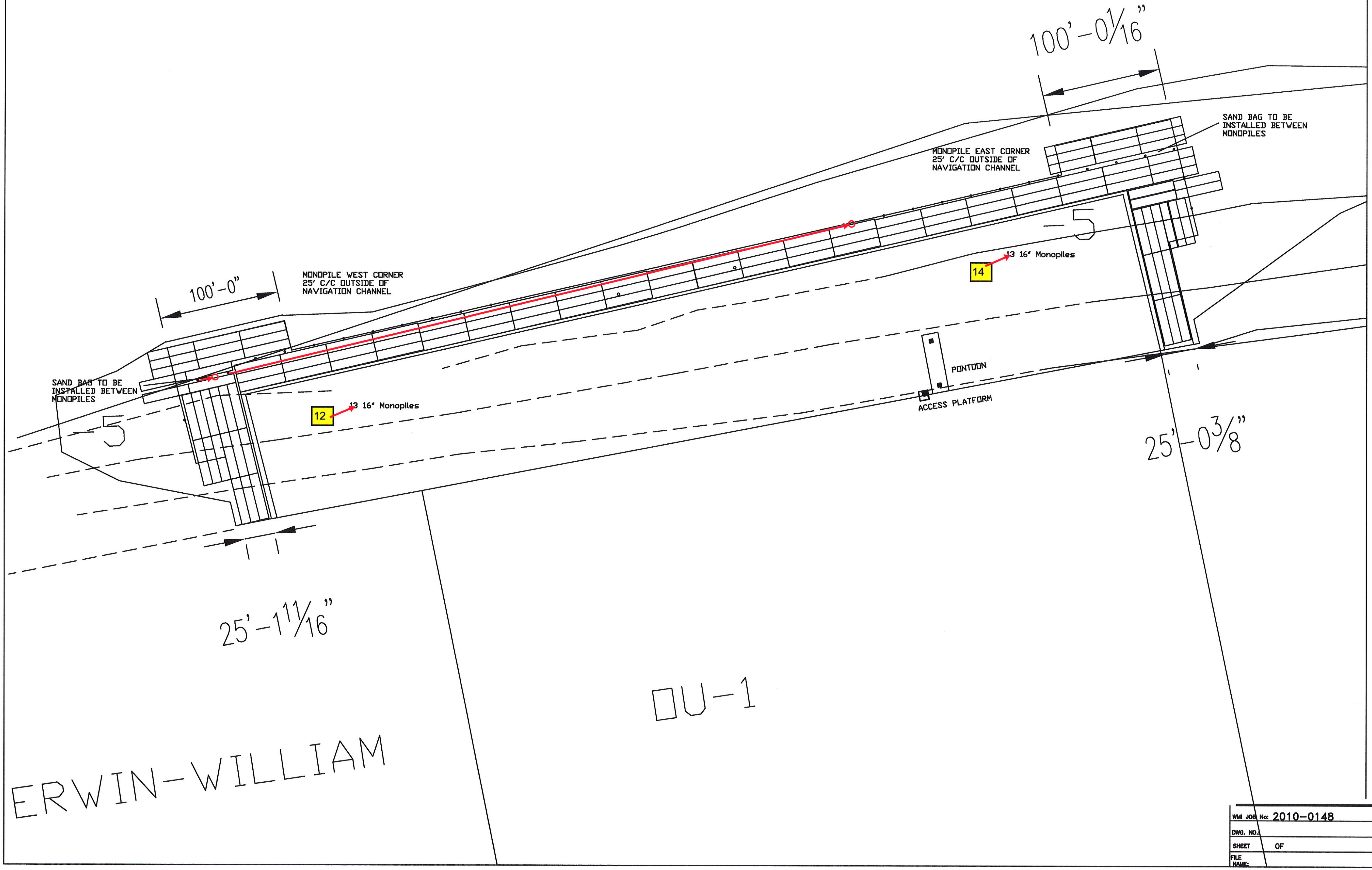
SIGNATURE

7/8/11 Syracuse
Date Office Location

☒ RESUBMIT ☐ REJECTED

PC-008-R2

RESUBMIT:
We have indicated revisions we'd like to see for monopile locations directly on the submittal as pdf edit. I've attached that for Weeks use.



NO.	REFERENCE DWG NUMBER	DATE	DESCRIPTION	BY
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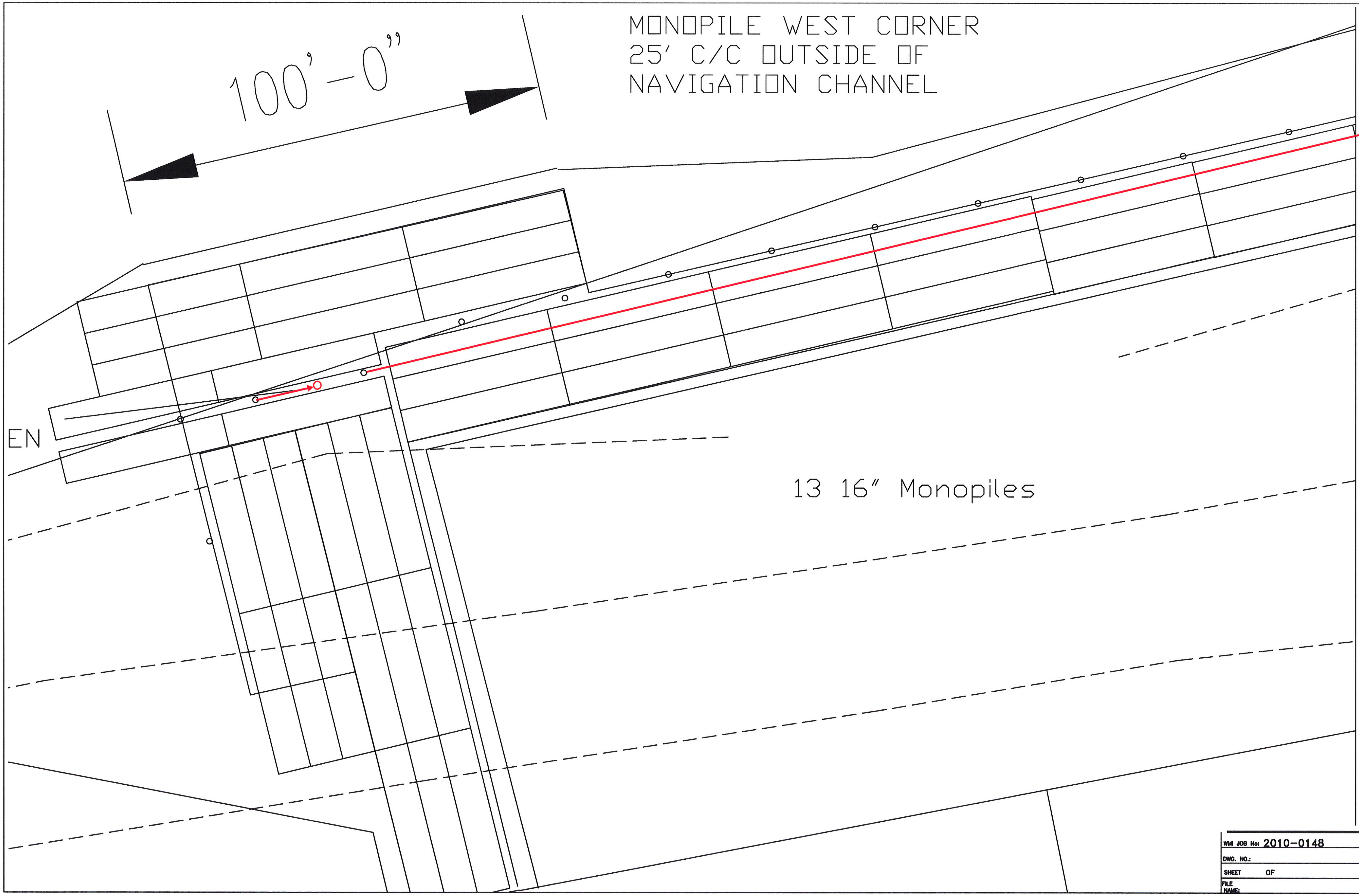
DRAWN BY: C. Dion
APPROVED BY:
DATE: 1/25/2011
SCALE: N/A
PAPER SIZE B

Passaic River
Newark, NJ
Lower Passaic River Study

WEEKS MARINE, INC.
4 COMMERCE DRIVE
CRANFORD, NJ 07016-3598
(908) 272-4010

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:

MONOPILE WEST CORNER
25' C/C OUTSIDE OF NAVIGATION CHANNEL



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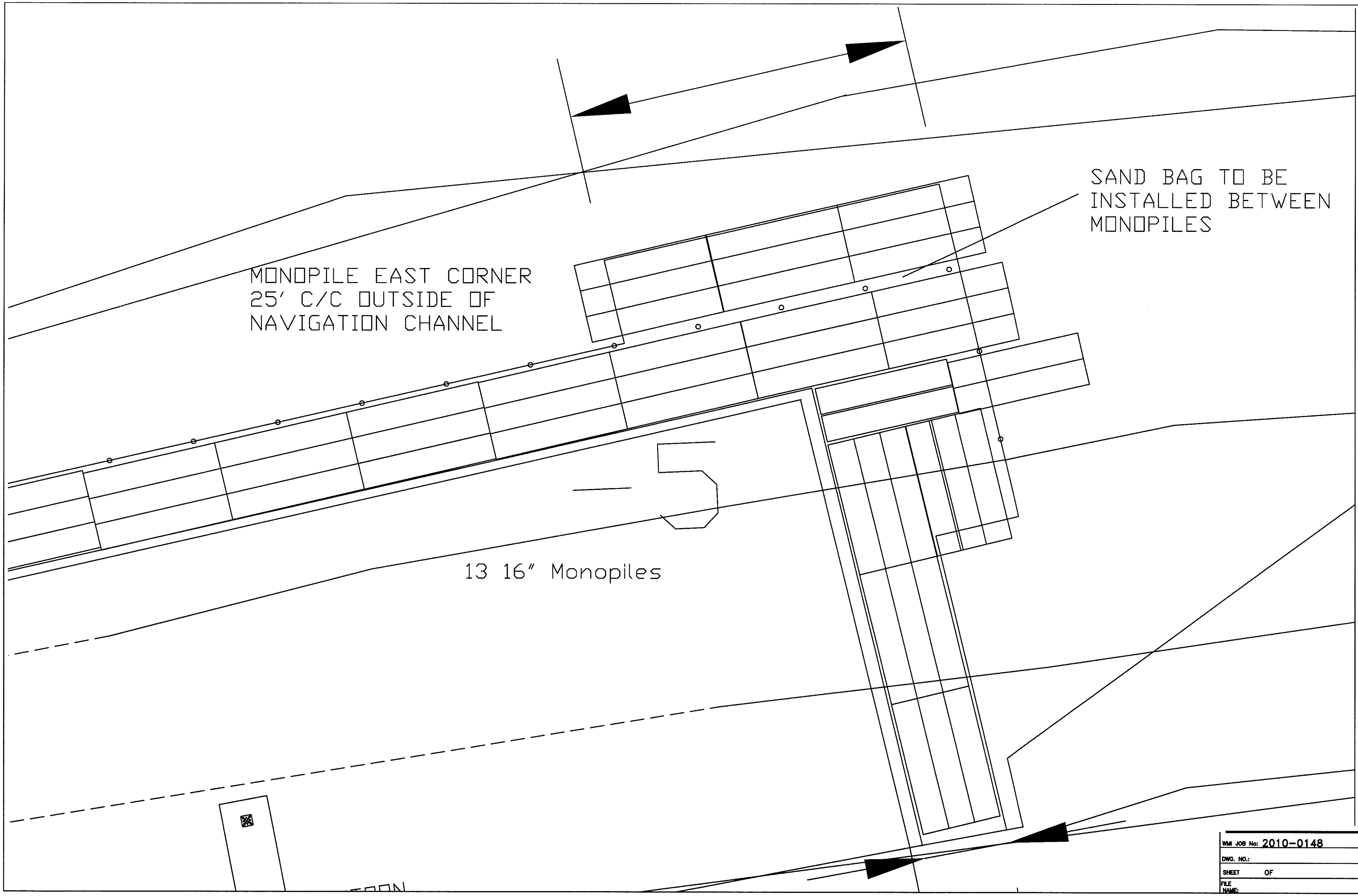
DRAWN BY: C. Dion
APPROVED BY:
DATE: 1/25/2011
SCALE: N/A
PAPER SIZE B

Passaic River
Newark, NJ
Lower Passaic River Study

WEEKS MARINE, INC.
4 COMMERCE DRIVE
CRANFORD, NJ 07016-3598
(908) 272-4010

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:



NO.	REFERENCE DWG NUMBER	DATE	DESCRIPTION	BY
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DRAWN BY: C. Dion
APPROVED BY:
DATE: 1/25/2011
SCALE: N/A
PAPER SIZE B

Passaic River
Newark, NJ
Lower Passaic River Study

WEEKS MARINE, INC.
4 COMMERCE DRIVE
CRANFORD, NJ 07016-3598
(908) 272-4010

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:

ARCADIS SUBMITTAL # PC-008-R3

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 017600-02-B
Date of Submittal: December 16, 2011
Contractor: Weeks
Contract No.: B0009964.001
Subject of Submittal: Monopiles Location

Specification No. 01 76 00
Par. No. N/A
Drawing No. G-12

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings ☐ Progress Schedules ☐ Testing Procedure ☐ First Submission ☒ Third Submission

☐ Sample ☐ O&M Manual ☐ Contact List ☐ Second Submission ☐ ______ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
This submittal was requested by Arcadis to provide location of the monopile only.	1
Weeks will install the monopiles as shown in the attached drawing	1

☒ REVIEWED ☐ REVIEWED & NOTED

REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

SIGNATURE

12/19/11
Date

Syr
Office Location

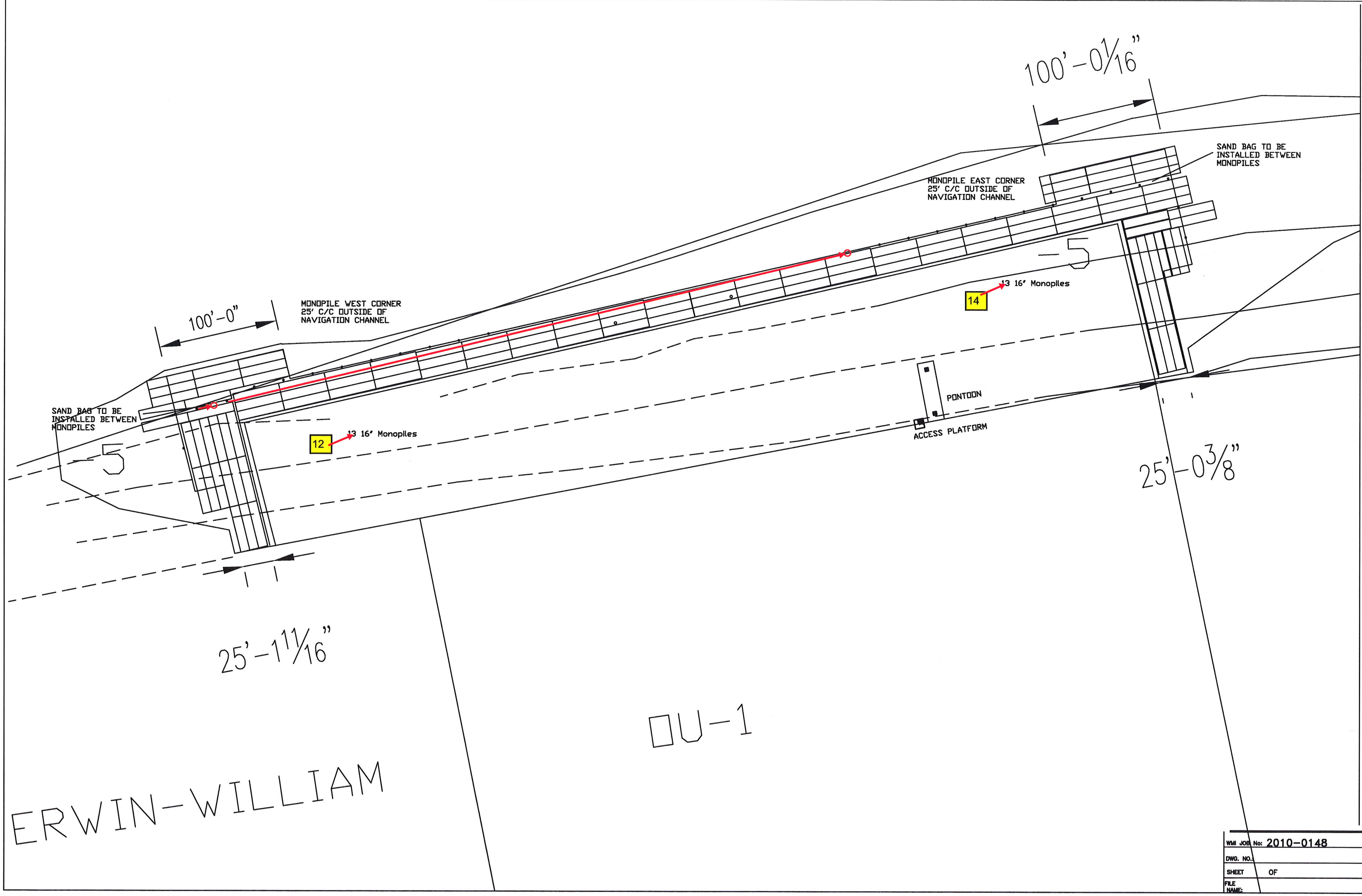
☐ RESUBMIT ☐ REJECTED

Complete either (a) or (b) and ©, in the
a (X) The Contractor verified that the ma
shown,, or indicated in the Contract Doc
b ( ) The Contractor has verified that the
shown, or indicated in the Contract Docu

c (X) The Contractor has stamped or wri
certifying that the Contractor has satisfie
requirements of Article 6 of the General

Signed (By the Contractor): ____________

Claude



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REFERENCE DWG NUMBER

DRAWN BY: C. Dion
APPROVED BY:
DATE: 1/25/2011
SCALE: N/A
PAPER SIZE B

Passaic River
Newark, NJ
Lower Passaic River Study

WEEKS MARINE, INC.
4 COMMERCE DRIVE
CRANFORD, NJ 07016-3598
(908) 272-4010

WMI JOB No: 2010-0148
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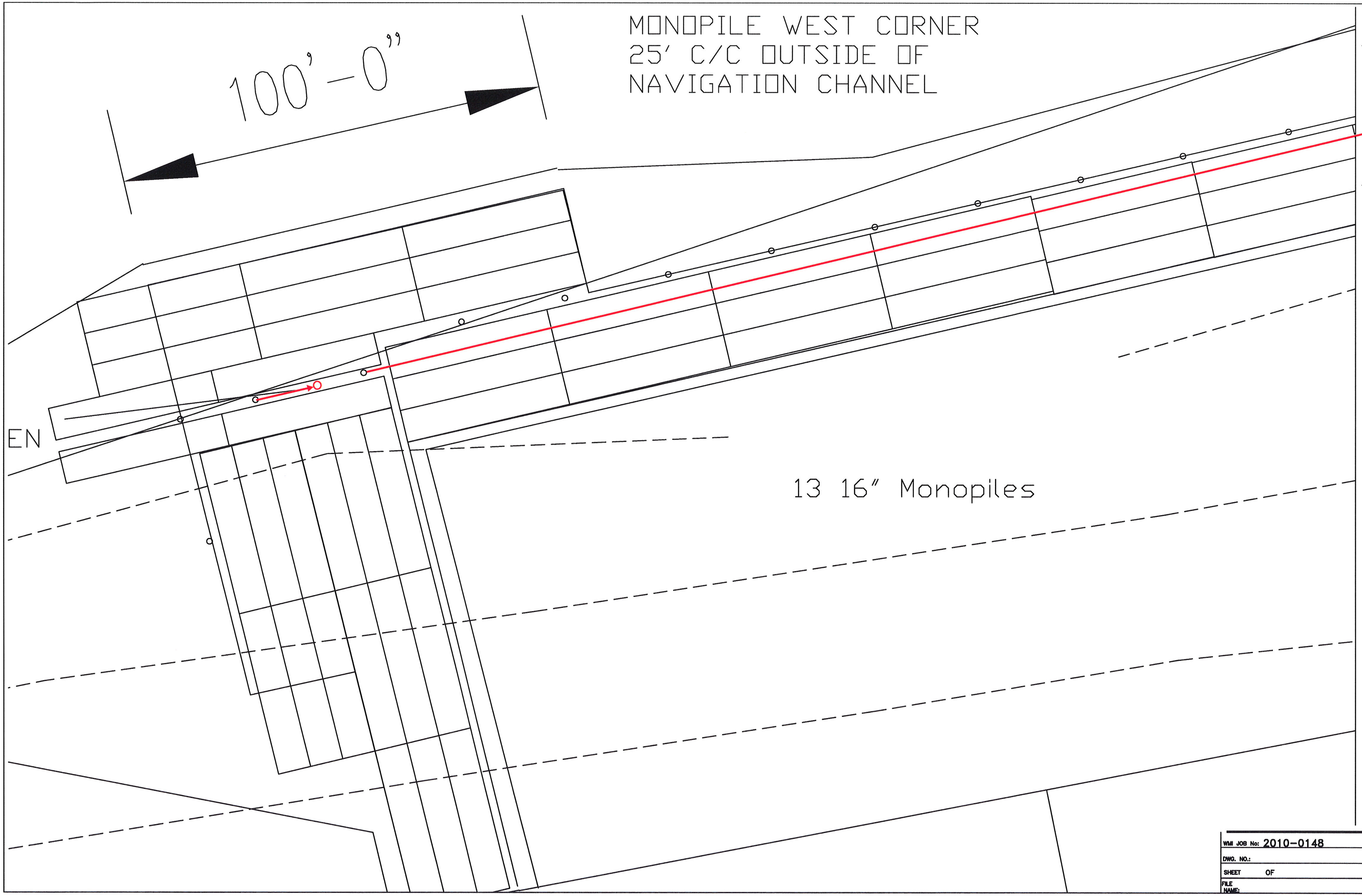

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DRAWN BY: C. Dion
APPROVED BY:
DATE: 1/25/2011
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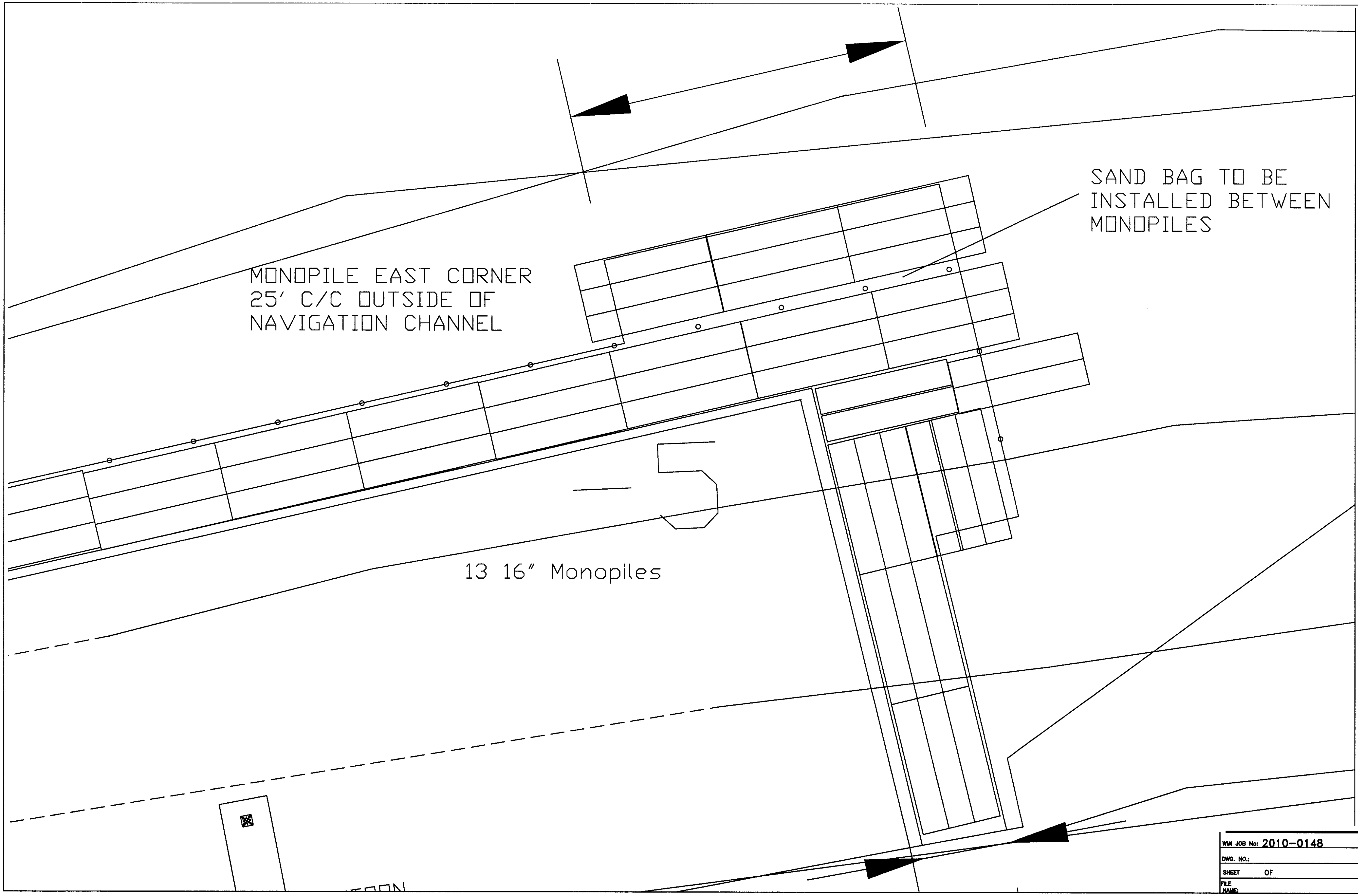
PAPER SIZE B

Passaic River
Newark, NJ
Lower Passaic River Study

WEEKS MARINE, INC.
4 COMMERCE DRIVE
CRANFORD, NJ 07016-3598
(908) 272-4010

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:



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DRAWN BY: C. Dion
APPROVED BY:
DATE: 1/25/2011
SCALE: N/A
PAPER SIZE B

Passaic River
Newark, NJ
Lower Passaic River Study

WEEKS MARINE, INC.
4 COMMERCE DRIVE
CRANFORD, NJ 07016-3598
(908) 272-4010

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:

ARCADIS SUBMITTAL # PC-009-R1

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 354300-01-A
Date of Submittal: June 2, 2011
Contractor: Weeks
Contract No.: B0009964.001
Subject of Submittal: Concrete Mattresses Layou

Specification No. 35 43 00
Par. No. 1.4
Drawing No. D-14

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings
☐ Sample
☐ Progress Schedules
☐ O&M Manual
☐ Testing Procedure
☐ Contact List
☒ First Submission
☐ Second Submission
☐ Third Submission
☐ _____ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
Concrete Mattresses Layout	1
Concrete Mattresses will be 8' nominal by 40'	
The 8' nominal means that the mattress will be 8' minimum to 8'-9" maximum	
Sand bags will be placed between monopiles	

☐ **REVIEWED** ☐ **REVIEWED & NOTED**

REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

SIGNATURE

6/15/11
Date

Office Location

☒ **RESUBMIT** ☐ **REJECTED**

Complete either (a) or (b) and ©, in the case
a (X) The Contractor verified that the materi
shown,, or indicated in the Contract Docume
b ( ) The Contractor has verified that the ma
shown, or indicated in the Contract Docume

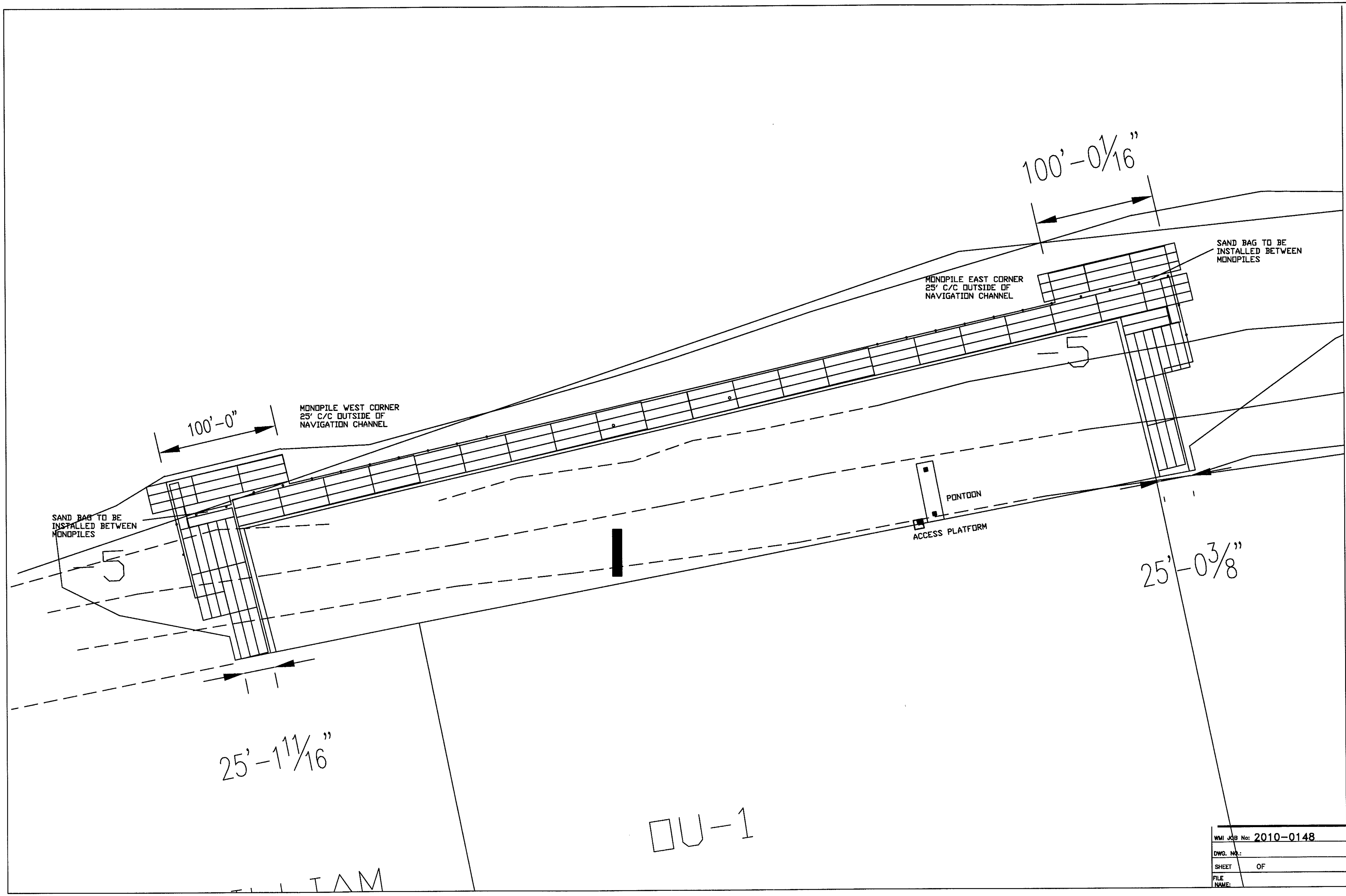
c (X) The Contractor has stamped or written
certifying that the Contractor has satisfied its
requirements of Article 6 of the General Con

Signed (By the Contractor): ____________
Claude Dior

PC-009-R1

RESUBMIT:

- General note: Additional clarification is requested for partial submittals;
- It appears that there should be an additional monopile on the east side of the enclosure (see attached). Please confirm the # and location of the mono-piles; and
- Provide additional detail for monopiles material type and dimensions to satisfy Product information in 01 76 00.



NO.	REFERENCE DWG NUMBER	DATE	DESCRIPTION	BY
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DRAWN BY: C. Dion
APPROVED BY:
DATE: 1/25/2011
SCALE: N/A
PAPER SIZE B

Passaic River
Newark, NJ
Lower Passaic River Study

WEEKS MARINE, INC.
4 COMMERCE DRIVE
CRANFORD, NJ 07016-3588
(908) 272-4010

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:

ARCADIS SUBMITTAL # PC-009-R2

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 354300-01-B
Date of Submittal: June 2, 2011
Contractor: Weeks
Contract No.: B0009964.001
Subject of Submittal: Concrete Mattresses Layou

Specification No. 35 43 00
Par. No. N/A
Drawing No. D-14

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings	☐ Progress Schedules	☐ Testing Procedure	☐ First Submission	☐ Third Submission
☐ Sample	☐ O&M Manual	☐ Contact List	☒ Second Submission	☐ _____ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
This submittal was requested by Arcadis to provide the layout of the matresses only.	
Therefore it was not intended for a specific requirement of spec. 35 43 00.	
After approval of the layout, additional submittal as specified in spec. 35 43 00 will be submitted	
Please find attached the "layout" of the matresses for approval.	1
Concrete Mattresses will be 8' nominal by 40'	
The 8' nominal means that the mattress will be 8' minimum to 8'-9" maximum	
No addititional dimension will be fabricated.	
Please call so we can discussed prior to final approval.	

Complete either (a) or (b) and ©, in the case of technical Submittals or Progress Schedule Submittals:

a (X) The Contractor verified that the material, equipment, or other item contained in this Submittal meets all the requirements specified, shown,, or indicated in the Contract Documents with no exceptions.

b ( ) The Contractor has verified that the material, equipment, or other item contained in this Submittal meets all requirements specified, shown, or indicated in the Contract Documents except for variances identified in the following attached documents:

c (X) The Contractor has stamped or written its approval on each Shop Drawing sheet, or cover sheet in the case of other Submittals, certifying that the Contractor has satisfied its responsibilities with respect to the review of the submission including, but not limited to, the requirements of Article 6 of the General Conditions.

Signed (By the Contractor): Claude Dion

Claude Dion

☐ **REVIEWED** ☒ **REVIEWED & NOTED**

REVIEWED SOLELY FOR GENERAL
COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

SIGNATURE

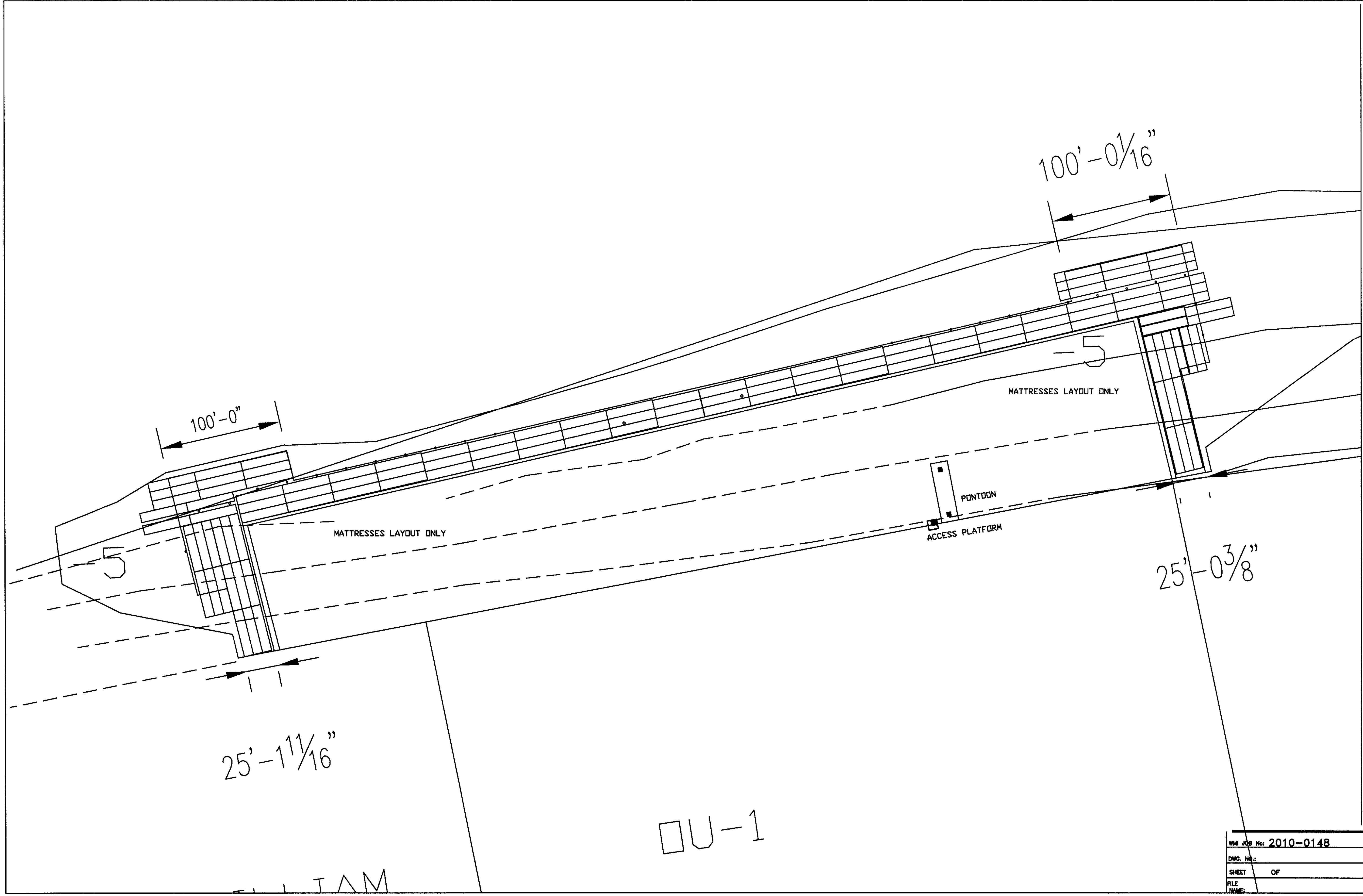
6/26/11
Date

Syracuse
Office Location

☐ **RESUBMIT** ☐ **REJECTED**

PC-009-R2, Reviewed &Noted:

Weeks will be required to show that sand bags will be placed in the gaps between mattresses shown in the submittal and that this is demonstrated to satisfaction of the engineer.



NO.	DATE	DESCRIPTION	BY

NO.	REFERENCE DWG NUMBER
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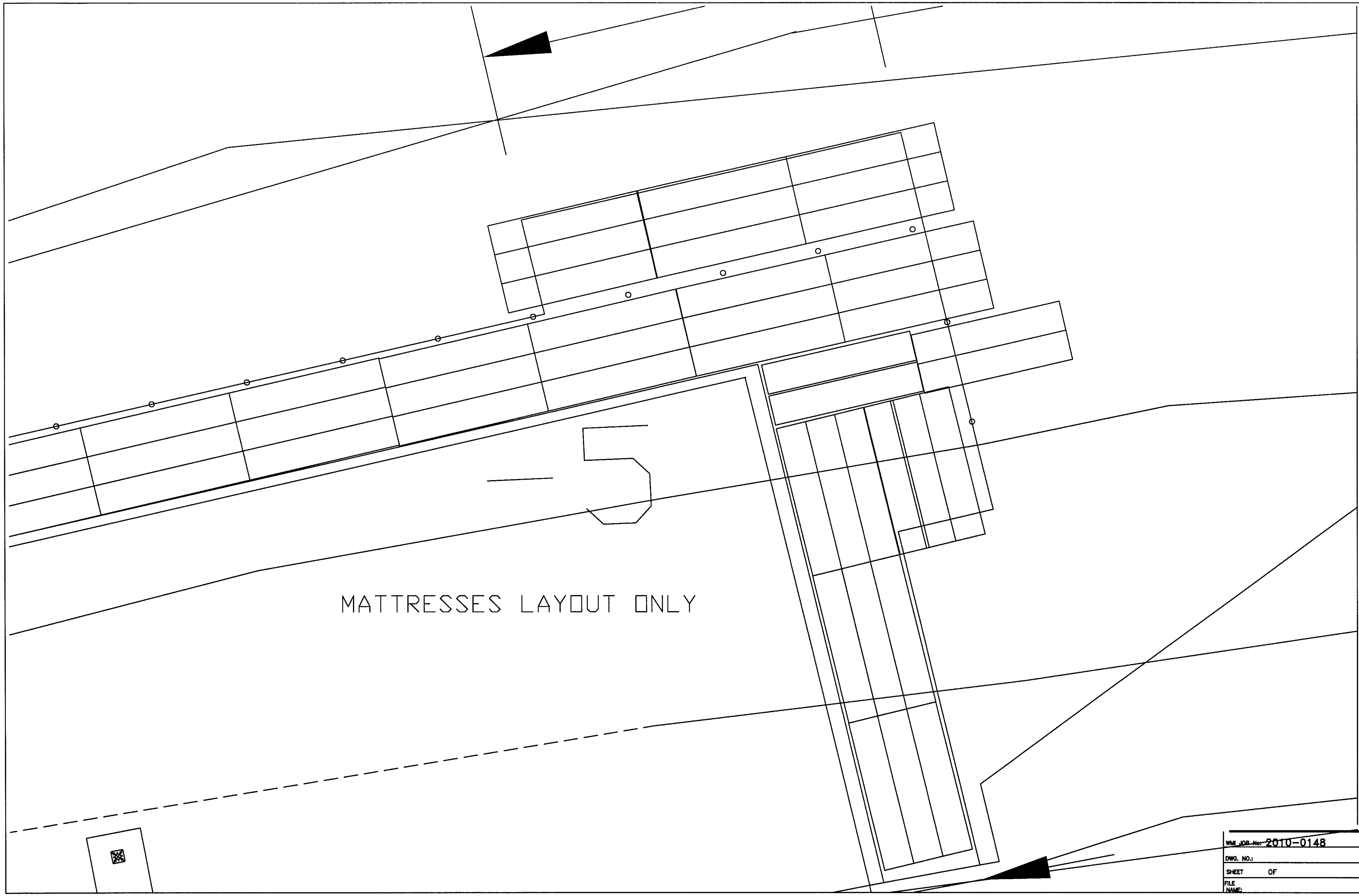
DRAWN BY: C. Dion
APPROVED BY:
DATE: 1/25/2011
SCALE: N/A
PAPER SIZE B

Passaic River
Newark, NJ
Lower Passaic River Study

WEEKS MARINE, INC.
4 COMMERCE DRIVE
CRANFORD, NJ 07016-3598
(908) 272-4010

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:



NO.	REFERENCE DWG NUMBER	DATE	DESCRIPTION	BY
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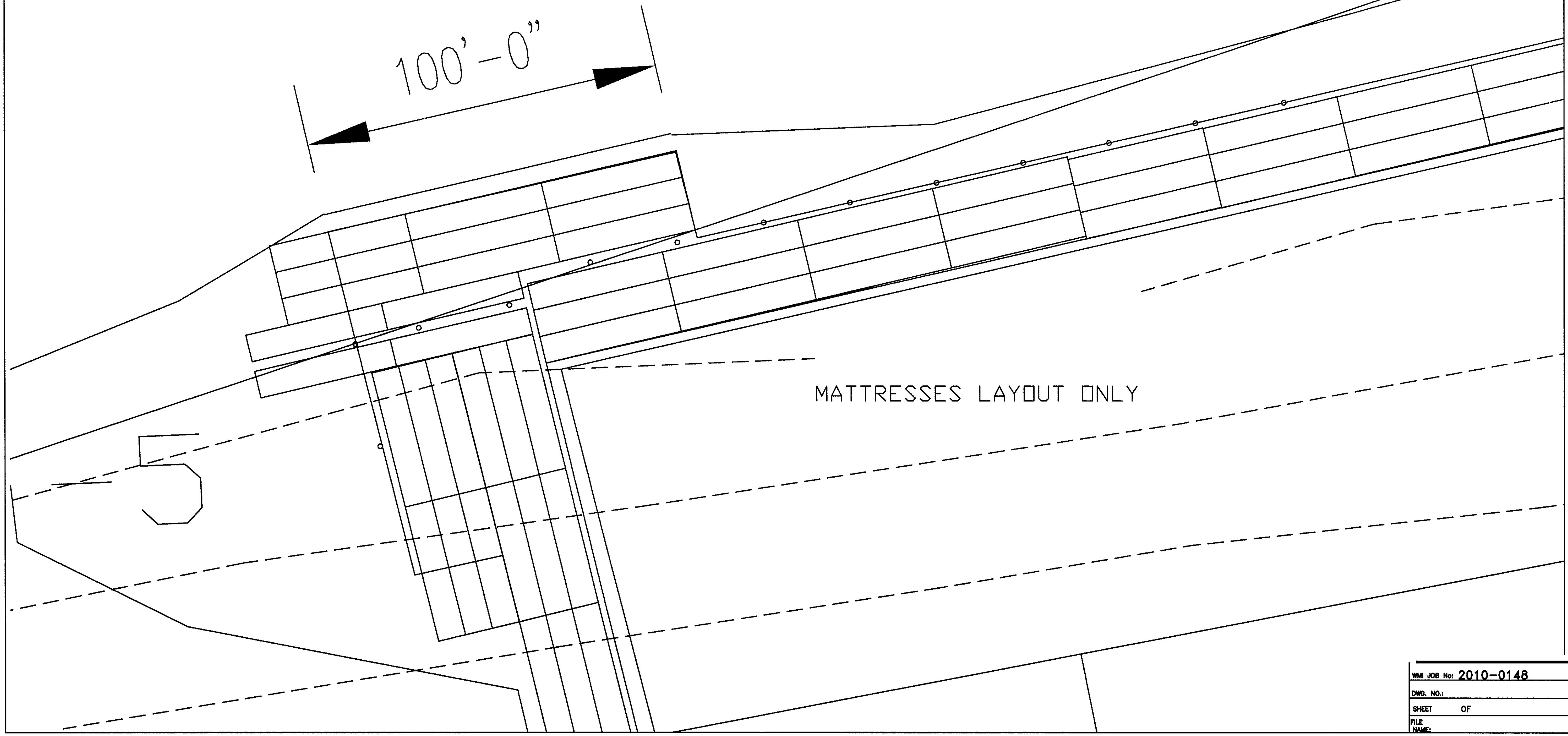
2				

DRAWN BY: C. Dion
APPROVED BY:
DATE: 1/25/2011
SCALE: N/A
PAPER SIZE B

Passaic River
Newark, NJ
Lower Passaic River Study

WEEKS MARINE, INC.
4 COMMERCE DRIVE
CRANFORD, NJ 07016-3598
(908) 272-4010

WMI ~~JOB No:~~ 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:



NO.	REFERENCE DWG NUMBER
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DATE	DESCRIPTION	BY

DRAWN BY: C. Dion
APPROVED BY:
DATE: 1/25/2011
SCALE: N/A
PAPER SIZE B

Passaic River
Newark, NJ
Lower Passaic River Study

WEEKS MARINE, INC.
4 COMMERCE DRIVE
CRANFORD, NJ 07016-3598
(908) 272-4010

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:

ARCADIS SUBMITTAL # PC-010-R1

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 315100-02-A
Date of Submittal: June 7, 2011
Contractor: Nicholson
Contract No.: B0009964.001
Subject of Submittal: # of Years TieBack Inst.

Specification No. 31 51 00 Par. No. 1.4.2.1
Drawing No. ______

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings ☐ Progress Schedules ☐ Testing Procedure ☒ First Submission ☐ Third Submission

☐ Sample ☐ O&M Manual ☐ Contact List ☐ Second Submission ☐ ______ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
Nicholson's experience in Tie Back installation	1

☒ REVIEWED ☐ REVIEWED & NOTED

REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

SIGNATURE

6/15/11

Date Office Location

☐ RESUBMIT ☐ REJECTED

Complete either (a) or (b) and ©, in t
a (X) The Contractor verified that th
shown,, or indicated in the Contract
b ( ) The Contractor has verified that
shown, or indicated in the Contract C

c ( ) The Contractor has stamped or
certifying that the Contractor has sati
requirements of Article 6 of the Gene

Signed (By the Contractor): ______

Clau

Anchor Projects

Total Projects= **27**

David D. Terry Lock & Dam 2 Pine Bluff, AR	The concrete spillway piers at the David D. Terry Dam have numerous cracks resulting from Alkali-Silica Reactivity (ASR). Work consists of 11 exploratory core holes and 22 anchors to be installed in 11 piers. The anchors and exploratory holes are to be installed from downstream side of the piers. The work includes the following: drilling exploratory core holes, recovery and storage of sequenced and oriented core samples, down-hole imaging of the interior of exploratory core holes, surveying/videoing and mapping of underwater cracks, patching of cracks, drilling holes for anchors, perform water pressure testing and consolidation grouting, drill test cores to verify penetration and overall quality of crack repairs and grouting, installation and testing of anchors, install anchor protective covers. **Owner:** U.S. Army Corps of Engineers	U.S. Army Corps of Engineers Carmen Terrell (501) 324-5721	$4,549,722.00 Upcoming
C1B New Haven Line Catenary Bridgeport, CT	40 Permanent Ground Anchors, 10 Performance Tests, 7 Extended Creep Tests, 3 Verification Test for Micropiles, 18 Proof Tests for Micropiles, 301 Micropiles for two bridge locations. NCC DESIGN SCOPE: Design of alternate for the micropiles which was approved by engineer –of –record for the two bridges. **Owner:** State of CT Department of Transportation	Banton Construction Company Steven Ryan (203) 234-2253	$2,709,450.00 Ongoing
Orchard Street Transmission Repair Springfield, MA	Installation of 2 jet grout columns to seal gap between new and existing sheet pile walls. Installation of 11 temporary tie back anchors (125 kips). Proof test and lock off anchors. **Owner:** Springfield Water & Sewer Commission	P. Gioioso & Sons, Inc. Marco Gioioso	$119,000.00 2010

Con Edison - Pelham Plaza Pelham Manor, NY	Installation of 67, 100 kip permanent anchors at an inclination of 45 degrees. Each tieback has a 6-inch diameter x 10 foot rock socket and an average free length of 75 feet. **Owner:** Con Edison	Conti Services, LLC Andrejs Miller (908) 791-4808	$1,396,417.00 2009
Olmos Dam San Antonio, TX	Nicholson is drilled, water tested, grouted, re-drilled, and re-tested four test anchors at Olmos Dam. Each anchor is a different design and bond for site testing. All four anchors have a load cell for long term monitoring and evaluation by the owner's engineer. **Owner:** Bexar County	Freese & Nicholls, Inc. Victor Vasquez (512) 617-3100	$235,130.00 2009
Second Creek Waste Water Storage Knoxville, TN	The construction of a new wastewater treatment facility at Second Creek required the installation of 60 rock anchors drilled into the limestone bedrock at the site. The rock anchors will consisted of a 1 3/8" GR 150 bar having either 21'-6" or 14' bond zone and free lengths of either 10' or 8'-9". **Owner:** Knoxville Utility Board	Bowen Engineering Corp. Dallas Coplin (865) 293-4042	$87,295.00 2009
World Trade Center Memorial Liner Wall New York, NY	Nicholson installed approximately 25,000 square feet of a four-inch thick reinforced concrete liner wall, 183 tieback anchors, 20 24-inch caissons, approximately six 12 1/4 inch micropiles and approximately 7,750 square feet of slurry wall for a cutoff with a jet grout toe. **Owner:** National Sept. 11 Memorial	Bovis Lend Lease LMB, Inc. Brian Peters (212) 592-6700	$17,417,500.00 2009
Four Seasons Baltimore - Anchors Baltimore, MD	Nicholson installed 533 temporary anchors with simple corrosion protection for support of a new diaphragm wall. Anchors range from 10 strands in the upper rows to as many as 28 strands in the lower rows for a total of approximately 52,000 linear feet. **Owner:** Armada Hoffler Construction Company	Armada Hoffler Construction Company Tim Hodges (410) 727-2929	$7,242,000.00 2008

INDOT SR 66 Perry County, IN, IN	Nicholson installed and tested 87 permanent tieback anchors for landslide remediation. The tieback loads range from 50 to 160 kips with the average drill length at 45 feet. Tiebacks are connected at the top to drilled shafts (by others) on 8 foot centers with precast concrete lagging (by others) between shafts. **Owner:** Indiana Department of Transportation	Ragle, Inc. Scott York (812) 853-9558	$307,000.00 2008
RPV Spent Fuel Mockup Chattanooga, TN	Project consists of construction of 85 ft deep shaft and adjacent holding pool inside an existing building. Nicholson's scope of work included installation and stressing of 88 permanent anchors. In addition to the support of excavation, Nicholson also injected approximately 15,000 gal of sodium silicate grout and 50 gallons of polyurethane grout around the toe of the sheet pile wall to provide water cut-off and prevent soil from migrating between the toe of the sheets and the rock. Nicholson also installed micropiles. **Owner:** Westinghouse	W.L. Hailey Bill Harworth (423) 493-0740	$444,470.00 2008
St. Joseph Hospital - Phase 3B Ann Arbor, MI	Nicholson installed ten anchors through sleeves in new caissons for design loads ranging from 230 to 360 kips. The geology is alluvial outwash consisting of sand and gravel with nestled cobbles and boulders below the caisson tip elevation. **Owner:** The Christman Company	The Christman Company Jeff Tomczak (734) 260-3785	$140,000.00 2008
Abingdon Heights Arlington, VA	Nicholson designed and constructed a permanent earth retention system for an eleven-story condominium tower with three levels of below-grade parking. The project consists of 48 Load Bearing Elements (Barrettes) which are 3 feet by 10 feet by 75 feet. Nicholson also installed 48, 29-strand permanent anchors. **Owner:** Sunburst Hospitality Corporation	Donohoe Construction Company Neil Stablow (202) 333-0880	$4,710,000.00 2007

Bayswater Peaking Facility Far Rockaway, NY	Nicholson installed and tested 12 tiebacks through an existing sheetpile bulkhead using a crane suspended mast/platform. **Owner:** Florida Power Light & Energy	D'Onofrio Construction Shea Thorvaldsen (718) 832-5700	$380,000.00 2007
Port Authority Bus Terminal - BT-254.220 New York, NY	Installed and tested 48 rock tiedowns through sleeved holes in a new concrete footings as part of the rehabilitation of the existing bus terminal; the new footing is to be bearing on rock; a minimum of ten feet of headroom is to be provided. Staged construction (an attempt to overlap 1A and 1B to minimize mobilizations) will be used. Stage 1 A includes the installation of eight anchors; Stage 1B is two anchors (three months later); Stage 1C - 14 anchors (three months later); Stage 1D - 24 anchors (three months later). **Owner:** Port Authority of NY & NJ	Koch-Skanska Paul Koch (732) 969-1700	$545,000.00 2007
Safford Leach Project Safford, AZ	Nicholson drilled and installed 118 owner-provided anchor bars. **Owner:** Phelps Dodge Safford, Inc.	Nielsons Skanska, Inc. George Cookie (970) 565-8000	$38,380.00 2007
World Trade Center Hub-Secant Pile Wall Tiebacks New York, NY	Nicholson installed 112 temporary tiebacks (18-22 strand) to support the secant pile separation wall at the WTC HUB site. The project involved chipping out secant pile concrete and installing wedge plates and walers. **Owner:** Port Authority of NY & NJ	Phoenix Constructors, JV William DeCamp (212) 616-5800	$3,300,000.00 2007

Canton Lake Dam Spillway Stabilization Canton, OK	Provided instrumentation, installed 64 rock anchors, dewatering/fish relocation, and drilled stilling basin drains. Designed the rock anchors and work platforms. The anchor capacities ranged from 775 to 1,125 kips. **Owner:** U.S. Army Corps of Engineers	U.S. Army Corps of Engineers Richard Alexander (405) 610-4640	$4,525,000.00 2006
Hoover Dam Phase 4 Boulder City, NV	Drill 24 holes for 22 strand cable anchors. The anchors will be installed and stressed by others. **Owner:** U.S. Federal Highway Administration	Obayashi/PSM JV Jim Stevens (702) 293-4924	$140,180.00 2006
Keystone Buildout Project Saltsburg, PA	Nicholson constructed two retaining walls which include 115,000 square feet of shotcrete facing and 4,000 soil nails (12,865 LF). The project also includes another 2,103 cubic yards of shotcrete slope protection; 54,897 lineal feet of rock anchors; and 8,100 lineal feet of sub horizontal drains. **Owner:** Norfolk Southern Railway Company	Charles J. Merlo, Inc. Gary Heinrich (814) 322-1545	$2,464,150.00 2006
Thorne Dam Improvements Amenia, NY	Nicholson installed and tested 31 tiedowns through existing stone masonry dam working off the top of the dam and scaffold platform. **Owner:** N/A	C. A. Phillips Construction Corp. Chad Phillips (845) 557-8153	$472,912.00 2006
Hoover Dam Phase 2 Boulder City, NV	Nicholson installed anchor bars in blocks for cable highline system. **Owner:** US Federal Hwy Admin	Obayashi/ PSM JV Jim Stevens (702) 293-4924	$410,000.00 2005

I-79 Carnegie Exit Carnegie, PA	Nicholson installed 99 each 160 & 260 kip permanent anchors ranging from 100 to 130 feet long. 262 each 6 inch diameter concrete dowels (soil piles w/#8 bars full length) around existing piers will also be installed. **Owner:** Pennsylvania Department of Transportation	Trumbull-Lindy JV Roland Kania (412) 279-1805	$1,016,000.00 2005
South Hills Village Parking Garage Pittsburgh, PA	Nicholson installed 36 rock anchors to depths ranging from 80 feet to 135 feet through drilled-in H-beams for the retaining wall of the new Port Authority Parking Garage at the South Hills Village Shopping Mall. The anchors were installed on a 45-degreee angle and socketed 12 to 15 feet into bedrock. The anchored H-beam and wood lagging retaining wall was the back form for the cast-in-place concrete wall of the garage. **Owner:** Port Authority of Allegheny County	Walsh Construction Rick Sinopoli (412) 787-3100	$150,000.00 2004
Long Island Expressway Test Program New Hyde Park, NY	Nicholson installed and tested ten anchors for walls. Two SBMA. **Owner:** New York State Department of Transportation	Modern Continental Construction (617) 864-6300	$140,863.00 2003
Queens Center Mall Expansion Elmhurst, NY	Nicholson installed 138 permanent tieback anchors and 65 tiedown anchors through sheet piles to support a 30 foot deep excavation. The east side of the mall expansion covered 43,000 square feet and an average 80 foot depth while the west side of the expansion covered 11,500 square feet with an average 65 foot depth. Test loads were 180 K with design loads of 150 K for the 4-5 strand anchors. Soils consisted of alluvial deposits of sand interbedded w/ silt and clay. **Owner:** The Macerich Company	Ruttura and Sons Construction Peter Ruttura (631) 454-0291	$1,653,381.00 2003

World Trade Center Recovery New York, NY	Nicholson acted as managing partner in a joint venture and installed 980, 600 kip rock anchors ranging from 45 to 130 feet in length, socketed into rock, to support the three-foot-thick concrete diaphragm wall, commonly known as the "bathtub," surrounding the World Trade Center site. The wall, formerly supported by the basement floors within its 3,000 foot perimeter, retained the earth and held back the Hudson River for more than three decades. Compromised by the events of Sept. 11, 2001, the basement floors were pancaked under the impact of the collapsing structures, and the permanent structure was no longer able to provide lateral support for the walls. Since debris and rubble had to be removed below grade within the wall perimeter, anchors were needed to provide wall support and prevent further movement or failure. Logistics atypical of most construction projects and an overwhelming effort to ensure the safety of all individuals working around the many hazards on site made this a notable project in Nicholson's history. **Owner:** New York Dept. of Design & Construction	Bovis Lend Lease Brian Peters/Jim Abadie (212) 258-0174	$10,000,000.00 2002
Titicus Dam Purdy, NY	Nicholson drilled eight each 200 feet, 1900 K WL, 54-strand dam anchors with 10 inch diameter holes. Water test/survey (grout and redrill). Total 1800 linear feet of drilling. Special guide sleeves were fastened to dam and spiral ribbed and "flo-thru" type "can" stabilizers were used to maintain borehole alignment to within 0.5 degrees of that specified. Holes checked with R-Singleshot survey instrumentation. Numerous environmental measures taken. **Owner:** NYC Dept. of Env'l Protection	Thalle Construction Co. Thalle Const. Co. (914) 762-3415	$203,345.00 1998

ARCADIS SUBMITTAL # PC-011-R1

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 315100-03-A
Date of Submittal: June 7, 2011
Contractor: Nicholson
Contract No.: B0009964.001
Subject of Submittal: Tie Back Resume

Specification No. 31 51 00
Par. No. 1.4.2.2
Drawing No.

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings ☐ Progress Schedules ☐ Testing Procedure ☒ First Submission ☐ Third Submission

☐ Sample ☐ O&M Manual ☐ Contact List ☐ Second Submission ☐ _____ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
Nicholson's Personnel Resume	1

☑ REVIEWED ☐ REVIEWED & NOTED

REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

SIGNATURE

6/15/11
Date

Office Location

☐ RESUBMIT ☐ REJECTED

Complete either (a) or (b) and ©, in
a (X) The Contractor verified that th
shown,, or indicated in the Contract
b ( ) The Contractor has verified that
shown, or indicated in the Contract D

c ( ) The Contractor has stamped or
certifying that the Contractor has sat
requirements of Article 6 of the Gene

Signed (By the Contractor):

Clau

Tim Nestor *Superintendent*

Mr. Nestor joined Nicholson Construction in August of 2001. Since that time he has worked on the following projects:

World Trade Center Trans. Hub-Micropiles & Anchors Ongoing

New York, NY Port Authority of NY & NJ $19,909,000

In a joint venture, Nicholson installed 459 micropiles (approximately 40,000 linear feet total) through and under the active NYCTA #1 Line Subway box. Core drilling was performed for access holes, and access sleeves, pile cutoffs, cap plates, and spoil control are also included in the JV's scope of work. Nicholson also installed 923 tieback anchors to support the new east bathtub diaphragm wall and the existing H&M wall. The anchors are primarily 19 strands in size, up to 120 feet long for a total of approximately 60,000 linear feet of drilling. Core drilling through existing H&M walls is a large part of the JV's scope of work.

World Trade Center Trans. Hub-Jet Grouting 2008

New York, NY Port Authority of NY & NJ $7,093,000

Nicholson installed 110 jet grout columns through and under the active NYCTA #1 Line Subway box using low headroom rigs during weekend outages. Project also includes core drilling of access holes, 12 3/4-inch OD access sleeves and pre-bore holes for jet grouting and spoil control. Columns outside the subway box are being completed from grade outside of the subway with normal unrestricted headroom.

Roslyn Viaduct 2007

Roslyn, NY New York State Department of Transport $4,766,000

The joint venture installed approximately 900 micropiles with 12 3/4 inch casing. The micropiles are 70 feet in length. There was also soldier pile and lagging work, 35 tiebacks, and dewatering.

World Trade Center Trans. Hub Z-Wall 2007

New York, NY Port Authority of NY & NJ $1,425,000

Nicholson installed 62 micropiles and 44 jet grout columns in low headroom within the C-level of the H&M structure to form part of the SOE and water cutoff for the excavation of the new WTC Towers. Also drilled access holes, 12 inches in diameter, through the existing concrete floor slab and spoil control are also included in the JV scope of work.

Gilboa Dam 2006

Schoharie County, NY New York City DEP $20,122,000

The project involved the installation of 79 high-capacity anchors for an emergency dam remediation project. The anchors range in length from 175 to 230 feet and have capacities ranging from 1,500 to 2,200 kips. The largest anchors on the project have 58 strands.

Dearborn CSO Contract #2 2006

Dearborn, MI Dept. of Public Works, City of Dearborn $2,293,230

Rock grouted a 50 feet high zone below 100 feet of overburden in preparation of caisson construction. Double-fluid jet grouting to provide a seal/underpinning at base of caisson. Installation of temporary tiebacks at part of underpinning work at base of caisson. Installation of permanent tiebacks and shotcrete face within rock excavation at base of caisson. All work keeps water and methane/hydrogen sulfide from entering excavation.

Dearborn CSO Contract #3 2005

Dearborn, MI Dept. of Public Works, City of Dearborn $3,070,935

Nicholson performed rock grouting of a 50 foot zone below 100 feet of overburden in preparation for caisson construction. Double-fluid jet grouting was performed to provide a seal/underpinning at base of caisson. The project also includes installation of temporary tiebacks at part of underpinning work at the base of the caissons. There was also installation of permanent tiebacks and shotcrete face within the rock excavation at base of caisson. Nicholson removed existing grout pipes and performed chemical contact grouting. All work keeps water and methane/hydrogen sulfide from entering excavation.

Former Market Street 2005

Newark, NJ PSE&G-SC $230,000

Nicholson installed 44 temporary tiebacks along a sheetpile wall. The anchors have design loads of 182 kips and were installed to depths of 65 feet. Approximately 2,860 linear feet of anchors were installed.

Long Island Expressway-Temporary Tieback System 2004

Old Westbury, NY New York State Department of Transport $1,022,000

Nicholson installed walers, 160 anchors, and test anchors. Nicholson had to design the anchors to fit within the right of way of the project site. Also designed were wales to transfer tiebacks to the sheet pile retaining walls.

J.T.Myers Lock & Dam II 2004

Mt. Vernon, IN U.S. Army Corps of Engineers $509,105

Nicholson installed 12 each 12 strand anchors. Core samples done of bond zone from the 9 monoliths receiving anchors. Anchor design load is 400 K and anchors are 85 feet in length. Anchor bond length is 35 feet, with a free length of 50 feet.

Shippensburg Univ. Instructional Arts Facility 2004

Shippensburg, PA Commonwealth of Pennsylvania $1,024,932

Nicholson installed 184 micropiles for a total of 9,640 linear feet. Piles will be 7" casing with two #18 bars in bond zone. 54 of 184 piles will have full length tension bar. #18 Gr. 75 geology is Karstic Limestone.

I-86/Rt. 15 Interchange 2004

Steuben County, NY New York State Department of Transport $269,080

Nicholson performed one ASTM D1143 "Quick" load test and installation of 72 micropiles. Nicholson designed the micropiles and the connection to the pile cap.

SR 33 Bridge 2004

Easton, PA Pennsylvania Department of Transportati $2,434,000

Installed micropile pile load tests and 124 production micropiles for bridge reconstruction.

Department of Sanitation Garage 2004

New York, NY Department of Sanitation-New York $690,000

Designed and installed single-fluid jet grout columns in order to underpin an existing one-story building for a 17 foot deep-cut excavation. The 106 total installed columns also provided support of excavation and water cutoff. The 43-foot deep columns, measure 4 feet in diameter.

Proctor's Theatre - Phase I 2004

Schenectady, NY Proctors $460,000

Nicholson installed 67 micropiles for the theater's expansion project.

Electric Boat 2004

Groton, CT Electric Boat Corporation $3,000,000

Completed jet grouting for repair and soil stabilization of a sheet pile coffer cell at a Navy submarine manufacturing facility. A total of 184 single and double-fluid jet grout columns with various diameters were installed. The average drill depth was 90 feet and the average grout depth was 60 feet.

Amos Plant SCR Unit 1 Exterior 2004

Winfield, WV American Electric Power $1,076,919

Nicholson installed 73 micropiles for SCR foundations and 32 booster fan piles.

Cross Westchester Expressway 2004

White Plains, NY New York State Department of Transport $1,160,000

Nicholson installed 88 micropiles beneath 735 kVa high voltage wires with just 25 feet of overhead clearance. Work performed in 3 phases (two phases in 2003 and last phase in 2004) while existing bridge is being replaced. Piles are 12-3/4 inch O.D. with a 3/4 inch wall and will be installed in a 16 inch temporary outer casing. One pile load test performed.

Ocean Pkway and Belt Pkway 2003

Brooklyn, NY New York State Department of Transport $944,125

Test program with four sacrificial micropiles (Phase I - Mid June 2003). Nicholson installed 56 micropiles beneath existing bridge (Ocean Parkway) (Phase II-Late September 2003). Four week window.

Pittsburgh Mills Site Development 2003

Pittsburgh, PA Pittsburgh Mills L.L.C. $620,000

Nicholson designed and constructed a temporary soil nail wall for culvert replacement. The 50 foot high, 200 foot wide wall includes 5,900 square feet of 6-inch fiber-reinforced shotcrete facing and 247 soil nails ranging from 13 inches to 63 inches. The retail center is located on a 340-acre site.

Long Island Expressway Test Program 2003

New Hyde Park, NY New York State Department of Transport $140,863

Nicholson installed and tested ten anchors for walls. Two SBMA.

491 Greenwich Street 2002

New York, NY Take One, LLC $1,124,232

Nicholson renovated and converted a 19th century warehouse into a contemporary apartment complex. Nicholson installed 92 micropiles along with performance of 2 compression/tension load tests.

O'Hare Airport Soil Stabilization 2002

Chicago, IL Airport Owner's Representative $1,372,725

Nicholson triple-fluid jet grouted to stabilize over 5,400 cubic yards of soil to support a 90 inch water main. Nicholson's grouting efforts will support the subsequent tunneling of three, 144-inch diameter storm sewers. A total of 296 jet grout columns were installed adjacent to and under the water main which carries water to the majority of Chicago's northwest suburbs. The soil composition around the water main ranged from medium-stiff clays to silty sands and sandy silts. To stabilize the soil, Nicholson achieved an unconfined compressive strength of 100 to 200 psi.

Leesville Dam 2002

Gretna, VA American Electric Power $2,101,958

Nicholson performed the design-build installation of 47 dam anchors along the bulkhead walls and in the spillways. The anchors featured working loads of 1,600 K. The anchors ranged in size from 16 to 45 strands. Anchor corrosion protection consisted of 8-inch ID full-length corrugated using two-stage grouting techniques. Work was performed from drill platforms, telescoping to heights of 80 feet, constructed on the spillway and bulkhead faces. Nicholson completed 1,176 LF of 9-inch drilling and 3,430 LF of 12-inch drilling. Design scope included responsibility for detailing anchors and sizing bond lengths. Special guide sleeves were fastened to dam and spiral ribbed and "flo-thru" type "can" stabilizers were used to maintain borehole alignment to within 0.5 degrees of the specifications. Nicholson was also responsible for the means and methods of design such as access and platforms, as well as testing with a 1,400-ton jack. All anchors were locked off at 110% of their design load. The project involved numerous hazards including working at elevated heights, high tension wires, and working over water with potential slip/trip/fall hazards.

Montgomery County Jail 2002

Clarksville, TN Montgomery County $1,870,900

For the Montgomery County Jail expansion, Nicholson installed 434 micropiles ranging from 40 to 120 feet in depth (33,556 linear feet). They faced extremely difficult drilling conditions as the 280 K micropiles had to be drilled into highly pinnacle karst formations. In some 5 feet horizontal areas there would be a 60 foot vertical difference. Of the two load tests, the team took one to 240% of the design load without indication of failure or excessive movement. This project was completed in 3 1/2 months working two drill rigs an average of 5 days per week.

Clifty Creek Plant Crane Foundations 2002

Madison, IN American Electric Power $5,610,631

To support a 800 K crane used to set structural elements on the top of an existing plant structure, Nicholson drove 208 H-Piles and constructed a concrete pad. Two cranes, one barge mounted and the other situated on an earthen bench, were used to drive the piles. Templates constructed out of steel beams control pile alignment and act as crew access for welding and cutting activities.

Gateway Arch Bridge 2002

Nashville, TN Tennessee Department of Transportation $177,640

In order for a new pedestrian bridge to be built across the Cumberland River, Nicholson worked from bridge abutments to provide temporary support for the construction sequence of the precast concrete arch bridge. The two main areas of work were the East and West sides. The West side involved the installation of 28 anchors to depths of 20 feet and four tension tests. The East side involved the installation of 12 tension piles to depths of up to 100 feet. The precast sections would be lifted into place in sections. In order to hold the curved arches prior to final placement of center piece, it was necessary to erect towers and a stay-cable system. Once the arch became self supporting, cables and towers were removed, and anchors were abandoned.

30 Hudson Street Pile Caps 2002

Jersey City, NJ Goldman-Sachs $190,000

Nicholson installed 24 micropiles (12-3/4 inch diameter) with 11.5 foot socket into rock.

Big Sandy Power Plant		2002
Louisa, KY	American Electric Power	$538,591

Nicholson installed and tested (Comp/Lateral/Tension) of 74 each 400 K micropiles.

Pittsburgh Engineering Warehouse & Repair Shops		2002
Pittsburgh, PA	U.S. Army Corps of Engineers	$1,144,361

The PEWARS facility serves as a base for the U.S. Army Corps of Engineers barges and tugboats used to service area locks and dams. The facility consists of approximately 1,400 feet of dock front. Over time the sheet pile cells had deteriorated and a new dock frontage was needed. The U.S. Army Corps of Engineers chose to install a new sheet pile wall in front of the existing cells, install permanent rock anchors, and place backfill between the two walls. Nicholson installed and stressed 69, 17-strand, 130 foot long anchors to support the new sheet pile wall. The anchors were installed from barges. The anchors have a 45-foot bond length, 83-foot free length, and a 7 foot tail. The stress and lock-off was at 37.5% of design load. Anchors were stressed to 133% of the design load then locked off at 90% of design load when the anchor's concrete waler tested less than 4 ksi. All work was completed from river barges. Work was limited to 7 hours per day.

Distrigas Terminal		2001
Everett, MA	Distrigas of Mass.	$5,733,772

Nicholson erected a massive steel structure supported by piles in order to expand the plant capabilities of Distrigas of MA, a center that stores and processes liquified natural gas (LNG), transforming it to usable gas for subsequent distribution to the Boston area. The original contract called for 190 auger cast piles in clay. Half way through the job, load test results showed that the piles were failing due to a clay strength that was weaker than anticipated. The portion of the concrete structure that was already erected had to be completely demolished. The owner, pressed by schedule constraints, requested micropiles to rock. At this point Nicholson was called in. 2 days later we mobilized and quickly began installing 214 200-ton capacity, 7" dia. micropiles with rock socket to average depths of 130 ft. utilizing rotary duplex drilling methods. Total length of piles installed was 34,150 ft. Challenges included 125 - 220 ft. pile depths; drilling through highly contaminated soil zones with volatile contaminates such as benzene, toluene, and xylene; re-circulation of the water to avoid flooding the work area with contaminated water; and pressure grouting of the pile at the interface with the glacial till to create a seal to avoid the migration of the contaminates to the rock strata.

Jaime R. Picorelli, P.E. **Sr. Project Manager**

PROFESSIONAL SUMMARY

Mr. Picorelli is a Sr. Project Manager for Nicholson Construction Company, working in the geotechnical construction industry since 1997. His responsibilities include project management within Nicholson's New York District. Mr. Picorelli has experience in all aspects of geotechnical construction, anchors, pin piles, soil and rock anchors, tied-back retaining walls, chemical and jet grouting.

EDUCATION

B.S. in Civil Engineering, Polytechnic University of Puerto Rico, Hato Rey, P.R. 1997

TRAINING

OSHA 10-Hour
OSHA 40-Hour

PROFESSIONAL EXPERIENCE

Nicholson Construction Company, Cuddy, PA
- Sr. Project Manager, 2010 – Present
- Project Manager, 2005 – 2009

Soletanche Inc. – Miami, FL
- Project Manager, 2000 – 2005

Peter Kiewit Construction Company – Rio Piedras, P.R.
- Lead Field Engineer, 1997 – 2000

Nicholson Related Projects:

- Anchors
  - 311 Broadway – New York, NY
  - Ciudadela – San Juan, P.R.
  - Capris – Miami Beach, FL
  - Con Edison – Pelham Plaza – Pelham Manor, NY
  - WTC Vehicle Security Center – New York, NY
  - WTC Hub and Low Headroom – New York, NY
  - ESA CQ31 – Long Island City, NY
- Augercast
  - Avenue U Subway Rehab – Brooklyn, NY
  - Avenue H – Brooklyn, NY
- Diaphragm Walls
  - Metro Plaza – San Juan, P.R.
  - Ciudadela – San Juan, P.R.
  - WTC Vehicle Security Center – New York, NY

- Drilling
  - Spring Creek School – Miser, UT
  - Lexington and 5th Avenue – New York, NY
- Jet Grouting
  - WTC Vehicle Security Center – New York, NY

  - Overpeck Valley – Ridgefield, NJ
  - Wernersville Pumping Station, NY
- Micropiles
  - 311 Broadway – New York, NY
  - United Nations Temp. Building – New York, NY
  - New Family Intake Center – Bronx, NY
  - Columbia University Load Tests – New York, NY
  - Avenue U Subway Rehab – New York, NY
  - Con Edison 74th Street Substation – New York, NY
  - Madison Avenue – New York, NY
  - Avenue H – Brooklyn, NY
  - WTC Hub and Low Headroom – New York, NY
  - ESA CQ31 – Long Island City, NY
- Secant Pile Wall
  - WTC Vehicle Security Center – New York, NY
  - Avenue U Subway Rehab – Brooklyn, NY
  - Avenue H – Brooklyn, NY

- Soldier Pile
  - 311 Broadway – New York, NY
- TaM Tubes/Sleeves
  - Inner Harbor CSO – Brooklyn, NY
- Tiebacks
  - WTC Vehicle Security Center – New York, NY
  - Madison Avenue – New York, NY
- Tiedowns
  - Port Authority Bus Terminal – New York, NY
- Vibrocompaction
  - Dumont Avenue – Brooklyn, NY

Prior Experience:

- Augercast
  - Grupo Carmelo Fly-Ash Storage Dome – San Juan, P.R.
  - New San Juan Parking Building Project – San Juan, P.R.
  - Port of Miami – Miami, FL
  - Tropigas Project – San Juan, P.R.
  - Hines Building Project – Miami, FL
  - Pan American Grain Silos Project – Guaynabo, P.R.
- Diaphragm Wall
  - La Ciudadela de Santurce – San Juan, P.R.
- Soil Nail Wall
  - Rexville Towne Center Project – Bayamon, P.R.
- Stone Columns
  - Lee Roy Selmon Cross-town Expressway – Tampa, FL
  - P.R. 22 Bechara Bridge – San Juan, P.R.
- Tie-back
  - Grove Garden Project – Miami, FL
  - Paseo – San Juan, P.R.

PROFESSIONAL MEMBERSHIPS

College of Engineers and Land Surveyors of P.R. – P.E.

- License No. 19138

ARCADIS SUBMITTAL # PC-012-R1

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 315100-04-A
Date of Submittal: June 7, 2011
Contractor: Nicholson
Contract No.: B0009964.001
Subject of Submittal: Grout

Specification No. 31 51 00
Par. No. 1.4.2.15
Drawing No.

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings
☐ Sample
☐ Progress Schedules
☐ O&M Manual
☐ Testing Procedure
☐ Contact List
☒ First Submission
☐ Second Submission
☐ Third Submission
☐ ______ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
Grout Material	1

☐ **REVIEWED** ☐ **REVIEWED & NOTED**

REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

SIGNATURE

Date

Office Location

☒ **RESUBMIT** ☐ **REJECTED**

Complete either (a) or (b) and ©,
a (X) The Contractor verified tha
shown,, or indicated in the Contra
b ( ) The Contractor has verified t
shown, or indicated in the Contra

Anchor grout is

c ( ) The Contractor has stamped
certifying that the Contractor has
requirements of Article 6 of the G

Signed (By the Contractor):
C

PC-012-R1

RESUBMIT:

- Please provide results of grout bleed testing (per ASTM C 940) indicating grout bleed is less than 2% for the proposed mix design; and
- Please confirm grout mix design includes only Portland cement (Type II or III), a w/c ratio of 0.45 (as indicated) and does not contain any additional admixtures or reagents.

NICHOLSON

a SOLETANCHE BACHY Company

eCRUZ CO. INC.
CONTRACTORS / ENGINEERS

H&M TIE-BACKS

Grout Breaks: NCC samples

Compressive Strength on 2" x 2" cubes
Grout: Cement Portland Type II or Type III, W/C = 0.45

Sample Date	Age Group Days	Specific Gravity	Break Load Lbs	Compressive Strength psi	Average Comp. Strength psi
25-Apr	3	1.75	19,200	4,800	**4,700**
25-Apr	3	1.77	18,600	4,650	
25-Apr	3	1.77	18,600	4,650	
25-Apr	7	1.77	23,000	5,750	**5,933**
25-Apr	7	1.78	22,600	5,650	
25-Apr	7	1.78	25,600	6,400	
25-Apr	28	1.77	27,600	6,900	**6,808**
25-Apr	28	1.78	28,300	7,075	
25-Apr	28	1.80	25,800	6,450	
26-Apr	4	1.82	26,600	6,650	**6,333**
26-Apr	4	1.84	23,600	5,900	
26-Apr	4	1.84	25,800	6,450	
26-Apr	7	1.82	23,800	5,950	**6,483**
26-Apr	7	1.84	25,500	6,375	
26-Apr	7	1.84	28,500	7,125	
26-Apr	28	1.84	32,500	8,125	**8,125**
26-Apr	28	1.84	33,000	8,250	
26-Apr	28	1.85	32,000	8,000	
27-Apr	3	1.84	24,600	6,150	**5,992**
27-Apr	3	1.84	24,400	6,100	
27-Apr	3	1.84	22,900	5,725	
27-Apr	7	1.84	26,200	6,550	**6,708**
27-Apr	7	1.84	28,500	7,125	
27-Apr	7	1.85	25,800	6,450	
27-Apr	28	1.84	27,000	6,750	**7,500**
27-Apr	28	1.85	31,000	7,750	
27-Apr	28	1.85	32,000	8,000	
2-May	5	1.75	25,800	6,450	**6,492**
2-May	5	1.75	25,100	6,275	
2-May	5	1.77	27,000	6,750	
2-May	7	1.75	17,000	4,250	**5,542**
2-May	7	1.77	24,900	6,225	
2-May	7	1.77	24,600	6,150	
2-May	28	1.75	29,000	7,250	**7,708**
2-May	28	1.77	31,500	7,875	
2-May	28	1.77	32,000	8,000	
17-Jul	6	1.85	25,000	6,250	**6,083**
17-Jul	6	1.85	23,200	5,800	
17-Jul	6	1.85	24,800	6,200	
17-Jul	8	1.85	25,000	6,250	**6,158**
17-Jul	8	1.85	24,350	6,088	
17-Jul	8	1.85	24,550	6,138	
17-Jul	28	1.85	18,600	4,650	**6,542**
17-Jul	28	1.85	28,900	7,225	
17-Jul	28	1.85	31,000	7,750	
18-Jul	5	1.80	19,000	4,750	**4,933**
18-Jul	5	1.80	19,500	4,875	
18-Jul	5	1.80	20,700	5,175	
18-Jul	7	1.80	17,200	4,300	**4,492**
18-Jul	7	1.80	18,250	4,563	
18-Jul	7	1.82	18,450	4,613	
18-Jul	28	1.80	24,850	6,213	**6,138**
18-Jul	28	1.80	24,400	6,100	
18-Jul	28	2	24,400	6,100	

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H&M TIE-BACKS

Grout Breaks: NCC samples

Compressive Strength on 2" x 2" cubes
Grout: Cement Portland Type II, W/C = 0.45

Sample Date	Age Group Days	Specific Gravity	Break Load Lbs	Compressive Strength psi	Average Comp. Strength psi
24-Jul	3	1.85	19,800	4,950	**5,117**
24-Jul	3	1.85	21,500	5,375	
24-Jul	3	1.85	20,100	5,025	
24-Jul	7	1.84	27,700	6,925	**6,763**
24-Jul	7	1.84	26,300	6,575	
24-Jul	7	1.84	27,150	6,788	
24-Jul	29	1.88	29,400	7,350	**7,725**
24-Jul	29	1.90	30,800	7,700	
24-Jul	29	2	32,500	8,125	
25-Jul	5	1.84	21,800	5,450	**5,800**
25-Jul	5	1.84	21,400	5,350	
25-Jul	5	1.84	26,400	6,600	
25-Jul	7	1.85	26,000	6,500	**6,321**
25-Jul	7	1.84	25,450	6,363	
25-Jul	7	1.84	24,400	6,100	
25-Jul	28	1.84	21,400	5,350	**7,117**
25-Jul	28	1.86	31,000	7,750	
25-Jul	28	1.86	33,000	8,250	
26-Jul	4	1.80	18,900	4,725	**5,025**
26-Jul	4	1.80	20,200	5,050	
26-Jul	4	1.80	21,200	5,300	
26-Jul	8	1.82	25,600	6,400	**6,096**
26-Jul	8	1.82	25,700	6,425	
26-Jul	8	1.82	21,850	5,463	
26-Jul	28	1.84	31,000	7,750	**7,583**
26-Jul	28	1.84	28,000	7,000	
26-Jul	28	1.84	32,000	8,000	
27-Jul	69 hours	1.78	10,400	2,600	**2,792**
27-Jul	69 hours	1.78	12,200	3,050	
27-Jul	69 hours	1.78	10,900	2,725	
27-Jul	7	1.77	16,800	4,200	**3,975**
27-Jul	7	1.78	16,900	4,225	
27-Jul	7	1.79	14,000	3,500	
27-Jul	28	1.82	15,000	3,750	**4,317**
27-Jul	28	1.82	17,300	4,325	
27-Jul	28	1.80	19,500	4,875	
30-Jul	69 hours	1.82	13,700	3,425	**4,350**
30-Jul	69 hours	1.84	19,400	4,850	
30-Jul	69 hours	1.80	19,100	4,775	
30-Jul	7	1.82	17,900	4,475	**5,267**
30-Jul	7	1.84	20,700	5,175	
30-Jul	7	1.80	24,600	6,150	
30-Jul	28	1.85	26,200	6,550	**6,650**
30-Jul	28	1.85	26,200	6,550	
30-Jul	28	1.85	27,400	6,850	

NICHOLSON
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CRUZ CO. INC.
CONTRACTORS ENGINEERS

H&M TIE-BACKS

Grout Breaks: NCC samples

Compressive Strength on 2" x 2" cubes
Grout: Cement Portland Type II, W/C = 0.45

Sample Date	Age Group Days	Specific Gravity	Break Load Lbs	Compressive Strength psi	Average Comp. Strength psi
31-Jul	3	1.80	14,500	3,625	3,700
31-Jul	3	1.80	19,000	4,750	
31-Jul	3	1.80	10,900	2,725	
31-Jul	7	1.82	15,200	3,800	4,342
31-Jul	7	1.82	15,700	3,925	
31-Jul	7	1.84	21,200	5,300	
31-Jul	28	1.82	24,700	6,175	6,400
31-Jul	28	1.82	25,100	6,275	
31-Jul	28	1.82	27,000	6,750	
1-Aug	17	1.83	26,000	6,500	5,983
1-Aug	17	1.86	22,600	5,650	
1-Aug	17	1.85	23,200	5,800	
1-Aug	28	1.85	24,500	6,125	6,442
1-Aug	28	1.85	23,200	5,800	
1-Aug	28	1.86	29,600	7,400	
9-Aug	4	1.80	15,900	3,975	4,050
9-Aug	4	1.80	16,500	4,125	
9-Aug	4	1.82	16,200	4,050	
9-Aug	7	1.80	19,800	4,950	4,767
9-Aug	7	1.80	19,400	4,850	
9-Aug	7	1.82	18,000	4,500	
9-Aug	28	1.80	22,600	5,650	6,050
9-Aug	28	1.82	25,800	6,450	
9-Aug	28	1.82	24,200	6,050	
23-Aug	4	1.89	23,200	5,800	5,217
23-Aug	4	1.90	18,800	4,700	
23-Aug	4	1.90	20,600	5,150	
23-Aug	7	1.90	18,200	4,550	5,108
23-Aug	7	1.90	18,900	4,725	
23-Aug	7	1.90	24,200	6,050	
23-Aug	28	1.91	32,000	8,000	8,000
23-Aug	28	1.88	34,000	8,500	
23-Aug	28	1.88	30,000	7,500	
24-Aug	3	1.78	14,900	3,725	3,942
24-Aug	3	1.78	17,200	4,300	
24-Aug	3	1.78	15,200	3,800	
24-Aug	28	1.85	27,200	6,800	6,650
24-Aug	28	1.86	28,000	7,000	
24-Aug	28	1.86	24,600	6,150	
29-Aug	3	1.84	12,600	3,150	2,975
29-Aug	3	1.82	10,500	2,625	
29-Aug	3	1.83	12,600	3,150	
29-Aug	7	1.84	11,200	2,800	2,450
29-Aug	7	1.82	8,200	2,050	
29-Aug	7	1.83	10,000	2,500	
29-Aug	28	1.85	24,300	6,075	6,008
29-Aug	28	1.86	22,800	5,700	
29-Aug	28	1.83	25,000	6,250	

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CRUZ CO. INC.
CONTRACTORS ENGINEERS

H&M TIE-BACKS

Grout Breaks: NCC samples

Compressive Strength on 2" x 2" cubes
Grout: Cement Portland Type II, W/C = 0.45

Sample Date	Age Group Days	Specific Gravity	Break Load Lbs	Compressive Strength psi	Average Comp. Strength psi
30-Aug	3	1.84	19,600	4,900	4,658
30-Aug	3	1.84	19,800	4,950	
30-Aug	3	1.82	16,500	4,125	
30-Aug	7	1.86	17,400	4,350	4,733
30-Aug	7	1.86	20,200	5,050	
30-Aug	7	1.87	19,200	4,800	
30-Aug	28	1.89	23,400	5,850	6,025
30-Aug	28	1.85	28,100	7,025	
30-Aug	28	1.88	20,800	5,200	
20-Sep	7	1.80	15,100	3,775	4,617
20-Sep	7	1.79	18,100	4,525	
20-Sep	7	1.83	22,200	5,550	
20-Sep	28	1.80	21,600	5,400	5,875
20-Sep	28	1.80	24,800	6,200	
20-Sep	28	1.80	24,100	6,025	
23-Oct	1	1.92	21,050	5,263	5,704
23-Oct	1	1.92	23,000	5,750	
23-Oct	1	1.94	24,400	6,100	
23-Oct	3	1.97	30,500	7,625	7,500
23-Oct	3	1.98	30,500	7,625	
23-Oct	3	2.00	29,000	7,250	
23-Oct	7	2.00	32,000	8,000	9,375
23-Oct	7	2.00	43,500	10,875	
23-Oct	7	2.00	37,000	9,250	
23-Oct	28	2.00	37,000	9,250	9,375
23-Oct	28	2.00	29,500	7,375	
23-Oct	28	2.00	46,000	11,500	
26-Oct	1	1.88	25,400	6,350	6,604
26-Oct	1	1.90	27,850	6,963	
26-Oct	1	1.90	26,000	6,500	
26-Oct	3	1.93	33,000	8,250	7,833
26-Oct	3	1.93	29,500	7,375	
26-Oct	3	1.93	31,500	7,875	
26-Oct	8	1.91	31,600	7,900	7,758
26-Oct	8	1.91	30,500	7,625	
26-Oct	8	1.91	31,000	7,750	
26-Oct	28	1.91	31,500	7,875	8,042
26-Oct	28	1.91	31,500	7,875	
26-Oct	28	1.91	33,500	8,375	

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CRUZ CO. INC.
CONTRACTORS ENGINEERS

H&M TIE-BACKS

Grout Breaks: NCC samples

Compressive Strength on 2" x 2" cubes
Grout: Cement Portland Type II, W/C = 0.45

Sample Date	Age Group Days	Specific Gravity	Break Load Lbs	Compressive Strength psi	Average Comp. Strength psi
2-Nov	1	1.86	16,300	4,075	**4,117**
2-Nov	1	1.86	16,700	4,175	
2-Nov	1	1.86	16,400	4,100	
2-Nov	3	1.84	14,800	3,700	**3,867**
2-Nov	3	1.84	16,400	4,100	
2-Nov	3	1.84	15,200	3,800	
2-Nov	7	1.85	26,600	6,650	**6,908**
2-Nov	7	1.87	28,700	7,175	
2-Nov	7	1.88	27,600	6,900	
2-Nov	29	1.88	32,500	8,125	**7,875**
2-Nov	29	1.88	26,500	6,625	
2-Nov	29	1.88	35,500	8,875	
29-Nov	1	1.85	12,200	3,050	**3,050**
29-Nov	1	1.85	11,100	2,775	
29-Nov	1	1.85	13,300	3,325	
29-Nov	4	1.85	20,250	5,063	**5,454**
29-Nov	4	1.85	21,200	5,300	
29-Nov	4	1.85	24,000	6,000	
29-Nov	7	1.84	28,600	7,150	**6,588**
29-Nov	7	1.85	24,200	6,050	
29-Nov	7	1.87	26,250	6,563	
29-Nov	28		25,500	6,375	**6,775**
29-Nov	28		26,800	6,700	
29-Nov	28		29,000	7,250	
7-Dec	1		12,800	3,200	**4,304**
7-Dec	1		17,600	4,400	
7-Dec	1		21,250	5,313	
7-Dec	3			0	**0**
7-Dec	3			0	
7-Dec	3			0	
7-Dec	7	1.89	27,850	6,963	**6,379**
7-Dec	7	1.89	24,100	6,025	
7-Dec	7	1.89	24,600	6,150	
10-Jan	1		18,500	4,625	**4,779**
10-Jan	1		19,800	4,950	
10-Jan	1		19,050	4,763	
10-Jan	3		21,400	5,350	**4,850**
10-Jan	3		20,800	5,200	
10-Jan	3		16,000	4,000	
10-Jan	7		29,950	7,488	**7,079**
10-Jan	7		26,000	6,500	
10-Jan	7		29,000	7,250	
10-Jan	28		33,000	8,250	**7,817**
10-Jan	28		34,500	8,625	
10-Jan	28		26,300	6,575	
14-Jan	1		10,200	2,550	**2,933**
14-Jan	1		13,000	3,250	
14-Jan	1		12,000	3,000	
14-Jan	3		27,300	6,825	**5,613**
14-Jan	3		20,950	5,238	
14-Jan	3		19,100	4,775	
14-Jan	7		30,000	7,500	**7,817**
14-Jan	7		29,300	7,325	
14-Jan	7		34,500	8,625	
14-Jan	28		37,000	9,250	**8,917**
14-Jan	28		35,000	8,750	
14-Jan	28		35,000	8,750	

NICHOLSON
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CRUZ CO. INC.
CONTRACTORS ENGINEERS

H&M TIE-BACKS

Grout Breaks: NCC samples

Compressive Strength on 2" x 2" cubes
Grout: Cement Portland Type II, W/C = 0.45

Sample Date	Age Group Days	Specific Gravity	Break Load Lbs	Compressive Strength psi	Average Comp. Strength psi
15-Jan	2		18,900	4,725	**4,763**
15-Jan	2		19,400	4,850	
15-Jan	2		18,850	4,713	
15-Jan	3		25,500	6,375	**6,138**
15-Jan	3		23,550	5,888	
15-Jan	3		24,600	6,150	
15-Jan	7		32,500	8,125	**7,500**
15-Jan	7		25,000	6,250	
15-Jan	7		32,500	8,125	
15-Jan	28		36,500	9,125	**8,833**
15-Jan	28		33,000	8,250	
15-Jan	28		36,500	9,125	
26-Jan	2		23,050	5,763	**5,092**
26-Jan	2		21,300	5,325	
26-Jan	2		16,750	4,188	
26-Jan	3		24,200	6,050	**5,963**
26-Jan	3		24,500	6,125	
26-Jan	3		22,850	5,713	
26-Jan	10		20,000	5,000	**6,333**
26-Jan	10		32,000	8,000	
26-Jan	10		24,000	6,000	
26-Jan	27		26,800	6,700	**7,175**
26-Jan	27		24,300	6,075	
26-Jan	27		35,000	8,750	
27-Jan	1		22,000	5,500	**5,388**
27-Jan	1		20,950	5,238	
27-Jan	1		21,700	5,425	
27-Jan	4		28,900	7,225	**7,092**
27-Jan	4		29,900	7,475	
27-Jan	4		26,300	6,575	
27-Jan	9		33,100	8,275	**8,592**
27-Jan	9		37,500	9,375	
27-Jan	9		32,500	8,125	
27-Jan	29		40,000	10,000	**8,875**
27-Jan	29		41,000	10,250	
27-Jan	29		25,500	6,375	
28-Jan	1		16,300	4,075	**4,246**
28-Jan	1		17,100	4,275	
28-Jan	1		17,550	4,388	
28-Jan	3		25,400	6,350	**6,667**
28-Jan	3		27,900	6,975	
28-Jan	3		26,700	6,675	
28-Jan	8		32,500	8,125	**7,833**
28-Jan	8		27,000	6,750	
28-Jan	8		34,500	8,625	
28-Jan	28		28,000	7,000	**8,125**
28-Jan	28		39,000	9,750	
28-Jan	28		30,500	7,625	
30-Jan	1		17,350	4,338	**4,313**
30-Jan	1		16,900	4,225	
30-Jan	1		17,500	4,375	
30-Jan	7		29,750	7,438	**7,200**
30-Jan	7		28,050	7,013	
30-Jan	7		28,600	7,150	
30-Jan	28		26,500	6,625	**8,333**
30-Jan	28		36,500	9,125	
30-Jan	28		37,000	9,250	

Lab Technician:	**Eric DOUET** **Field Engineer**
Signature:	

ARCADIS SUBMITTAL # PC-012-R2

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 315100-04-B
Date of Submittal: June 17, 2011
Contractor: Nicholson
Contract No.: B0009964.001
Subject of Submittal: Grout

Specification No. 31 51 00
Par. No. 1.4.2.15
Drawing No. ____

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings ☐ Progress Schedules ☐ Testing Procedure ☐ First Submission ☐ Third Submission

☐ Sample ☐ O&M Manual ☐ Contact List ☒ Second Submission ☐ ______ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
Nicholson Letter to comfirm the following	1
Bleed testing	
Grout mix design is only Portland cement (Type II or III), a w/c ratio of 0.45	
with no admixture or reagents	

☐ **REVIEWED** ☒ **REVIEWED & NOTED**

REVIEWED SOLELY FOR GENERAL
COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

SIGNATURE

7/8/11 Date
Syracuse Office Location

☐ **RESUBMIT** ☐ **REJECTED**

Complete either (a) or (b) and ©, in the
a (X) The Contractor verified that the m
shown,, or indicated in the Contract Do
b ( ) The Contractor has verified that th
shown, or indicated in the Contract Doc

c ( ) The Contractor has stamped or wri
certifying that the Contractor has satisfi
requirements of Article 6 of the General

Signed (By the Contractor): ____
Claude

PC-012-R2

REVIEWED & NOTED:

Specification 31 51 00 includes performance requirements for grout mixture to achieve required compressive strength within five days to allow proof and performance testing. Sufficient samples are required to provide for 3 and 7 day break tests, and to demonstrate the minimum 3,000 psi compressive strength design criterion has been achieved.

NICHOLSON

Grout Mix Re-Submittal

06/17/11

1. We confirm that the grout mix will have only Portland cement (Type II or III) and water at a ratio of 0.45 water to cement by weight. There will be no admixtures or reagents in the mix.
2. We don't have any current bleed test data as it is something that really was proven long ago for this high cement content mix. We attach a chart from a rather old document showing rough bleed expectations for various water to cement ratio grouts. From this you will see that the bleed expected for a 0.45 w/c grout is between 0 and 1%.

4.5 FIELD MEASUREMENTS OF BLEED

For guidance only in the absence of test results on the actual grout for the contract using the proposed constituent materials, Tables 4.2, 4.3, 4.4 and 4.5 may be used for neat cement, bentonite/cement, flyash/cement and flyash/cement/seawater grouts, respectively.

W/C	Bleed %
0.3	0
0.5	1
1.0	18
2.0	48
5.0	75
10.0	88+
20.0	94+

Table 4.2 Approximate Relationship between Bleed and W/c Ratio for neat cement grout.

\+ In practice, due to formation of cement sediment, bleed may be limited to 85%.

Extract from a document entitled 'Cement Based Grouts', a publication made for Colcrete Engineers in the UK by their Technical Director, Prof G.S. Littlejohn. circa 1980

ARCADIS Submittal # PC-015-R1

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 354300-02-A
Date of Submittal: June 24, 2011
Contractor: Weeks
Contract No.: B0009964.001
Subject of Submittal: Sand Scour Protection

Specification No. 35 43 00 Par. No. 1.4.2
Drawing No.

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings ☐ Progress Schedules ☐ Testing Procedure ☒ First Submission ☐ Third Submission

☐ Sample ☐ O&M Manual ☐ Contact List ☐ Second Submission ☐ ______ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
1.4.2.1	
Tilcon New York	1
162 Old Mill Rd., West Nyack, NY 10994	
Plant 211-CP-D Product 1011004 GRITS	
2,000 CY	

☐ **REVIEWED** ☒ REVIEWED & NOTED

REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

SIGNATURE

7/15/11
Date

Syr
Office Location

☐ **RESUBMIT** ☐ REJECTED

Complete either (a) or (b) and ©, in th
a ( ) The Contractor verified that the r
shown,, or indicated in the Contract C
b ( ) The Contractor has verified that t
shown, or indicated in the Contract D

c ( ) The Contractor has stamped or
certifying that the Contractor has sati
requirements of Article 6 of the Gene

Signed (By the Contractor): ______

Cla

PC-015-R1

REVIEWED & NOTED:

ARCADIS will be collecting the remaining submittal information associated with this (i.e. chemistry samples in accordance with the RAWP QAPP of the Tilcon material).

Since Advance Testing 1984
CONSTRUCTION MATERIALS TESTING & INSPECTION SERVICES

July 12, 2010

To Whom It May Concern:

Tilcon New York Inc. Clinton Point Quarry is a New York State DOT approved material source. The Source Number is 8-9R. This source is 100% virgin Dolostone that is quarried and processed to finished sizes. To the best of our knowledge it is clean and free from contaminants, prior to shipping.

The following analysis is provided for ‘Grits’.

Sieve Size	% Pass
¼”	100
no.4	99
no.8	33
no.16	10
no.30	3
no.50	2
no.100	1
no.200	1.0

This product is 100% Washed Grits, from the crushing operation.

Please contact me with any questions regarding this material.

Yours truly,

Robert Patton
Quality Control

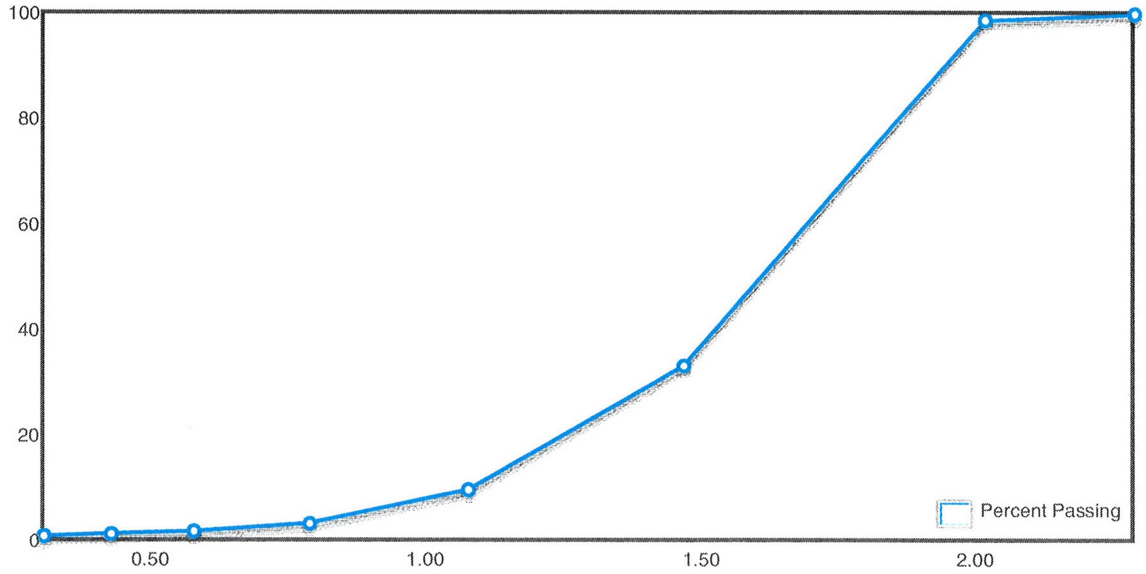
WWW.ADVANCETESTING.COM
3348 Route 208 • Campbell Hall, NY 10916 • Telephone: 845.496.1600 • Fax: 845.496.1398
With Offices in New York & Massachusetts

Tilcon New York, Inc.

Gradation Blend Report

Blending Data					
Quarry	**Material**	**Location**	**From**	**To**	**Blend Percent**
Clinton Point	Grits	All	01/04/2010	07/12/2010	100

Sieve (in.)	Sieve (mm)	% Retained	% Passing
1/4	6.3	0.0	100.0
#4	4.75	1.2	98.8
#8	2.36	65.6	33.2
#16	1.18	23.5	9.7
#30	0.6	6.3	3.4
#50	0.3	1.5	1.9
#100	0.15	0.5	1.4
#200	0.075	0.4	1.0



December 13, 2006
Lab no. 206845

Mr. Robert Patton
Advance Testing
3348 Route 208
Campbell Hall, New York 10916

Dear Mr. Patton:

Enclosed are the x-ray fluorescence (XRF) results for the sample, “Clinton Point Quarry” received with Project no. 060041. This report will be mailed and emailed to you, as requested.

A representative portion of the sample was ground to approximately -400 mesh in a steel swing mill and then analyzed by our standard XRF procedure for 31 major, minor and trace elements. The relative precision/accuracy for this procedure is ~5–10% for major–minor elements and ~10–15% for trace elements (those elements listed in ppm) at levels greater than twice the detection limit in samples of average geologic composition. A replicate sample and a standard reference material ("SY3", a CANMET standard rock) were analyzed with the sample to demonstrate analytical reproducibility for your sample and analytical accuracy for a geologic standard, respectively. The accepted ("known") values for the quality control standard are listed with the XRF results.

Thank you for the opportunity to be of continuing service to Advance Testing.

Sincerely,

Joy Maes

Advance Testing Company
XRF Results for Sample, "Clinton Point Quarry" Project No. 060041

December 13, 2006
Lab no. 206845

	Wt %												
Ident	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	S	Cl	K_2O	CaO	TiO_2	MnO	Fe_2O_3	BaO
SAMPLE	<0.05	19.8	2.31	10.8	<0.05	0.12	<0.02	1.40	30.3	0.11	0.02	0.90	0.01
Quality Control - Replicate (R) sample and standard reference material (SY3) analyzed with sample													
SAMPLE(R)	<0.05	19.9	2.30	10.9	<0.05	0.12	<0.02	1.40	30.4	0.11	0.02	0.90	0.01
SY3-XRF	4.46	2.54	12.7	60.1	0.70	<0.05	<0.02	4.37	8.24	0.12	0.31	6.35	0.05
SY3-known	4.15	2.67	11.8	59.7	0.54	0.05	0.014?	4.20	8.26	0.15	0.32	6.45	0.05

	PPM												
Ident	V	Cr	Co	Ni	W	Cu	Zn	As	Sn	Pb	Mo	Sr	U
SAMPLE	11	12	<10	<10	<10	<10	<10	<20	<50	<10	<10	90	20
Quality Control													
SAMPLE(R)	13	15	<10	<10	<10	<10	<10	<20	<50	<10	<10	97	17
SY3-XRF	45	<10	19	<10	52	23	259	25	<50	146	<10	310	687
SY3-known	51	10	12	11	--	16	250	20	--	130	--	306	650

	PPM				
Ident	Th	Nb	Zr	Rb	Y
SAMPLE	52	<10	45	26	<10
Quality Control					
SAMPLE(R)	38	<10	45	29	<10
SY3-XRF	1104	144	351	226	773
SY3-known	990	145	320	208	740

Analysis Performed By The Mineral Lab, Inc

Advance Testing
3348 Route 208, Campbell Hall, NY 10916
Phone: 845-496-1600 Fax: 845-496-1398
25 Hathorn Road, Enfield, NH 03748
42 Day Farm Road, West Stockbridge, MA 01266

Client:	Tilcon New York Inc.	**Project:**	Clinton Point Quarry 210
Material:	Agricultural Lime	**Project Number:**	050121
Source:	Tilcon NY	**Lab Number:**	11-0348
Location:	Stockpile	**Item Number:**	N/A
Date Sampled:	5/12/2011	**Sampled By:**	R. Patton
Date Tested:	5/18/2011	**Tested By:**	Ken Harris

Report of pH of Soil

Test Method: ASTM D4972 Method A

pH Test Result: 7.7 (in Distilled Water)

N/A (In Calcium Chloride Solution)

Specification

Comments:

Report Reviewed By: Emily J. Rodriguez

ARCADIS Submittal # PC-016-R1

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 358000-01-A
Date of Submittal: June 24, 2011
Contractor: Weeks
Contract No.: B0009964.001
Subject of Submittal: Backfill

Specification No. 35 80 00
Par. No. 1.4.1.2
Drawing No.

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings
☐ Progress Schedules
☐ Testing Procedure
☒ First Submission
☐ Third Submission
☐ Sample
☐ O&M Manual
☐ Contact List
☐ Second Submission
☐ ______ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
Backfill from 2 to 0 feet	
Tilcon New York	1
162 Old Mill Rd., West Nyack, NY 10994	
Plant 211-CP-D Product 1011004 GRITS	

Complete either (a) or (b) and ©, i
a ( ) The Contractor verified that th
shown,, or indicated in the Contra
b ( ) The Contractor has verified th
shown, or indicated in the Contrac

☐ REVIEWED ☑ REVIEWED & NOTED
REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS
ARCADIS
SIGNATURE
7/15/11 Date
Syr Office Location
☐ RESUBMIT ☐ REJECTED

c ( ) The Contractor has stamped c
certifying that the Contractor has s
requirements of Article 6 of the Ge

Signed (By the Contractor):

Cl

PC-016-R1

REVIEWED & NOTED:

ARCADIS will be collecting the remaining submittal information associated with this (i.e. chemistry samples in accordance with the RAWP QAPP of the Tilcon and Amboy material).

Since Advance Testing 1984
CONSTRUCTION MATERIALS TESTING & INSPECTION SERVICES

July 12, 2010

To Whom It May Concern:

Tilcon New York Inc. Clinton Point Quarry is a New York State DOT approved material source. The Source Number is 8-9R. This source is 100% virgin Dolostone that is quarried and processed to finished sizes. To the best of our knowledge it is clean and free from contaminants, prior to shipping.

The following analysis is provided for 'Grits'.

Sieve Size	% Pass
¼"	100
no.4	99
no.8	33
no.16	10
no.30	3
no.50	2
no.100	1
no.200	1.0

This product is 100% Washed Grits, from the crushing operation.

Please contact me with any questions regarding this material.

Yours truly,

Robert Patton
Quality Control

WWW.ADVANCETESTING.COM
3348 Route 208 • Campbell Hall, NY 10916 • Telephone: 845.496.1600 • Fax: 845.496.1398
With Offices in New York & Massachusetts

Tilcon New York, Inc.

Gradation Blend Report

Blending Data					
Quarry	**Material**	**Location**	**From**	**To**	**Blend Percent**
Clinton Point	Grits	All	01/04/2010	07/12/2010	100

Sieve (in.)	Sieve (mm)	% Retained	% Passing
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#4	4.75	1.2	98.8
#8	2.36	65.6	33.2
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#100	0.15	0.5	1.4
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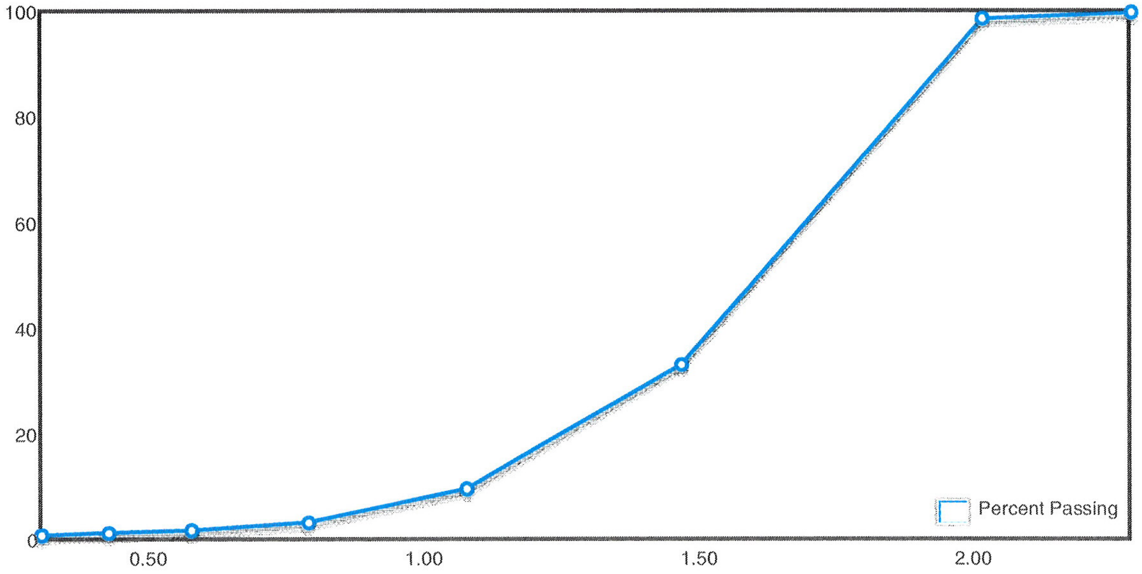

Advance Testing
3348 Route 208, Campbell Hall, NY 10916
Phone: 845-496-1600 Fax: 845-496-1398
25 Hathorn Road, Enfield, NH 03748
42 Day Farm Road, West Stockbridge, MA 01266

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Material:	Agricultural Lime	**Project Number:**	050121
Source:	Tilcon NY	**Lab Number:**	11-0348
Location:	Stockpile	**Item Number:**	N/A
Date Sampled:	5/12/2011	**Sampled By:**	R. Patton
Date Tested:	5/18/2011	**Tested By:**	Ken Harris

Report of pH of Soil

Test Method: ASTM D4972 Method A

pH Test Result: 7.7 (in Distilled Water)

N/A (In Calcium Chloride Solution)

Specification

Comments:

Report Reviewed By: Emily J. Rodriguez

December 13, 2006
Lab no. 206845

Mr. Robert Patton
Advance Testing
3348 Route 208
Campbell Hall, New York 10916

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Thank you for the opportunity to be of continuing service to Advance Testing.

Sincerely,

Joy Maes

Advance Testing Company
XRF Results for Sample, "Clinton Point Quarry" Project No. 060041

December 13, 2006
Lab no. 206845

	Wt %												
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SAMPLE	<0.05	19.8	2.31	10.8	<0.05	0.12	<0.02	1.40	30.3	0.11	0.02	0.90	0.01
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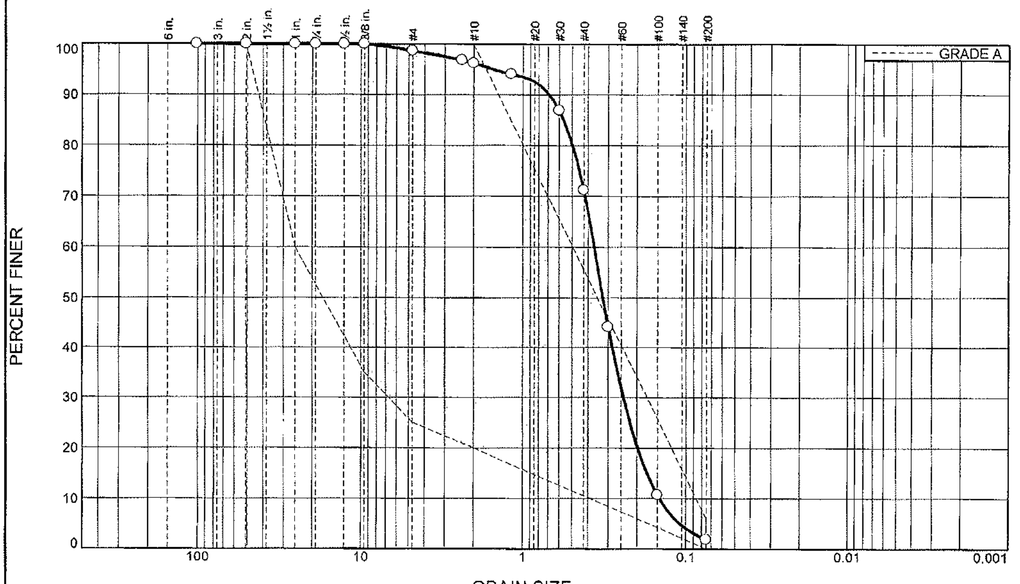
SY3-known	4.15	2.67	11.8	59.7	0.54	0.05	0.014?	4.20	8.26	0.15	0.32	6.45	0.05

	PPM												
Ident	V	Cr	Co	Ni	W	Cu	Zn	As	Sn	Pb	Mo	Sr	U
SAMPLE	11	12	<10	<10	<10	<10	<10	<20	<50	<10	<10	90	20
Quality Control													
SAMPLE(R)	13	15	<10	<10	<10	<10	<10	<20	<50	<10	<10	97	17
SY3-XRF	45	<10	19	<10	52	23	259	25	<50	146	<10	310	687
SY3-known	51	10	12	11	--	16	250	20	--	130	--	306	650

	PPM				
Ident	Th	Nb	Zr	Rb	Y
SAMPLE	52	<10	45	26	<10
Quality Control					
SAMPLE(R)	38	<10	45	29	<10
SY3-XRF	1104	144	351	226	773
SY3-known	990	145	320	208	740

Analysis Performed By The Mineral Lab, Inc

Particle Size Distribution Report--AASHTO T27



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.3	2.5	25.0	69.4	1.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4"	100.0		
2"	100.0	100.0 - 100.0	
1"	100.0	60.0 - 100.0	
3/4"	100.0		
1/2"	100.0		
3/8"	100.0	35.0 - 100.0	
#4	98.7	25.0 - 100.0	
#8	96.8		
#10	96.2	20.0 - 100.0	
#16	94.1		
#30	86.8		
#40	71.2		
#50	44.1		
#100	10.7		
#200	1.8	0.0 - 6.0	

* GRADE A

Soil Description

Light Brown fine to medium SAND, trace Silt, trace fine Gravel (Raw Sand)

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.6918 D_{85}= 0.5658 D_{60}= 0.3658
D_{50}= 0.3234 D_{30}= 0.2424 D_{15}= 0.1736
D_{10}= 0.1456 C_u= 2.51 C_c= 1.10

Classification

USCS= SP AASHTO=

Remarks

Sample met the Grade A specifications
Received date: 09/13/10

Sample Number: 5

Date: 9/14/10

Key-Tech
201 Maple Place * Keyport, NJ 07735
Phone: 732-888-8308 Fax: 732-888-8307

Client: Amboy Aggregates
Project:

Project No: **Figure**

Tested By: Dali Wu

ARCADIS SUBMITTAL # PC-028-R1

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 135000-01-A
Date of Submittal: August 8, 2011
Contractor: Weeks Marine
Contract No.: B0009964.001
Subject of Submittal: Vibra Tech Wall Monitoring Work Plan

Specification No. 135000 Section 1.4
Par. No.
Drawing No. S-19

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings	☐ Progress Schedules	☐ Testing Procedure	☒ First Submission	☐ Third Submission
☐ Sample	☐ O&M Manual	☐ Contact List	☐ Second Submission	☐ ______ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
Vibra-Tech Work Plan for Remote Seismic Instrumentation and Monitoring System	1

☐ REVIEWED ☒ REVIEWED & NOTED

REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

Robert

SIGNATURE

8/12/2011
Date

SYR
Office Location

☐ RESUBMIT ☐ REJECTED

Complete either (a) or (b) an
a ( ) The Contractor verified
shown,, or indicated in the C
b ( ) The Contractor has veri
shown, or indicated in the Cc

c ( ) The Contractor has stam
certifying that the Contractor
requirements of Article 6 of th

Signed (By the Contractor):

PC-028-R1

REVIEWED & NOTED:

For reasons outside of ARCADIS's control, the Sherwin-Williams property cannot be accessed for monitoring installations. Please plan accordingly.

Additionally, the specification reference of 31 50 00 is not correct in the submittal and should instead be Section 13 50 00: Special Instrumentation.

Vibra-Tech
VibraTechinc.com

500 "A" Campus Drive
Mount Holly, NJ 08060
Phone 609.261.7100
Fax 609.261.0701

August 5, 2010

Mr. Benjamin L. Warrick
Weeks Marine, Inc.
4 Commerce Drive
Cranford, New Jersey 07016-3598

Work Plan
For
Re:mote™ Seismic Instrumentation and Monitoring
Lower Passaic River Phase 1 Cercla Non-Time-Critical Removal Action Project
Newark, New Jersey

PROJECT DESCRIPTION

The Lower Passaic River Sediment Removal Project is located at 80 Lister Avenue, Newark, New Jersey. The Two (2) acre plot of river bordering property is west of I-95 and East of downtown Newark. This project's purpose in Phase 1 is to remove 40,000 CY of contaminated sediment from the Passaic River bed along the existing concrete retaining wall. The sediment removal process will be contained by a sheet pile wall enclosure that is approximately 750 feet in length by 135 feet in width. This project will be utilizing 35' sheet piles and 62.5'king piles which will be driven to elevation approximately -25.4' and -52.9', respectively.

The sediment will be extracted, collected and debris screened. Contaminated water will also be collected and processed at the Upland Processing Facility (UPF). The sediments that are processed and collected at the UPF will be hauled to a landfill or incinerator by rail. The contaminated water that is collected will be treated and returned to the Passaic River. Once the contaminated sediment is removed from the enclosure, the metal sheet pile wall enclosure area will be backfilled to its original condition with clean fill and the sheet piles will be removed.

RE:MOTE ™ INSTRUMENTATION AND MONITORING

Interpretation of Monitoring Data

Based on the project specifications, *Special Instrumentation 13 50 00, Section 3.2 Vibration Monitoring, Paragraph 5*, the threshold monitoring value is stated at a **not to exceed limit of 0.8 in/sec**. This section specifically states the following:

> "5. Vibration at existing structures will not exceed allowable values. The peak particle velocity, as measured by a three-component seismograph, will not exceed 0.8 inch per second at any structures within 50 ft of the vibration-induced activities."

Vibration Criteria: 0.80 in/sec

The following will be required with the purpose of protecting the existing structures, specifically, OU-1 Floodwall, Sherwin-William bulkhead and Singer Realty bulkhead and /or existing pipes, facility or other additional structures adjacent to the site. All instrumentation installation and monitoring shall be performed under the direct supervision of a qualified instrumentation manager and/or specialist.

Vibration Monitoring

Vibration monitoring will be conducted by installing remote seismic stations in Five (5) specific locations as indicated on Drawing S-19 provided by Weeks Marine (drawing attached as *Appendix A*). The remote systems will be installed prior to construction activities so that baseline data will be obtained.

Five (5) Multiseis Plus Seismograph systems will be installed. The seismographs will be capable of measuring and recording vibration in three mutually perpendicular planes of motion, have visual readout and a certificate of calibration dated in the last 12 months directly traceable to the US Bureau standards. The seismographs have a dynamic range up to 10 in/sec. The entire system is calibrated internally prior to each recording in addition to an annual shake table calibration.

The seismographs will be programmed to monitor in histogram combo mode to record maximum vibration levels at 1-minute intvervals, with a 5-second record time where the waveform is generated when the peak particle velocity exceeds the warning limit or trigger which is yet to be provided. Three sensors will be vertically bolted to the retaining wall in locations indicated on the drawing. Two additional sensors will be installed on the Sherwin-Williams property and Singer Realty property (access must be granted by owners).

As required in project specifications, *Special Instrumentation 31 50 00, Section 1.4, Submittals, Paragraph 4,* the manufacturer's literature and seismograph technical specifications for the units which will be utilized for this project has been attached as *Appendix B*.

Remote System Vibration Monitoring

The seismographs will be housed in a security enclosure and will be powered by solar power with a back-up battery system. The seismographs will be programmed prior to installation. All units will be set on timer to monitor daily from 6:00 to 18:00, Sunday through Saturday. The units will record continuously in histogram combo mode and take readings at 9:00, 12:00and 15:00, (unless otherwise instructed) and automatically download via remote IP communications technology.

Vibra-Tech's Blastware notification system can be set up to provide data from the remote stations for each time period to select on-site individuals or to notify upon trigger and/or any exceedance. All data will be provided to client on a weekly basis. The Contractor will be required to keep a daily log of the construction activity to coordinate with the vibration data as this vibration monitoring option does not include a Vibra-Tech technician on site.

During all construction activities, Vibra-Tech MultiSeis Plus remote vibration monitoring systems will be used to monitor vibration levels for concordance with the established vibration criteria of 0.8 in/sec and warning limit (trigger) to be provided. The remote seismograph systems will be installed by a Vibra-Tech Instrumentation and Monitoring Specialist. The remote vibration monitoring systems will continuously measure and record the peak vibration level every minute. This is referred to as the *histogram mode*. Data provided by the histogram mode includes the date, time (in one minute intervals), the peak vibration level measured and recorded in the vertical, horizontal, and transverse planes of motion, and respective corresponding frequencies. If vibration levels exceed a predetermined trigger level (example: 80% of design criteria), the seismograph will record a 5-second dynamic time history of the event at a sample rate of 1024 samples per second (sps). This is referred to as the *waveform mode*. Data provided by the waveform mode includes the date and time of the vibration event with a tabular summary and graphical representation of the vibration event (1024 samples per second for 5 seconds) measured and recorded in the vertical, horizontal, and transverse planes of motion.

Upon a vibration trigger or exceedance, an email or text alarm notification will be automatically sent by each seismograph when the predetermined trigger level is reached. After the time history is recorded, the seismographs will resume recording the peak vibration levels.

QA/QC for Remote System Vibration Monitoring

All remote vibration monitoring systems will be installed at specific locations as indicated on Drawing S-19 by our Instrumentation Specialists. Vibra-Tech will review the daily vibration monitoring data and prepare the weekly letter of report. In accordance with project specifications, *Special Instrumentation* 13 *50 00, Section 1.5, Paragraph 2 and Section 2.3, Paragraph 1,* Vibra-Tech will submit the annual calibration sheet for each seismograph at the time of installation (to be verified on site by the Engineer).

Vibra-Tech's Key Personnel

Vibra-Tech's Organizational Chart in addition to our Key Personnel Short Resumes have been included for your reference as *Appendix C* (A Qualifications Package and References are available upon request).

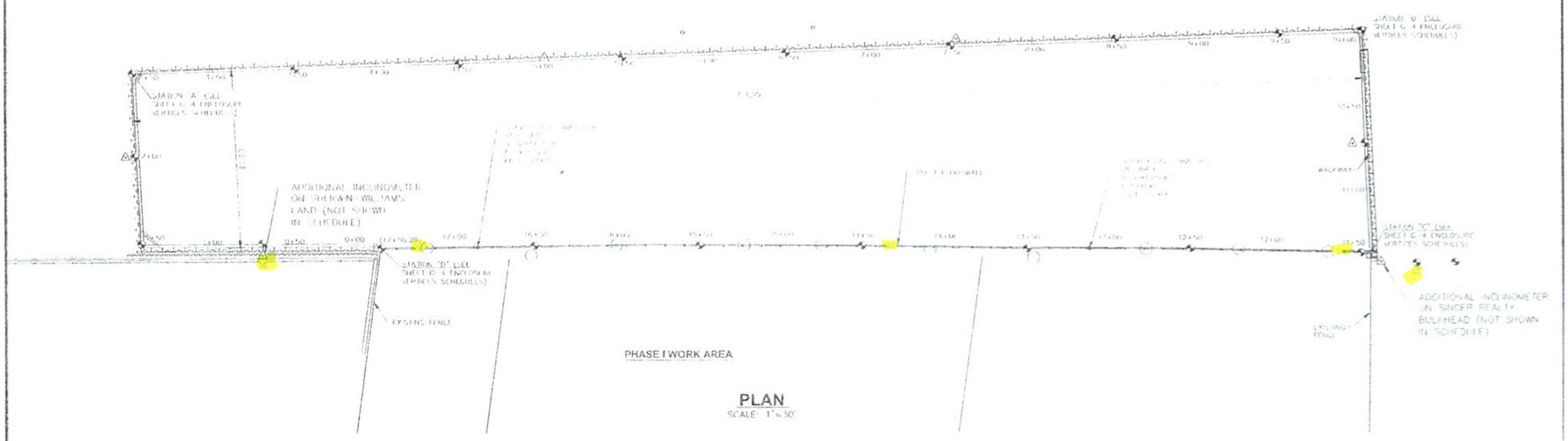
This concludes the Work Plan for the Lower Passaic River Phase 1 Cercla Non-Time-Critical Removal Action Project, Newark, New Jersey.

Sincerely,
VIBRA-TECH

En-Huei Joe
En-Huei Joe, PE
Technical Manager/Geotechnical Engineer
Date: Aug 5 2011

Diane Petras
Diane Petras
Office Manager/Remote Instrumentation Specialist
Date: 5 AUG 11
13110047

APPENDIX A

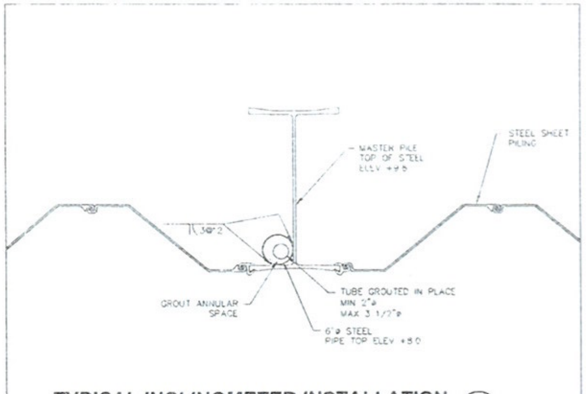


PLAN

SCALE: 1"=30'

Special Instrumentation Schedule					
Instrument	**Wall**	**Placement**			**Installation**
Optical Survey Points	OU-1	Sta. 12+50, 13+50, 14+50, 15+50, 16+50			To be installed on top of the temporary enclosure walls as well as the OU-1, Singer Realty, and Sherwin-Williams floodwalls. See Specifications 13 50 00 for further instruction.
	Sherwin-Williams Enclosure	Sta. 0+00, 0+71, 1+42 (cor)			
	West Enclosure	Sta. 1+96, 2+51 (cor)			
	North Enclosure	Sta. 3+50, 4+50, 5+50, 6+50, 7+50, 8+50, 9+50, 10+02 (cor)			
	East Enclosure	Sta. 10+69, 11+36 (cor)			
	Singer Realty	30' and 60' east of western Singer Realty property line			
Load Cells	OU-1	*Tieback*	*Station*	*Load Cell*	Load cells shall be installed at the time of tieback installation. The tieback installation subcontractor shall install the load cells at the head of each tieback before tensioning operations begin. See Specification 13 50 00 for more information.
		T-2	11+67.52	1	
		T-6	12+24.97	2	
		T-10	12+82.43	3	
		T-14	13+48.1	4	
		T-18	14+13.77	5	
		T-22	14+71.22	6	
		T-26	15+28.68	7	
		T-30	15+94.35	8	
		T-34	16+51.81	9	
		T-38	17+18.52	10	
Inclinometers	West Enclosure	Sta. 1+96			Inclinometer tube casing shall be as specified in Specification 13 50 00 and installation as shown in Detail 1 (at right).
	North Enclosure	Sta. 5+01, 7+52			
	East Enclosure	Sta. 10+69			
Vibration Monitoring	OU-1	Sta. 11+60, 14+39, 17+20			Seismographs will be placed by the Engineer at the vibration monitoring locations at the time of monitoring. See Specification 13 50 00 for further instruction.
	Sherwin-Williams Enclosure	~~74' west of eastern Sherwin-Williams~~ property line			
	Singer Realty	30' east of western Singer Realty property line			

*cor = corner of enclosure



TYPICAL INCLINOMETER INSTALLATION ①

SCALE: 1"=1'-0"

LEGEND:

- HZ-AZ COMBINATION WALL
- FENCE
- PROPERTY BOUNDARY
- PIERHEAD AND BULKHEAD LINE
- OPTICAL SURVEY POINT
- VIBRATION MONITOR
- △ INCLINOMETER
- ○ LOAD CELL

CITY: TOLEDO-OH DIV/GROUP: DB A. HUNT LD: PIC R. ROMAGNOLI PM R. ROMAGNOLI TM R. ROMAGNOLI LYR: ON=*;OFF=*REF
\OH03FP01\Data\Project\B0009961.0000\Drawing\MONITORINGPLAN - STRUCTURE MONITORING PLAN AND DETAILS.dwg LAYOUT: S-19 MONITORINGPLAN - STRUCTURE MONITORING PLAN AND DETAILS SAVED: 4/8/2011 2:06 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: PDF - 11X17 2010
VERSION DWG TO PDF.PC3 PLOTSTYLETABLE: PLTCONT.CTB PLOTTED: 4/8/2011 2:11 PM BY: HUNT, AARON

XREFS IMAGES PROJECTNAME: -
09961X00
09961X00-AAHPE
baseline
09961X02
sheetpile
walkwayPlan
monopiles.matress
09964XL1
O-2 Survey Control PlanA

0' 2' 12' 24'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING

USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REPRODUCED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

Professional Engineer's Name: AARON A HUNT
Professional Engineer's No.: 24GE04804300
State: NJ
Date Signed:
Project Mgr:
Designed by: AAH
Drawn by: AAH
Checked by:

Aaron A. Hunt

ARCADIS
ARCADIS U.S., INC.
NEW JERSEY ENGINEERING CERTIFICATE OF AUTHORIZATION NUMBER 24GA27939600

TIERRA SOLUTIONS, INC. • LOWER PASSAIC RIVER, NEWARK, NJ
PHASE I CERCLA NON-TIME-CRITICAL REMOVAL ACTION

STRUCTURE MONITORING PLAN AND DETAILS

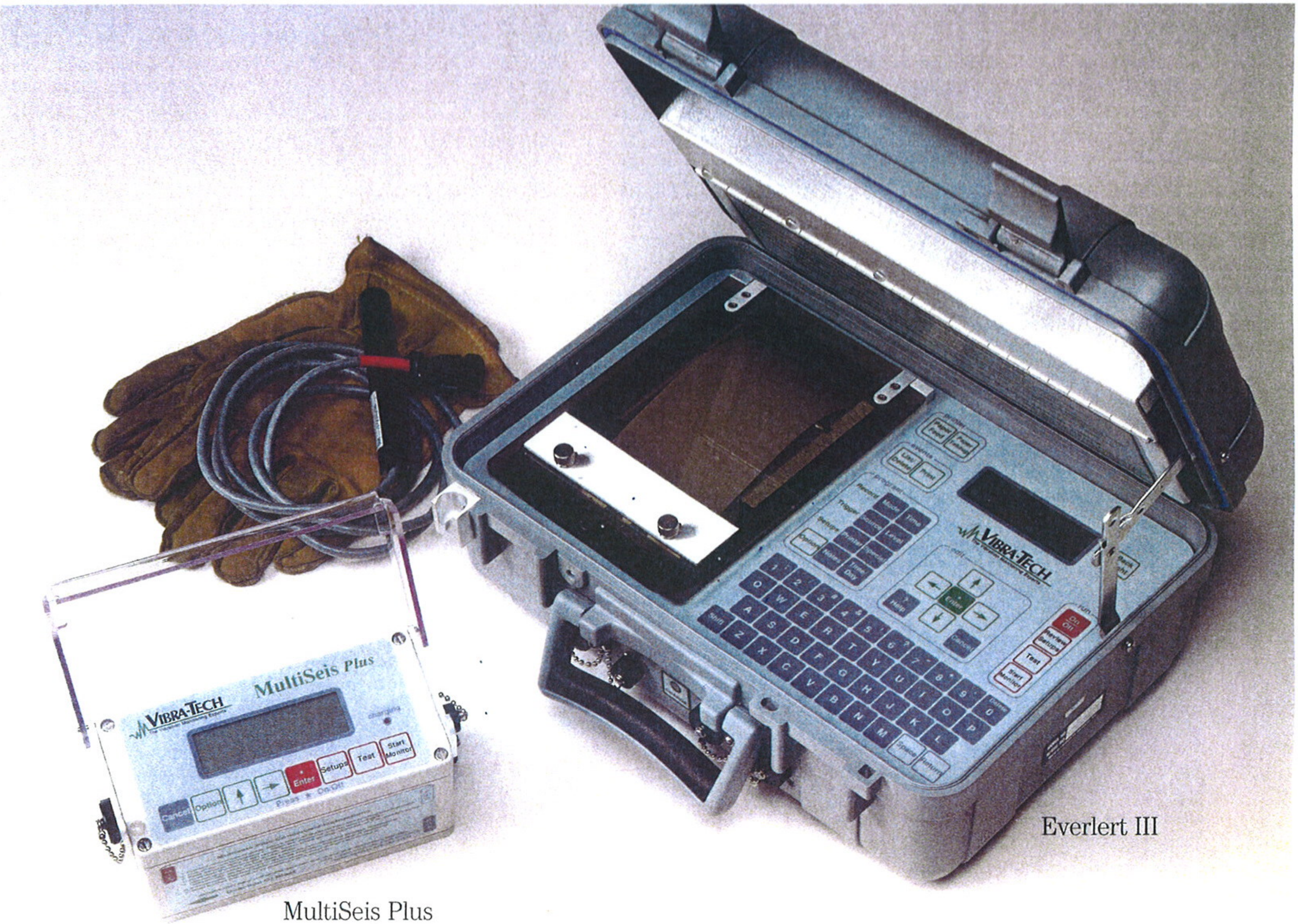
STRUCTURAL

WMI: RECEIVE 4/12/2011

ARCADIS Project No. B0009964.0001
Date: APRIL 2011
ARCADIS
6723 TOWPATH ROAD
BOX 66
SYRACUSE, NY 13214
TEL. 315.446.9120

S-19

APPENDIX B


Everlert III
MultiSeis Plus

This chart summarizes the important technical specifications for our two new instruments.

Specifications can be interrelated, which means a change in one can adversely affect another. Except where indicated otherwise, the specifications are for our standard instruments with equipped sensors and for standard 4 channel (three seismic, one air) at the standard rate of 1024 samples per second per channel. Substantially higher performance is available in the same instrument for use with other sensors and applications.

If you have questions about Vibra-Tech, these specifications or what they mean to your business, or if you have a special requirement, call us today.

MultiSeis Plus and Everlert III specifications

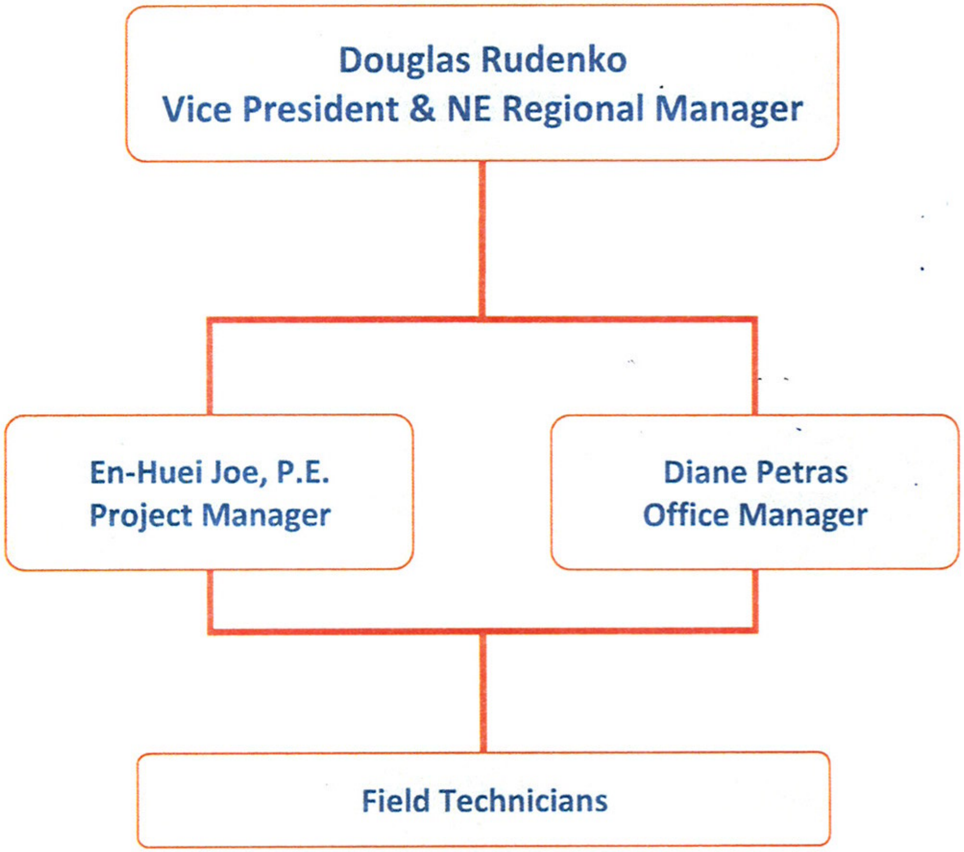
Seismic	Range	10 in/s (254 mm/s).
	Resolution	0.005 in/s (0.127 mm/s), to 0.000625 in/s (0.0159 mm/s) with built-in preamp.
	Trigger Levels	0.005 to 10 in/s (0.127 to 254 mm/s) in steps of 0.001 in/s (0.01 mm).
	Frequency Analysis	National and local standards for all countries.
	Accuracy	3% at 15 Hz.
	Acceleration, Displacement	Calculated using entire waveform, not estimated at peak.
Air Linear	Range	88-148 dB (500 Pa peak).
	Resolution	0.1 dB above 120 dB (0.25 Pa).
	Trigger Levels	100-148 dB in 1 dB steps.
	Accuracy	0.2 dB at 30 Hz and 127 dB.
A weight *(optional)*	Range	50 to 110 dB in steps of 0.1 dB.
Sampling Rate		Standard 1024 samples per second per channel to 16,384 (8,192 for 8 channel).
Event Storage	Full Waveform Events	300 standard, 900 and 1500 optional at standard sample rate of 1024.
	Summary Events	1750 standard, 5250 and 8750 optional at standard sample rate of 1024.
Frequency Response	2 to 300 Hz	Ground and air, independent of record time.
Full Waveform Recording	Fixed Record Modes	Manual, single shot, continuous and programmed start/stop.
	Fixed Record Time	1 to 100, 300 or 500 sec plus 0.25 sec pretrigger.
	Auto Record Mode	1 to 100, 300 or 500 sec plus 0.25 sec pretrigger.
Strip Chart Recording	Record Method	Record to memory and/or internal printer. Program interval 5, 15, 60 or 300 sec.
	Days Storage	3, 9 or 15 days at 5 second interval. 34, 107, or 180 days at 5 minute interval.
Special Functions	Timer Operation	Programmed start/stop.
	Self Check	Programmable daily check.
	Scaled Distance	Weight and distance stored with event.
	Monitor Log	History printout programmable up to all events stored.
	Measurement Units	Imperial or metric, dB or linear air pressure, or in units of custom sensors.
	Location	Log GPS (Global Positioning System) data into record.
Printer (Everlert III only)	Resolution	576 dots/line and 0.0049 inches (0.125 mm) per dot.
	Print Time	Less than 10 seconds for typical 1 second event with full analysis.
	Paper Control	Paper tear slot or automatic paper takeup, separate keys for feed and takeup.
	Rated Life – Print Head	18 miles (30 km) of printing.
	Number of Copies	1 to 10 copies automatic, any number manual.
User Interface	Keyboard	64 domed tactile with separate keys for common functions (MultiSeis Plus 8 keys).
	Display	4 line by 20 character high contrast backlit display with on line help.
Battery Life	MultiSeis Plus	10 days continuous recording, 25 days with timer.
	Everlert III	30 days continuous recording, 70 days with timer, printing will decrease life.
Dimensions	MultiSeis Plus	3.2" x 3.6" x 6.3" (81 mm x 91 mm x 160 mm).
	Everlert III	10.6" x 14.0" x 6.5" (269 mm x 355 mm x 165 mm).
Weight	MultiSeis Plus	3 lbs. (1.4 kg).
	Everlert III	14 lbs. (6.4 kg).
Warranty	2 Years Parts and Labor	Calibration and equipment check required at 1 year to maintain warranty.
Environmental	Printer/LCD	14 to 122 degrees F (-10 to 50 degrees C) operating.
	Electronics	-4 to 140 degrees F (-20 to 60 degrees C) operating.
	Storage	-4 to 160 degrees F (-20 to 70 degrees C).

Vibra-Tech
The Vibration Monitoring Experts

APPENDIX C

Vibra-Tech

Organizational Chart



Douglas Rudenko
Vice President & NE Regional Manager

En-Huei Joe, P.E.
Project Manager

Diane Petras
Office Manager

Field Technicians

Key Personnel

Vibra-Tech

VIBRATION MONITORING TECHNICIANS/INSPECTORS

GREGORIO JUANITES B.S. In Civil Engineering – 1988 – FEATI University – Manila, Philippines. Over Five Years Experience in vibration monitoring vibration monitoring of various sources such as pile driving, vibratory rollers and other construction activities and operations. Experienced and trained for NYCTA, NY/NJ/PA Port Authority for Installation of Geotechnical Monitoring Equipment for Vibration and Settlement – Certified NYCTA and LIRR Track Training – (Tunnel Installations and Monitoring) and OSHA 29 CFR 1910.120 40 Hr. Hazardous Waste Training.

RYAN WALZ B.S In Geography (Remote Sensing)– 2006 – Rowan University, Glassboro, New Jersey . Over Four Years Experience in vibration monitoring of various sources such as pile driving, vibratory rollers and other construction activities and operations. Report Preparation of all on-site activities. Programs, prepares and downloads tilt data from remote monitoring equipment and generates graphs. Experienced and trained for NYCTA, NY/NJ/PA Port Authority for Installation of Geotechnical Monitoring Equipment for Vibration and Settlement – Certified NYCTA and LIRR Track Training (Tunnel Installations and Monitoring). Personally conducted hundreds of inspections consisting of residential, commercial and industrial structures. OSHA 29 CFR 1910.120 40 Hr. Hazardous Waste Training.

JON NIELSEN A.S. Western Carolina University - Geography – 2003 - Cullowhee, NC/ - (Currently Attending Rutgers University). Over Three Years Experience in vibration monitoring of various sources such as pile driving, vibratory rollers and other construction activities and operations. Experienced and trained for NYCTA, NY/NJ/PA Port Authority for Installation of Geotechnical Monitoring Equipment for Vibration and Settlement – Certified NYCTA and LIRR Track Training (Tunnel Installations and Monitoring). Personally conducted hundreds of inspections consisting of residential, commercial and industrial structures. OSHA 29 CFR 1910.120 40 Hr. Hazardous Waste Training.

BRAD MILLER B.A. Richard Stockton University – Environmental Studies - 2007 - Pamona, New Jersey. Over Three Years Experience in vibration monitoring of various sources such as pile driving, vibratory rollers and other construction activities and operations. Experienced and trained for NYCTA, NY/NJ/PA Port Authority for Installation of Geotechnical Monitoring Equipment for Vibration and Settlement – Certified NYCTA and LIRR Track Training (Tunnel Installations and Monitoring). OSHA 29 CFR 1910.120 40 Hr. Hazardous Waste Training.

☐ REVIEWED ☐ REVIEWED & NOTED

REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

SIGNATURE

12/1/11
Date

Office Location

☒ RESUBMIT ☐ REJECTED

ARCADIS SUBMITTAL # PC-061-R1

CleanHarbors
ENVIRONMENTAL SERVICES®

42 Longwater Drive, Norwell, MA 02061
(781) 385-9813
Lis.Justin@cleanharbors.com
www.cleanharbors.com

Project Submittal

Project Name: Lower Passaic River Phase I Sediment Removal Action

November, 22 2011

Engineer: Rob Romagnoli, (QCA) Engineer of Record (ARCADIS)

Address: 6723 Towpath Road, Syracuse, NY 13214

Subcontractor:

Address:

Manufacturer:

Address:

Supplier:

Address:

Submittal: ML-021-R1

Specification/Drawing Reference: Specs 01 75 00, 40 90 01, 44 42 00

Transmittal Record	Attention	Sent	Received	Due	Quantity	Received
Contractor to Engineer	Rob Romagnoli (QCA) Scott Murphy (TM)	11/22/2011		11/30/11	1	
Engineer to Contractor	Justin Lis					

Review Action Code:
1. Reviewed/No exception taken
2. Make corrections noted
3. Revise as noted and resubmit
4. Incomplete submittal, resubmit
5. Rejected. Resubmit as specified

1	2	3	4	5	Drawing/Item	Dated	Description
					1	11/22/11	Clean Harbors' Water Treatment System Start-up and Testing Plan for water treatment
					-	-	system to be installed at the UPF water treatment site.

COMMENTS:

Clean Harbors requests approval of the attached Water Treatment System Start-up and Testing Plan. Clean Harbors will utilize the Water Treatment System Start-up and Testing Plan to successfully start, test and confirm functionality of the water treatment system to be installed at the UPF water treatment site.

Note: Section 9, O & M Manuals and section 10, Equipment/Material Cut Sheets were omitted to limit the size of this document. The hard copy document, which will be on file and used at the site will have all treatment system manuals and cut sheets included. Please feel free to request these if needed.

Authorized Reviewer: Justin Lis Date: 11/22/11

Notations do not authorize changes to contract sum or time. If you are authorized to proceed with the work identified in this submittal, it is assumed that no change in the contract amount or completion date is required. If a change in the work affecting your contract amount or completion is involved, notify the CM immediately.

"People and Technology Protecting and Restoring America's Environment"

PC-061-R1

RESUBMIT:

General Comments

- The PLC Schematics provided are difficult to read.
- Tanks T-100 and T-300 are provided with level switches as well as pressure transducers. The level switches are intended to provide redundant high level sensing.
- The EQ tanks (T100A-G) are intended to provide a minimum of 80,000 gallons of storm water storage capacity at all times.
- Pumps P-100 and P-200 are equipped with Variable Frequency Drives (VFDs).
- The Actiflo clarifier should not be allowed to empty during normal daily operation. If flow is stopped, it can take up to one hour to re-start the clarifier. The clarifier should only need to be placed into startup one time per week, after shutdown on the weekend.
- The pump discharge pressure for each pump should be verified on the pressure gauge and noted.
- Proofing system components appears to occur with the pumps in Hand, by testing the system in Hand, rather than Auto certain system features can't be tested.
- Where redundant pumps are provided, ensure both pumps are tested individually during startup.
- What does the manufacturer recommend in terms of calibrating and testing the turbidity meter?
- When is the audible alarm tested in relation to high level alarms?
- On the control panel drawings there is not a HOA switch for the Effluent Valve (FV-100), is manual operation of the valve possible?
- ARCADIS recommends that instead of using two outputs to open and close a valve, change the output to energize a relay which will open and close the valve. This way only the relay burns out and requires replacement and no wiring changes or changes the PLC code are required.
- On the control panel drawings there is not a HOA switch or output for P-500A. Possibly mislabeled as P-800A.
- On the control panel drawings there is a pressure transmitter (PIT-200) called out this was removed on the final drawings.
- There is no provision for a VFD feedback signal from the VFD to the PLC, so that the PLC knows what the VFD is running at.
- This MicroLogix PLC I/O is almost at the maximum. ARCADIS generally does not maximize the I/O on a PLC for a variety of reasons. ARCADIS recommends using the next PLC up from this one which would be either Compactlogix or SLC 5/05.
- On I/O Schematic #1, what valve is reference by "Incoming Valve"?

Startup Forms

ARCADIS recommends adding the following forms to the Start-up Submittal

1. Provide Electrical Testing Form for All Motors (Pumps and Compressor)
    a. Confirm that Pump has been wired correctly – (Example: 230VAC three phase or 480vac three phase)
    b. Include Megaohms of Power Cable from MCE or MCC to the Pump – Certify that the reading is to ARCADIS Specifications
    c. Include Pre-Start-up Electrical Power Reading – Check Against Required Power

    d. Include Pre-Start-Up Motor Megaohm Readings – Check Against Manufacturer Required Readings
    e. Include engineering approval prior to start-up.
    f. Include Motor Rotation Check
    g. Include VFD Programming Check (If VFD is controlling Motor)
    h. Include VFD Operation in “Hand” Check (If VFD is controlling Motor)
    i. Include VFD Operation in “Auto” Check (If VFD is controlling Motor)
    j. Confirm “Remote Run Switch” is working correct
    k. Confirm HOA is working correctly
2. Provide Electrical Testing Form for Motor Start Enclosure (MCE) or Motor Control Center (MCC)
    a. Confirm Motor Starter is connected to the correct Motor.
    b. Confirm Motor Starter trip setting are set correct for the motor that it is connected to.
    c. Confirm Power Reading is correct coming into the panel and going to each motor starter.
3. Provide Electrical Testing Form for the Control Panel
    a. Confirm Power Coming into the panel.
    b. Include engineering approval prior to powering on panel.
    c. Confirm power supplies are working correctly.
    d. Confirm Instrumentation is connected to the correct location in the control panel
4. Provide Electrical Instrumentation and Switch Testing Form
    a. Confirm wires coming from the control panel are going to the correct instrument or switch.
    b. Confirm correct power is being supplied to the instrument or switch.
    c. Confirm that the instrument or switch is wired correctly.
    d. Include engineering approval prior to powering on instrument.
    e. For switches, confirm that PLC is see switch being activated.
    f. For switches, during test operations confirm that the switch causes the correct reaction with-in the system.
    g. For instrumentation, simulate a 4-20 ma signal back to the PLC to confirm that the PLC is seeing the signal correctly.
    h. For instrumentation, during testing operations confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system.
    i. For instrumentation, provide all calibration certifications from manufacturer.

Testing Procedures Comments

Interlock Proofing (LS100A, LT100A, LT700B)

Specific to Tank T-100, these specific tests are not described

- LS100A is for redundant high level sensing only (LAHH). It should not be tested in Steps 5, 6, and 7 as indicated.
- In Step 4 the High High interlock (LAHH) should disable the storm water pumping station, this should be verified during testing.

- In Step 5 the High interlock (LAH) should set the VFD (on Pumps P-100A or B) to produce a flow rate of 830 gallons per minute.
- In Step 6 the Low interlock (LAL) should enable pump P-100 A or B, and the VFD should be set to a flow rate equal to the flow rate registered at FE-101, the influent flow meter from sediment processing

Specific to Tank T-700, these specific tests are not described

- In Step 4 the High – High level interlock should enable FV-100 to divert water to the river outfall
- In Step 6 the Low level interlock should enable FV-100 to divert water the treated water holding tanks

Proof Solids and Surge Tank pumps and transmitters

Specific to Tank T300, these specific tests are not described

- LS 300 is for redundant high level sensing only (LAHH). It should not be tested in Steps 4, 5 and 6.
- Step 4 the Low-Low interlock (LALL) should disable pumps P-200A or B
- Step 5 the Low interlock (LAL) should enable pump P-200 A or B
- Step 6 the High interlock (LAH) should disable P-100 A/B

Specific to Tank T900, this specific test is not described

- In Step 7 the High-High interlock (LAHH) should disable P-100A/B

Backwash solids tank pump and transmitter proofing

Specific to Tank 800 Backwash Solids Tank

- In step 4 the High-High interlock (LAHH) should disable the backwash pump

200,000 gallon full scale system test and discharge

Step 9 indicates the operator will start at the end of the system and isolate every tank, vessel and process line to perform pressure test. Is that test being conducted with the system pumps? If so, does that mean those pumps will be “dead headed”? Also, what equipment will be isolated during the pressure test to prevent potential damage as described in Section 44 42 00?

Clean Harbors Environmental Services

GX3741007	WTS Start Up and Testing Plan	B0009964.0001

Water Treatment System
Start Up and Testing Plan

Upland Processing Facility
Water Treatment System Construction
2011-2012

Client……………….	Arcadis-US
Location…………….	117 Blanchard St. Newark, New Jersey
Project Number……..	GX3741007
Project Manager…….	Justin Lis

Start Up and Testing Plan - Communication List

No.	Company	Project Function/Title	Name
01	ARCADIS	Client's Authorized Representative	Matthew Bowman
02	ARCADIS	Client's Construction Manager	Coleman King
03	CHES	Project Manager	Justin Lis
04	CHES	Construction Supervisor	Josh Stringer
05	CHES	Electrician and PLC Programmer	Bob Shoprey
Notes:			

Start Up and Testing Plan - Revision Tracking

Revision	Reason and Section Revised	Prepared	Checked	Approved
0.0				
1.0				
2.0				

Start Up and Testing Plan Sections

Section 1 - Water Treatment System Construction Overview
Section 2 - December 2011 Start Up and Testing Schedule
Section 3 - Equipment and Material ID Sheets
Section 4 - Electrical Drawings and Instrument Matrix
Section 5 - Treatment System Drawing and Flow Diagram
Section 6 - System Start up Checklist
Section 7 - Equipment and Material Testing Form
Section 8 - Equipment and Material Deficiency Form
Section 9- O & M Manuals
Section 10- Equipment and Material Cut Sheets

Water Treatment System
Start Up and Testing Plan

Section 1

Water Treatment System Construction Overview

Water Treatment System Start Up and Testing Plan Overview

Clean Harbors Environmental Services (Clean Harbors) has prepared this Water Treatment System Start Up and Testing Plan for ARCADIS-US to detail the means and methodology to be employed to confirm the construction and functionality of the temporary water treatment facility at the upland processing facility for the Lower Passaic River Phase I Removal Project.

General Requirements - Introduction

In general, the System Start Up and Testing will include, but not limited to, the following:

- Post Construction Start Up and Testing 2011 Schedule
- Full System Start Up and Testing 2012 Schedule
- Equipment and Material ID Sheets
- Electrical Drawings and Instrument Matrix
- Treatment System Drawing and Flow Diagram
- System Start up Checklist
- Equipment and Material Testing Form
- Equipment and Material Deficiency Form
- O & M Manuals
- Equipment and Material Cut Sheets

Project Management and QA/QC Staffing Plan

This section presents Clean Harbors' approach to the integration of all testing activities in order to insure a safe, timely and satisfactory completion of the start up and testing work specified for this project. Clean Harbors has developed a system for project/site QA/QC management based upon successful completion of numerous environmental construction projects of similar nature and complexity. Coordination of the total work effort is effected through a management approach characterized as follows:

- Defining, monitoring and control of equipment specifications, procurement, construction, integration and successful implementation.
- Quality control through a firm understanding of project specifications and documentation.

Project Manager/QA/QC Manager

Justin Lis

(Phone)	(781)-385-9813

Project Supervisor/System Operator/QA/QC Supervisor

Josh Stringer

(Phone)	(231)-384-3134

Electrical and PLC Integration QA/QC Supervisor

Bob Shoprey

(Phone)

Material and Equipment Delivery, Storage and Handling

Clean Harbors has procured, delivered, installed and handled all equipment needed for the project in accordance with the contract documents. Clean Harbors' has performed this work by following these guidelines:

- Clean Harbors has used all means necessary and reasonably possible to protect all the project materials before, during and after installation and work in a manor to protect the installed work and materials of other contractors.
- In the event of any damage caused by the failure of materials or equipment, by Clean Harbors or its subcontractors, Clean Harbors will immediately make all repairs and replacements necessary to the approval of the engineer and at no cost to customer.
- Clean Harbors has delivered all applicable pieces of equipment and material to the site in their original containers with labels intact and legible at time of use. These documents have been documented and provided to the customer.
- Clean Harbors has stored all applicable materials and equipment in accordance of the manufacturers recommendations and as approved by engineer.
- Clean Harbors has inspected all materials delivered to the site to ensure they comply with the requirements in the contract documentation.
- Clean Harbors has and will be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-startup during the warranty period.

Material and Equipment Quality Assurance and Warranty

In an effort to ensure quality materials and equipment have been procured and installed correctly in the temporary water treatment system, Clean Harbors has followed these quality assurance, acceptance and warranty procedures:

- To ensure that quality materials, equipment and services were used, Clean Harbors has procured the approved items and services from qualified manufacturers that have a successful history of producing and executing these items in the past.
- Clean Harbors has provided adequate personnel, including but not limited to the Project Manager and Project Supervisor, who have been present at all times during the execution of the work and who are thoroughly familiar with the specified requirements of the materials and methods needed for their execution, and have directed all work performed.
- Clean Harbors has provided an adequate number of qualified workers who are skilled in the necessary crafts and are properly informed of the methods, services, equipment and materials used.
- Clean Harbors has followed the equipment and material manufacturer's installation instructions, as approved by the engineer. These have served as a basis for acceptance or rejection of the work performed.

- Clean Harbors has submitted, to the engineer for approval, all specifications and product data for all equipment and materials installed in the water treatment system.
- Clean Harbors will include manufacturers warranty for any purchased materials with the shop drawing submittals.

Section 2

December 2011 Start Up and Testing Schedule

Water Treatment System

Start Up and Testing Plan Schedule
December 2011

December 2011	
12/12/11 Monday	• Receive 100,000 gallons from Seci. • Flow meter proofing (FIT101, 201) Pump control proofing (P100A/B P200A/B). • Actiflo primary clarifier proofing. • System run and pressure testing with 100,000 gallons.
12/13/11 Tuesday	• System run and pressure testing with 100,000 gallons. • CHES/Seci Interlock proofing (LS100A, LT100A, LT700B) • Proof Solids and Surge Tank pumps and transmitters (LS300, LT300, LT900, P800A, P800B).
12/14/11 Wednesday	• System run and pressure testing with 100,000 gallons. • Backwash solids tank pump and transmitter proofing (LT800, P500A, P300). • Pressure transmitter, turbidimeter, audible alarms and 3 way valve proofing (PIT200, AIT100, FV100).
12/15/11 Thursday	• System run and pressure testing with 100,000 gallons and discharge per Arcadis direction. • Storm water testing and proofing. • Conduct 200,000 gallon full scale system test and discharge per Arcadis direction.
12/16/11 Friday	• Contingency test day.
12/17/11 Saturday	• Contingency test day.
12/18/11 Sunday	• No work planned.
12/19/11 Monday	• Start system shut-down and winterization.

December 12, 2011

100,000 Gallon Transfer from Sediment Processing -

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 - System operator shall open inlet valves to all EQ tanks (T100A-G).

Step 4 - System operator shall close outlet valves to all EQ tanks (T100A-G).

Step 5 - System operator shall start 100,000 gallon transfer from sediment processing.

Step 6 - System operator shall observe and balance flow evenly into all EQ tanks (T100A-G).

Step 7 - When 100,000 gallons has been transferred, the system operator shall stop water flow to EQ tanks (T100A-G).

Step 8 - System operator shall complete all testing reports.

Flow Meter Proofing (FIT101, 201) Pump Control Proofing (P100A/B P200A/B) –

Note: The testing of flow meter (FIT101) will be performed in conjunction with the 100,000 Gallon Transfer from Sediment Processing.

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 - System operator shall open inlet valves to all EQ tanks (T100A-G).

Step 4 - System operator shall close outlet valves to all EQ tanks (T100A-G).

Step 5 - System operator shall start 100,000 gallon transfer from sediment processing.

Step 6 - System operator shall start proofing of (FIT101). The system operator will confirm flow rates from sediment processing to check calibration of flow meter.

Step 7 - When 100,000 gallons has been transferred, system operator shall stop water flow to EQ tanks (T100A-G).

Step 8 - System operator shall open outlet valves to all EQ tanks (T100A-G).

Step 9 - System operator shall open all inlet and outlet valves to actiflo primary clarifier.

Step 10 - System operator shall open all inlet and outlet valves to sand filters.

Step 11 - System operator shall open all inlet and outlet valves to bag filters.

Step 12 - System operator shall open all inlet and outlet valves to carbon vessels.

Step 13 - System operator shall close FV100 valve outfall line and open FV100 valve treated water line.

Step 14 - System operator shall close all inlet and outlet valves to temporary treated water holding tanks (T700D-H).

Step 15 - System operator shall open all inlet valves to treated water holding tanks (T700A/B/C).

Step 16 - System operator shall close all outlet valves to treated water holding tanks (T700A/B/C).

Step 17 - System operator shall open valves to (P100A/B) and turn pump switches to hand. The system operator shall begin filling the actiflo primary clarifier and surge tank.

Step 18 - When the surge tank is ¾ full the system operator shall open valves to (P200A/B) and turn pump switches to hand. The system operator shall run both (P100A/B and P200A/B pumps simultaneously and test.

Step 19 - System operator shall start proofing of (P100A/B and P200A/B pumps and FIT201).

Step 20 - The system operator will perform pipe pressure and vessel inspections and functionality tests of the sand filters, bag filters, carbon vessels and all interconnecting piping, during the transfer of 80,000 gallons of water from the EQ tanks to the treated water holding tanks.

Step 21 - When 80,000 gallons has been transferred, the system operator shall stop water flow from EQ tanks (T100B-G). Operator will ensure T100A is left filled with 20,000 gallons of water and T700B is filled with 20,000 gallons of water for the interlock proofing of (LS100A, LT100A, LT700B).

Step 22 - System operator shall complete all testing reports.

December 13, 2011

CHES/Seci Interlock proofing (LS100A, LT100A, LT700B) -

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 - System operator will hook-up (2) 4” trash pumps to the outlet lines of (T100A and T700B) and set-up discharge to (T100B and T800B)

Step 4 - System operator will draw both (T100A and T700B) tanks down to 90% capacity and CHES and SECI will set (LS100A, LT100A, LT700B) to High High interlock.

Step 5 - System operator will draw both (T100A and T700B) tanks down to 60% capacity and CHES and SECI will set (LS100A, LT100A, LT700B) to High interlock.

Step 6 - System operator will draw both (T100A and T700B) tanks down to 40% capacity and CHES and SECI will set (LS100A, LT100A, LT700B) to Low interlock.

Step 7 - System operator will draw both (T100A and T700B) tanks down to 20% capacity and CHES and SECI will set (LS100A, LT100A, LT700B) to Low Low interlock.

Step 8 - System operator shall complete all testing reports. System operator shall confirm all Material Testing Forms are complete and no deficiencies are present. If deficiencies are observed, the system operator shall complete deficiency report and repair or replace part/equipment and repeat test.

Proof Solids and Surge Tank pumps and transmitters (LS300, LT300, LT900, P800A, P800B) -

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 - System operator will hook-up (1) 4” trash pump to the outlet line of (T100B) and set-up discharge to (T300 and T900) tanks.

Step 4 - System operator will fill both (T300 and T900) tanks to 10% capacity and the system operator will set (LS300, LT300, LT900) to Low Low interlock.

Step 5 - System operator will fill (T300 and T900) tanks to 50% and 20% capacity (respectively) and the system operator will set (LS300, LT300, LT900) to Low interlock.

Step 6 - System operator will fill (T300 and T900) tanks to 70% and 50% capacity (respectively) and the system operator will set (LS300, LT300, LT900) to High interlock.

Step 7 - System operator will fill (T300 and T900) tanks to 90% and 70% capacity (respectively) and the system operator will set (LS300, LT300, LT900) to High High interlock.

Step 8 - System operator shall complete all testing reports. System operator shall confirm all Material Testing Forms are complete and no deficiencies are present. If deficiencies are observed, the system operator shall complete deficiency report and repair or replace part/equipment and repeat test.

<u>December 14, 2011</u>

Backwash solids tank pump and transmitter proofing (LT800, P500, P300) -

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 - System operator will open all discharge valves for (T800B) and turn (P500A) pump on hand.

Step 4 - System operator will draw (T800B) tank down to 90% capacity and system operator will set (LT800) to High High interlock.

Step 5 - System operator will draw (T800B) tank down to 70% capacity and system operator will set (LT800) to High interlock.

Step 6 - System operator will draw (T800B) tank down to 40% capacity and system operator will set (LT800) to Low interlock.

Step 7 – System operator will turn (P500A) to off position. System operator will utilize (P500B) pump to empty tank further.

Step 8 - System operator will draw (T800B) tank down to 10% capacity and system operator will set (LT800) to Low Low interlock.

Step 9 - System operator shall complete all testing reports. System operator shall confirm all Material Testing Forms are complete and no deficiencies are present. If deficiencies are observed, the system operator shall complete deficiency report and repair or replace part/equipment and repeat test.

Pressure transmitter, turbidimeter, audible alarms and 3 way valve proofing (PIT200, AIT100, FV100) -

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 – System operator shall open EQ tank (T100A) outlet, (P100A/B and P200A/B) inlets and outlets and Actiflo, sand filter, bag house and carbon vessel inlets and outlets.
Step 4 - System operator shall switch (P100A/B and P200A/B) pumps to hand and run water through system.

Step 5 - System operator shall proof pressure transmitter (PIT 200) by slowly closing down stream valve, incrementally, to set pressure interlocks.

Step 6 - System operator shall proof (FV-100) valve by lowering clarified holding tank (T700B) to set interlocks.

Step 7 - System operator shall proof turbidimeter after (FV-100) valve is working properly and send water to the outfall pipe.

Step 8 - System operator shall complete all testing reports. System operator shall confirm all Material Testing Forms are complete and no deficiencies are present. If deficiencies are observed, the system operator shall complete deficiency report and repair or replace part/equipment and repeat test.

December 15, 2011

Conduct 200,000 gallon full scale system test and discharge -

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 - System operator shall open inlet valves to all EQ tanks (T100A-G).

Step 4 - System operator shall open outlet valves to all EQ tanks (T100A-G).

Step 5 - System operator shall open all inlet and outlet valves to actiflo, sand filters, bag filters, carbon vessels and treated water holding tanks.

Step 6 - System operator shall open all pump inlets and outlets and set pumps to auto.

Step 7 - System operator shall start 200,000 gallon transfer from sediment processing.

Step 8 - System operator shall observe and balance flow evenly into all EQ tanks (T100A-G).

Step 9 - System operator will start at the end of the system and isolate every tank, vessel and process line to perform pressure tests. The system operator will utilize the pressure indicators throughout the system to satisfy the pressure testing requirements.

Step 10 - When 200,000 gallons has been transferred, the system operator shall run water flow from EQ tanks (T100A-G) till the Low Low alarm is tripped.

Step 11 - System shall shut down system.

Step 12 - System operator shall complete all testing reports. System operator shall confirm all Material Testing Forms and complete and no deficiencies are present. If deficiencies are observed, the system operator shall complete deficiency report and repair or replace part/equipment and repeat test.

Section 3

Equipment and Material ID Sheets

Clean Harbors Water Treatment System
Mechanical Equipment Check List

Clean Harbors' Inspection Conducted By: ________________________ Date: ____________
Arcadis Inspection Conducted By: ______________________________ Date: ____________
Weather: ____
Notes:

Equipment ID		Equipment Installed	Y/N	Equipment Inlet Process Connection	Y/N	Equipment Outlet Process Connection	Y/N
EQ	EQ-T100A	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
EQ	EQ-T100B	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
EQ	EQ-T100C	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
EQ	EQ-T100D	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
EQ	EQ-T100E	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
EQ	EQ-T100F	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
EQ	EQ-T100G	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
PB1	PB1	18' x 8' x 7.5' Building	Y/N	(2) 8" Process Lines	Y/N	(2) 8" Process Lines	Y/N
PB1	PB1-P100A	20 HP Pump EQ Transfer Pump	Y/N	(1) 8" Process Line x 6" Inlet	Y/N	(1) 4" Outlet x 8" Process Line	Y/N
PB1	PB1-P100B	20 HP Pump EQ Transfer Pump	Y/N	(1) 8" Process Line x 6" Inlet	Y/N	(1) 4" Outlet x 8" Process Line	Y/N
AF	AF-T200	ActiFlo Primary Clarifier	Y/N	(1) 8" Process Line x 10" Inlet	Y/N	(1) 12" Flange x 10" Process Line (1) 2" Flange x 2" Gravity Line	Y/N
STT	STT-T900	Solids Transfer Tank 1000 Gallon Poly Tank	Y/N	(1) 2" Gravity Line Inlet	Y/N	(1) 2" Outlet Solids Line	Y/N
PST	PST-T300	Process Surge Tank 2500 Gallon Poly Tank	Y/N	(1) 8" Inlet x 10" Gravity Process Line	Y/N	(1) 6" Outlet x 8" Process Line	Y/N
PB1	PB1-P200A	40 HP Pump PST-T300 Transfer Pump	Y/N	(1) 8" Process Line x 6" Inlet	Y/N	(1) 4" Outlet x 8" Process Line	Y/N
PB1	PB1-P200B	40 HP Pump PST-T300 Transfer Pump	Y/N	(1) 8" Process Line x 6" Inlet	Y/N	(1) 4" Outlet x 8" Process Line	Y/N
MMF	MMF-T400A	1000 GPM Sand Filter Skid	Y/N	(1) 6" Flange x 8" Process Header (1) 6" Inlet x 8" Clarified Backwash Line	Y/N	(1) 6" Outlet x 8" Process Header (1) 4" Flange x 4" Backwash Line	Y/N
MMF	MMF-T400B	1000 GPM Sand Filter Skid	Y/N	(1) 6" Flange x 8" Process Header (1) 6" Inlet x 8" Clarified Backwash Line	Y/N	(1) 6" Outlet x 8" Process Header (1) 4" Outlet x 4" Backwash Line	Y/N
MMF	MMF-T400C	1000 GPM Sand Filter Skid	Y/N	(1) 6" Flange x 8" Process Header (1) 6" Inlet x 8" Clarified Backwash Line	Y/N	(1) 6" Outlet x 8" Process Header (1) 4" Outlet x 4" Backwash Line	Y/N
BF	BF-F100A	1600 GPM 8 Bag Filter	Y/N	(1) 6" Inlet x 8" Process Header	Y/N	(1) 6" Outlet x 8" Process Header	Y/N

BF	BF-F100B	1600 GPM 8 Bag Filter	Y/N	(1) 6” Inlet x 8” Process Header	Y/N	(1) 6” Outlet x 8” Process Header	Y/N
GAC	GAC-T600A	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T600B	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T610A	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T610B	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T620A	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T620B	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T600C	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T600D	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T610C	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T610D	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T620A	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T620B	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
FV	FV-100	3-Way Flow Valve and Actuator	Y/N	(1) 8” Process Line	Y/N	(2) 8” Outlet Process Lines	Y/N
TW	TW-T700A	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700B	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700C	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700D	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700E	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700F	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700G	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700H	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N

BS	BS-T800A	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
BS	BS-T800B	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
BS	BS-T800C	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
PB2	PB2	18’ x 8’ x 7.5’ Building	Y/N	(3) Process Lines (8”,4” & 3”)	Y/N	(4) Process Lines (8”, 3”, 3” & ¾”)	Y/N
PB2	PB2-AC100	25 HP Air Compressor	Y/N	NA	Y/N	(1) ¾” Air Line	Y/N
PB2	PB2-AR-100	Air Receiver Tank	Y/N	(1) ¾” Air Line	Y/N	(1) ¾” Air Line (1) ½” Drain	Y/N
PB2	PB2-AD-100	Desiccant Air Dryer	Y/N	(1) ¾” Air Line	Y/N	(1) ¾” Air Line (1) ½” Drain	Y/N
PB2	PB2-P300	15 HP SF & GAC Clarified Backwash Pump	Y/N	(1) 8” Transfer Line x 4” Inlet	Y/N	(1) 3” Outlet x 8” Transfer Line	Y/N
PB2	PB2-P500A	2.25 HP Backwash Supernatant Transfer Pump	Y/N	(1) 8” Transfer Line x 4” Inlet	Y/N	(1) 3” Outlet x 4” Transfer Line	Y/N
PB2	PB2-P500B	100 scfm Backwash SolidsTransfer Pump	Y/N	(1) 3” Transfer Line x 3” Inlet	Y/N	(1) 3” Outlet x 3” Transfer Line	Y/N

<u>Deficiency:</u>	<u>Corrective Actions</u>:
1.______________________________	1.______________________________
2.______________________________	2.______________________________
3.______________________________	3.______________________________
4.______________________________	4.______________________________
5.______________________________	5.______________________________
6.______________________________	6.______________________________
7.______________________________	7.______________________________
8.______________________________	8.______________________________
9.______________________________	9.______________________________

Notes:
____
____
____

I certify that all mechanical equipment included on this checklist has been supplied and installed per contract specifications and by acceptance of the Engineer (Arcadis).

Clean Harbors Print: __________________Sign: _____________________Date: ________
Arcadis : Print: __________________Sign: _____________________Date: ________

Section 4

Electrical Drawings and Instrument Matrix

RJS ELECTRIC

WATER TREATMENT SKID

PROGRAMMED BY: TEMPEST ENTERPRISES ENGINEER:
BRIAN THERIAULT 989 390-5008

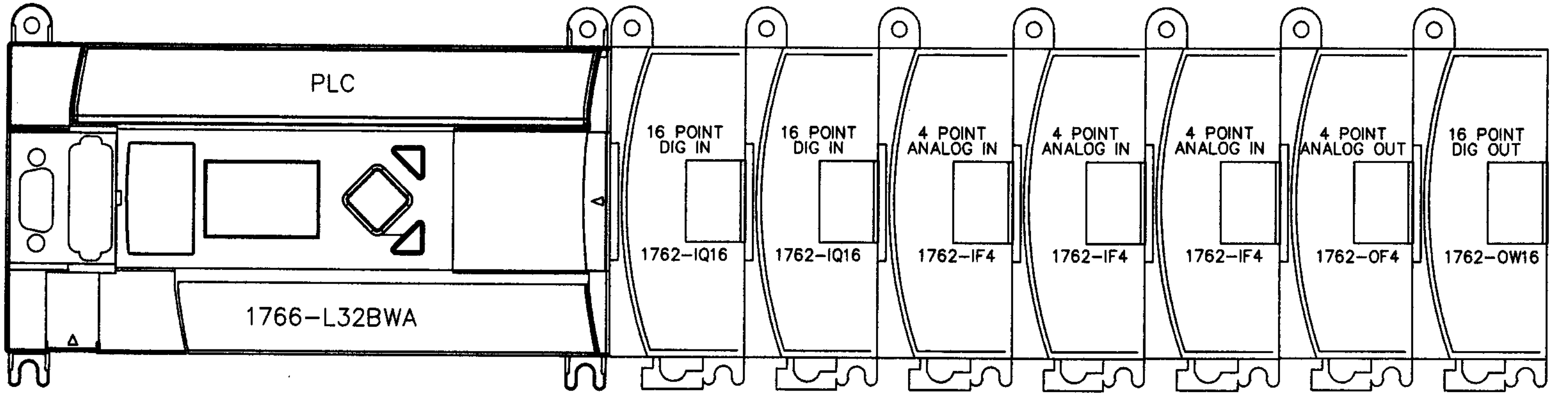
CAUSE & EFFECT MATRIX

10/28/2011

					DESCRIPTION / ACTION	PUMP PERMISSIVE	PUMP PERMISSIVE	MOVE VALVE TO OUTFALL POSITION	MOVE VALVE TO TREATED WATER STORAGE POS	OPEN INCOMMING VALVE	CLOSE INCOMMING VALVE	LIGHT AND HORN ALARM	SPARE	SPARE	SPARE	SPARE	SPARE	SC-100A TRANSFER PUMP SPEED CONTROL	SC-100B TRANSFER PUMP SPEED CONTROL	SC-200A TRANSFER PUMP SPEED CONTROL	SC-200B TRANSFER PUMP SPEED CONTROL	TRANSFER PUMP PERMISSIVE	TRANSFER PUMP PERMISSIVE	TRANSFER PUMP PERMISSIVE	TRANSFER PUMP PERMISSIVE	SPARE	SPARE	SPARE	SPARE	BACKWASH PUMP PERMISSIVE	SUPERNATANT TRANSFER PUMP PERMISSIVE	PUMP PERMISSIVE	PUMP PERMISSIVE	SPARE	SPARE	SPARE	SPARE
					END DEVICE	P-600	P-700	FV-100	FV-100									P-100A	P-100B	P-200A	P-200B	P-100A	P-100B	P-200A	P-200B					P-300	P-500A	P-800A	P-800B				
					PLC Address	O:0.0	O:0.1	O:0.2	O:0.3	O:0.4	O:0.5	O:0.6	O:0.7	O:0.8	O:0.9	O:0.10	O:0.11	O:6.0	O:6.1	O:6.2	O:6.3	O:7.0	O:7.1	O:7.2	O:7.3	O:7.4	O:7.5	O:7.6	O:7.7	O:7.8	O:7.9	O:7.10	O:7.11	O:7.12	O:7.13	O:7.14	O:7.15
TAG	EQUIPMENT	DESCRIPTION / ANNUNCIATE	SET POINT (Scale)	PLC Address	I/O TYPE	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	AO	AO	AO	AO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO
ESD-100		E-STOP	0=ESD	I:0.0	DI	X	X	X	X	X	X	X						X	X	X	X	X	X	X	X					X	X	X	X				
HS-100		RESET	1=RESET	I:0.1	DI																																
ESL-100		POWER FAILURE SENSE RELAY (R1)	0=FAIL	I:0.2	DI	X	X		X		X	X						X	X	X	X	X	X	X	X					X	X	X	X				
ESL-101		PHASE FAIL	0=FAIL	I:0.3	DI	X	X			X	X	X						X	X	X	X	X	X	X	X					X	X	X	X				
ZX1-100	FV-100	IN OUTFALL POSITION	1=IN POS	I:0.4	DI																																
ZX2-100	FV-100	IN TREATED WATER STORAGE POSITION	1=IN POS	I:0.5	DI																																
HS-800_L		P-800A&B LEAD/LAG	1= A LEAD	I:0.6	DI																											X	X				
		SPARE		I:0.7	DI																																
		SPARE		I:0.8	DI																																
		SPARE		I:0.9	DI																																
HS-100A_H	P-100A	HAND	1=HAND	I:0.10	DI													X				X															
HS-100A_A	P-100A	AUTO	1=AUTO	I:0.11	DI													X				X															
HS-100A_R	P-100A	REMOTE STOP	0=STOP	I:0.12	DI													X				X															
FS-100A	P-100A	DRIVE FAULT	0=FAULT	I:0.13	DI							X																									
YI-100A	P-100A	RUN STATUS	1=RUN	I:0.14	DI							X																									
HS-100B_H	P-100B	HAND	1=HAND	I:0.15	DI														X				X														
HS-100B_A	P-100B	AUTO	1=AUTO	I:0.16	DI														X				X														
HS-100B_R	P-100B	REMOTE STOP	0=STOP	I:0.17	DI														X				X														
FS-100B	P-100B	DRIVE FAULT	0=FAULT	I:0.18	DI							X																									
YI-100B	P-100B	RUN STATUS	1=RUN	I:0.19	DI							X																									
HS-200A_H	P-200A	HAND	1=HAND	I:1.0	DI															X				X													
HS-200A_A	P-200A	AUTO	1=AUTO	I:1.1	DI															X				X													
HS-200A_R	P-200A	REMOTE STOP	0=STOP	I:1.2	DI															X				X													
FS-200A	P-200A	DRIVE FAULT	0=FAULT	I:1.3	DI							X																									
YI-200A	P-200A	RUN STATUS	1=RUN	I:1.4	DI							X																									
HS-200B_H	P-200B	HAND	1=HAND	I:1.5	DI																X				X												
HS-200B_A	P-200B	AUTO	1=AUTO	I:1.6	DI																X				X												
HS-200B_R	P-200B	REMOTE STOP	0=STOP	I:1.7	DI																X				X												
FS-200B	P-200B	DRIVE FAULT	0=FAULT	I:1.8	DI							X																									
YI-200B	P-200B	RUN STATUS	1=RUN	I:1.9	DI							X																									
HS-300_H	P-300	HAND	1=HAND	I:1.10	DI																									X							
HS-300_A	P-300	AUTO	1=AUTO	I:1.11	DI																									X							
HS-300_R	P-300	REMOTE STOP	0=STOP	I:1.12	DI																									X							
OS-300	P-300	MOTOR OVERLOADS	0=OVERLOAD	I:1.13	DI							X																									
YI-300	P-300	RUN STATUS	1=RUN	I:1.14	DI							X																									
HS-500A_H	P-500A	HAND	1=HAND	I:1.15	DI																										X						
HS-500A_A	P-500A	AUTO	1=AUTO	I:2.0	DI																										X						
HS-500A_R	P-500A	REMOTE STOP	0=STOP	I:2.1	DI																										X						
OS-500A	P-500A	MOTOR OVERLOADS	0=OVERLOAD	I:2.2	DI							X																									
YI-500A	P-500A	RUN STATUS	1=RUN	I:2.3	DI							X																									
HS-800A_H	P-800A	HAND	1=HAND	I:2.4	DI																											X					
HS-800A_A	P-800A	AUTO	1=AUTO	I:2.5	DI																											X					
HS-800A_R	P-800A	REMOTE STOP	0=STOP	I:2.6	DI																											X					
OS-800A	P-800A	MOTOR OVERLOADS	0=OVERLOAD	I:2.7	DI							X																									
YI-800A	P-800A	RUN STATUS	1=RUN	I:2.8	DI							X																									
HS-800B_H	P-800B	HAND	1=HAND	I:2.9	DI																												X				
HS-800B_A	P-800B	AUTO	1=AUTO	I:2.10	DI																												X				
HS-800B_R	P-800B	REMOTE STOP	0=STOP	I:2.11	DI																												X				
OS-800B	P-800B	MOTOR OVERLOADS	0=OVERLOAD	I:2.12	DI							X																									
YI-800B	P-800B	RUN STATUS	1=RUN	I:2.13	DI							X																									
LSH-100B	T-100G	EQUALIZATION TANK HIGH LEVEL	0=HIGH	I:2.14	DI	X				X	X	X																									
LSH-300A	T-300	SURGE TANK HIGH LEVEL ALARM & SHUTDOWN	0=HIGH	I:2.15	DI							X						X	X			X	X														
LT-100A	T-100G	EQUALIZATION TANK LEVEL TRANSMITTER	0-100%	I:3.0	AI																																
LALL-100A	T-100G	EQUALIZATION TANK LOW LOW LEVEL SHUTDOWN			BIT							X						X	X			X	X														
LAL-100A	T-100G	ENABLE VFD ON P-100X to EQUAL FE-101			BIT													X	X			X	X														
LAH-100A	T-100G	ENABLE VFD ON P-100X to 830 GPM			BIT													X	X			X	X														
LAHH-100A	T-100G	EQUALIZATION TANK HIGH HIGH LEVEL SHUTDOWN			BIT	X	X			X	X	X																									
PIT-200		TREATED WATER TO CALIFIER PRESSURE TRANS		I:3.1	AI																																
PAH-200		TREATED WATER TO CALIFIER PRESS HIGH ALARM			BIT							X																									
PAL-200		TREATED WATER TO CALIFIER PRESS LOW ALARM AND SD			BIT							X						X	X			X	X														
LT-300	T-300	SURGE TANK LEVEL TRANS	0-100%	I:3.2	AI																																
LALL-300	T-300	SURGE TANK LOW LOW SHUTDOWN			BIT							X								X	X			X	X												
LAL-300	T-300	SURGE TANK LOW START			BIT															X	X			X	X												
LAH-300	T-300	SURGE TANK HIGH SHUTDOWN AND ALARM			BIT							X						X	X			X	X														
LT-800	T-800C	BACK WASH SOLIDS TANK LEVEL TRANS	0-100%	I:3.3	AI																																
LAL-800	T-800C	BACK WASH SOLIDS TANK LEVEL LOW ALARM			BIT							X																									
LAH-800	T-800C	BACK WASH SOLIDS TANK LEVEL HIGH ALARM			BIT							X																									
LAHH-800	T-800C	BACK WASH SOLIDS TANK LEVEL HIGH HIGH ALARM & SD			BIT							X																		X							
LT-700A	T-700C	TREATED WATER LEVEL TRANS	0-100%	I:4.0	AI																																
LAL-700A	T-700C	TREATED WATER LEVEL LOW OPEN TREATED			BIT				X																												
LAH-700A	T-700C	TREATED WATER LEVEL HIGH OPEN OUTFALL			BIT			X																													
LAHH-700A	T-700C	TREATED WATER LEVEL HIGH HIGH ALARM			BIT							X																									
LALL-700A	T-700C	TREATED WATER LEVEL LOW LOW ALARM			BIT							X																									
AIT-100		TURBIDITY ANALYZER	0-100%	I:4.1	AI																																
AAL-100		TURBIDITY LOW ALARM			BIT							X																									
AAH-100		TURBIDITY HIGH ALARM			BIT							X																									
LT-900	T-900	SOLIDS TANK LEVEL TRANS	0-100%	I:4.2	AI																																
LAL-900	T-900	BACK WASH SOLIDS TANK LEVEL LOW STOP			BIT																											X	X				
LAH-900	T-900	BACK WASH SOLIDS TANK LEVEL HIGH START			BIT																											X	X				
LAHH-900	T-900	BACK WASH SOLIDS TANK LEVEL HIGH HIGH SHUTDOWN			BIT							X						X	X			X	X														
		SPARE		I:4.3	AI																																
FIT-101	FE-101	PROCESS WATER FLOW METER	3-956 GPM	I:5.0	AI													X	X	X	X																
FIT-201	FE-201	TREATED WATER EFFLUENT FLOW RATE	3-956 GPM	I:5.1	AI																																
FIT-102	FE-102	CLARIFIER EFFLUENT FLOW RATE	3-956 GPM	I:5.2	AI															X	X																
		SPARE		I:5.3	AI																																

/// REVISIONS ///

LTR.	DESCRIPTION	DATE	APVD



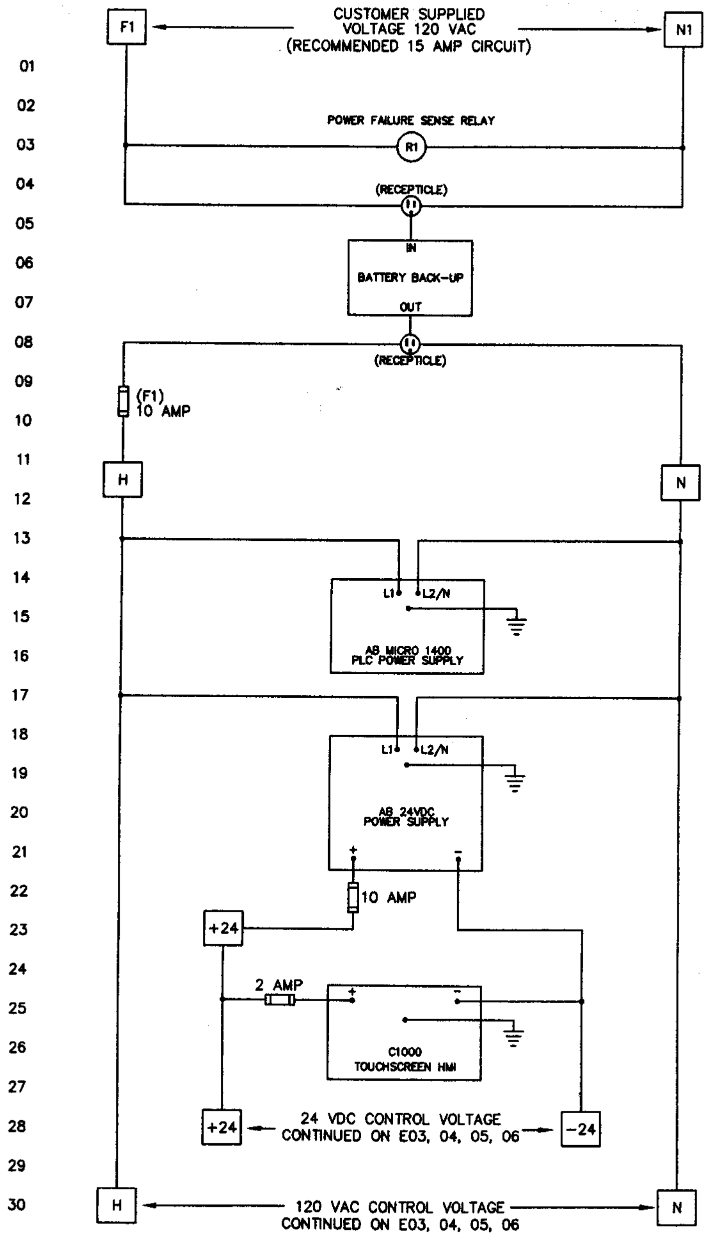
RJS ELECTRIC
WATER TREATMENT SKID

DWG #	DESCRIPTION	PANEL
PLC-E01	DWG LIST	
PLC-E02	CONTROL POWER SCHEMATIC	PLC PANEL
PLC-E03	I/O SCHEMATIC #1	PLC PANEL
PLC-E04	I/O SCHEMATIC #2	PLC PANEL
PLC-E05	I/O SCHEMATIC #3	PLC PANEL
PLC-E06	I/O SCHEMATIC #4	PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# B1680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

DRAWN BY: AZ
CHECKED BY:
DO NOT SCALE
DATE: 10-25-11
DWG TITLE: DWG LIST & DETAIL
DRAWING No: PLC-E01
REV.



/// REVISIONS ///

LTR.	DESCRIPTION	DATE	APVD

LEGEND

—— SOLID LINES INDICATE WIRING BY RJS

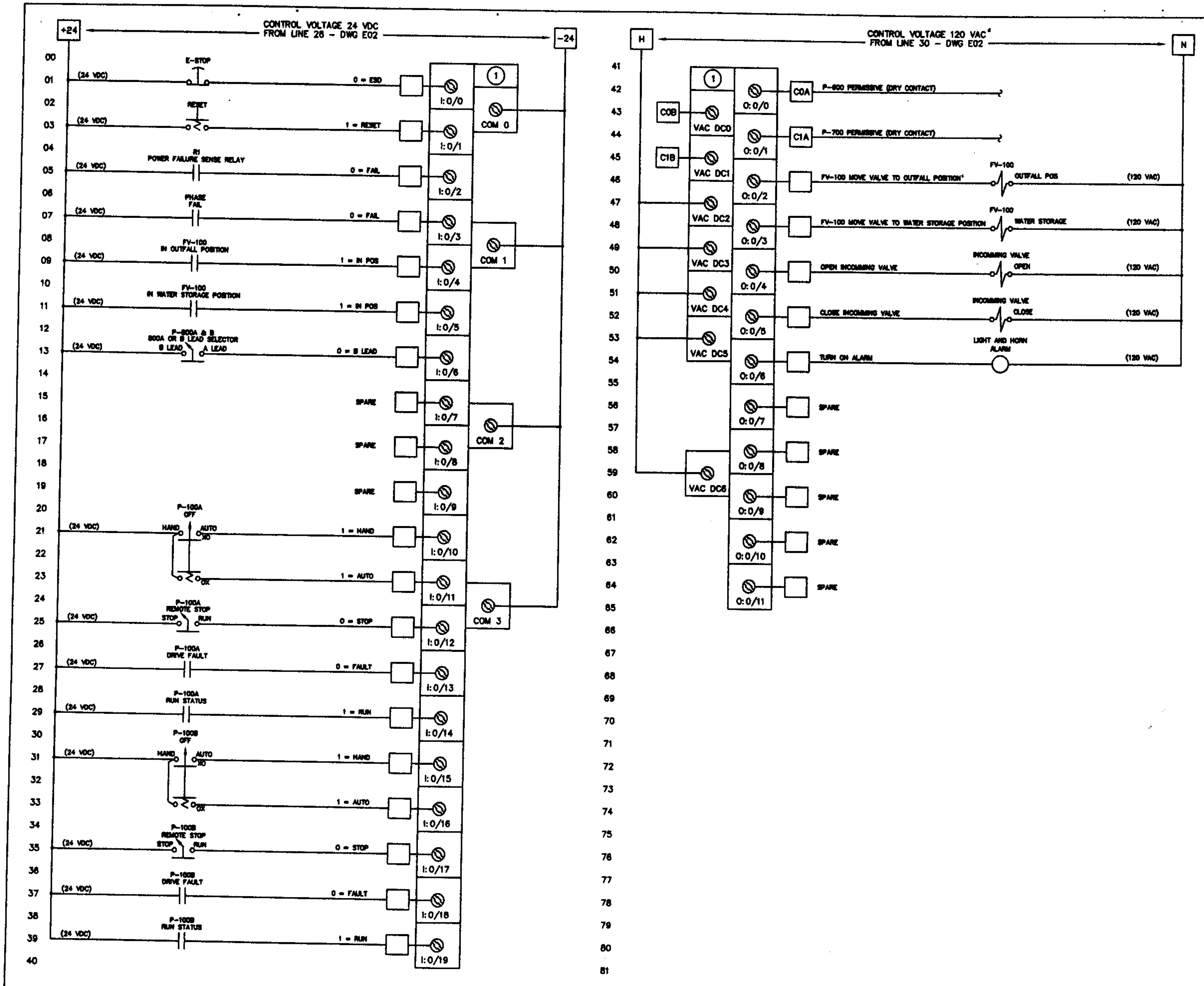
- - - BROKEN LINES INDICATE WIRING BY OTHERS

# INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# B1680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

DRAWN BY: AZ
CHECKED BY:
DO NOT SCALE
DATE: 10-25-11
DWG TITLE CONTROL POWER SCHEMATIC
DRAWING No. PLC-E02
REV.



⫽ REVISIONS ⫽			
LTR.	DESCRIPTION	DATE	APVD

① AB MICRO LOGIX 1400 BASE UNIT
1766-L32BWA

LEGEND

— SOLID LINES INDICATE WIRING BY RJS

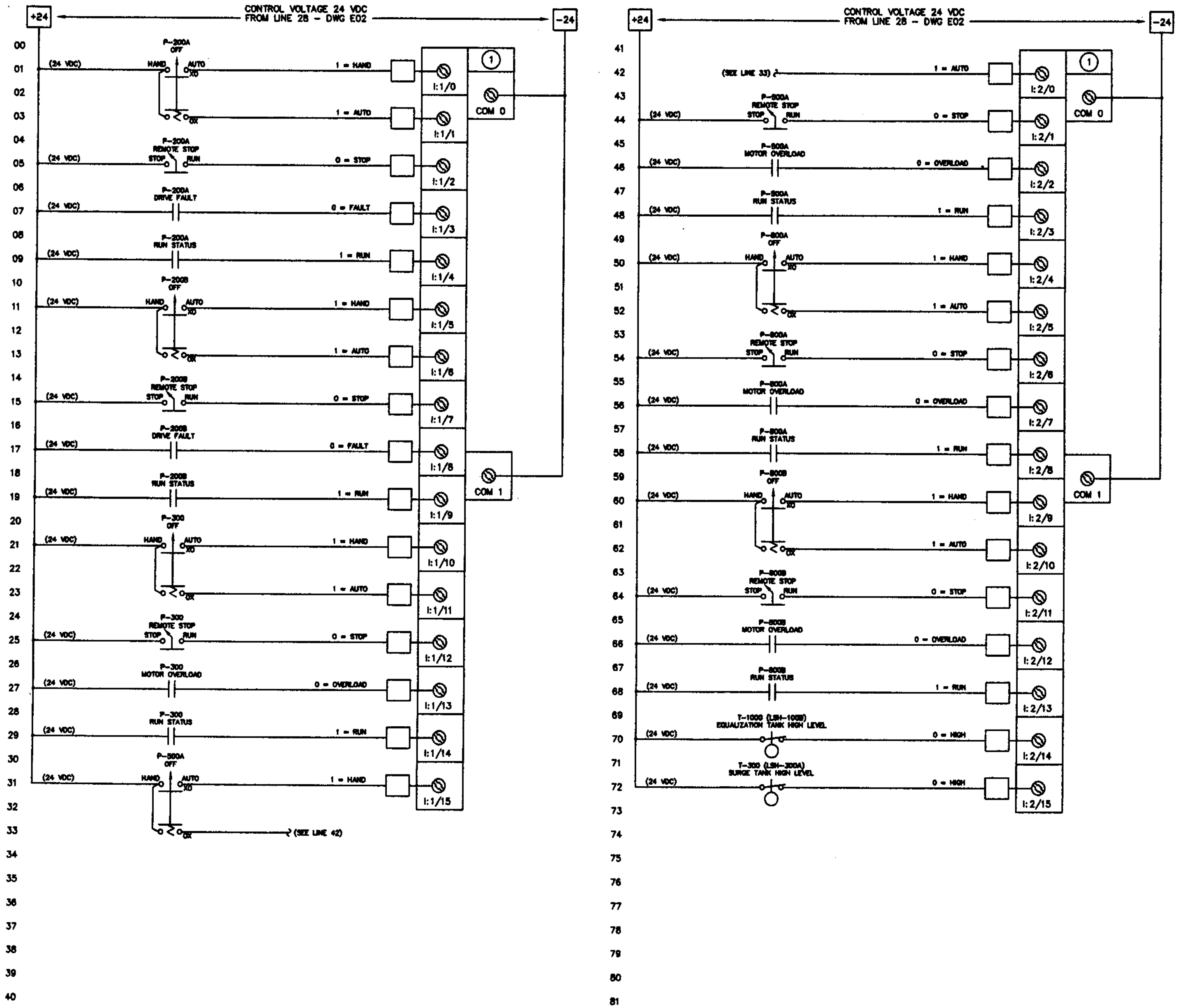
– – BROKEN LINES INDICATE WIRING BY OTHERS

▢ INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# 81680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

DRAWN BY AZ
DO NOT SCALE
DATE 10-25-11
I/O SCHEMATIC #1



REVISIONS			
LTR.	DESCRIPTION	DATE	APVD

① (2) AB 24VDC, 16 POINT DIGITAL INPUT CARD 1762-IQ16

LEGEND

— SOLID LINES INDICATE WIRING BY RJS

– – BROKEN LINES INDICATE WIRING BY OTHERS

\# INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

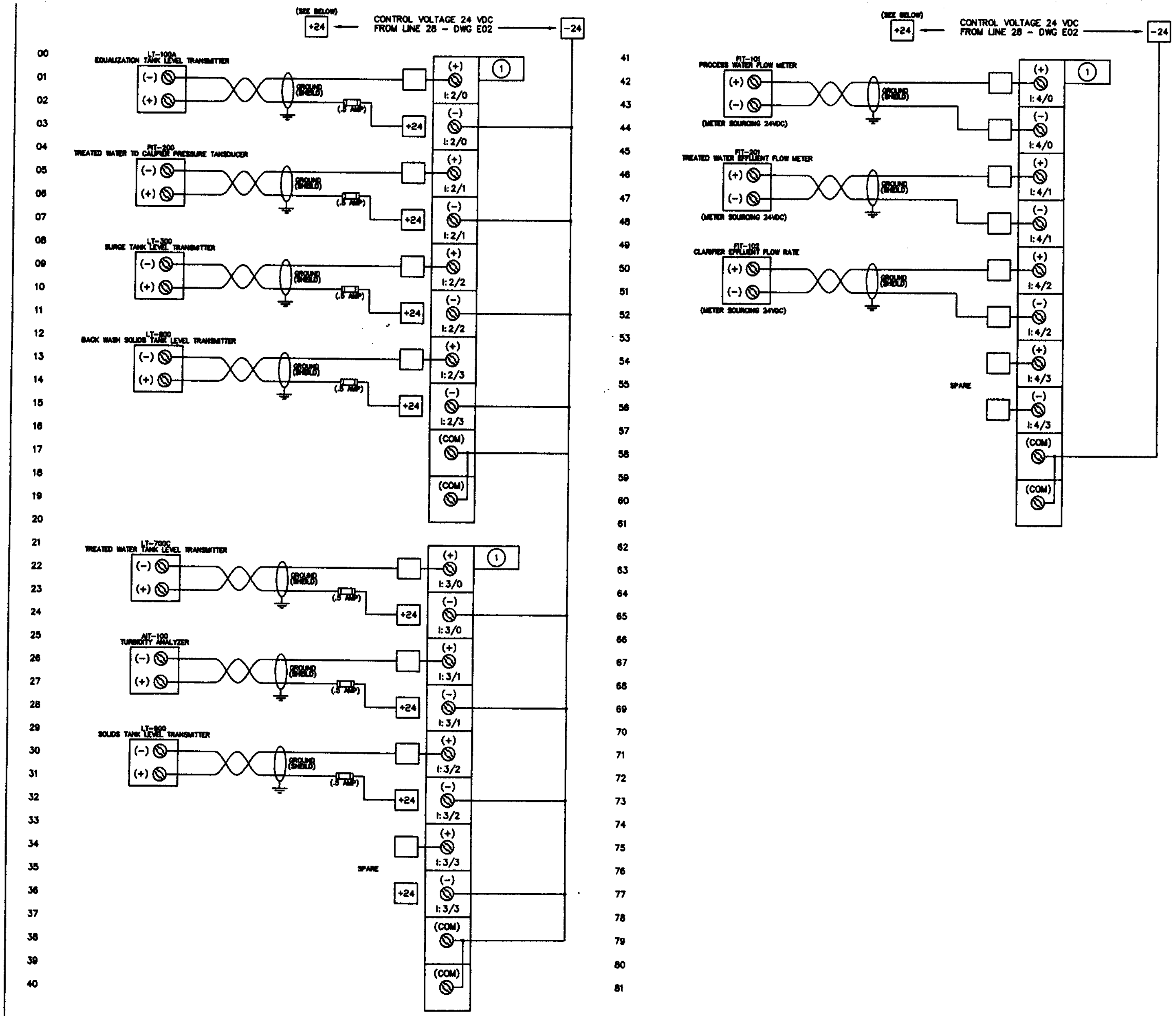
CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# B1680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

AZ
DO NOT SCALE
10-28-11

I/O SCHEMATIC #2

PLC-E04



// REVISIONS //

LTR.	DESCRIPTION	DATE	APVD

① (3) AB 4 POINT ANALOG INPUT CARD
1762-IF4

LEGEND

— SOLID LINES INDICATE WIRING BY RJS

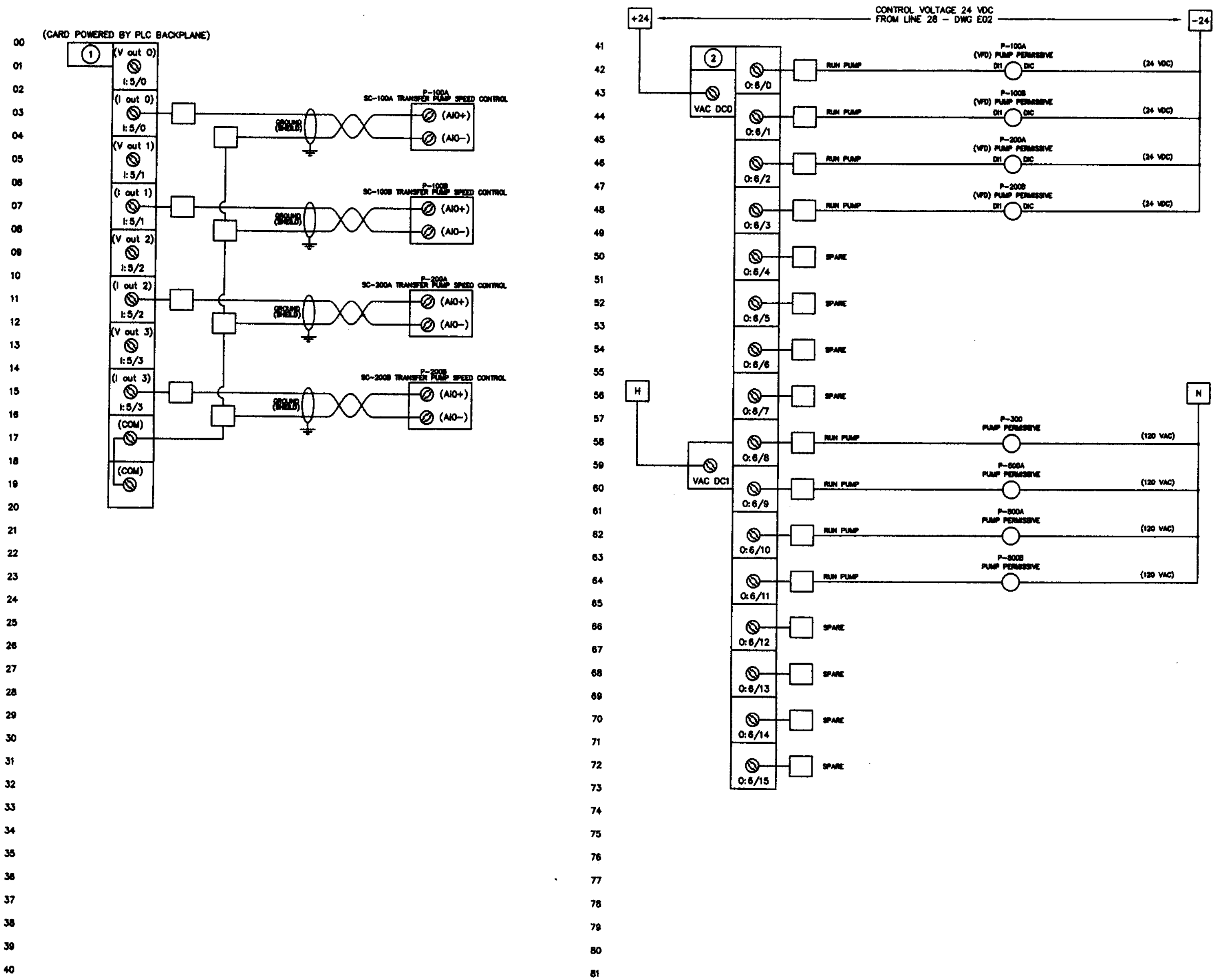
— — BROKEN LINES INDICATE WIRING BY OTHERS

▢ INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# B1680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

	AZ	DO NOT SCALE	
		10-24-11	
I/O SCHEMATIC #3		PLC-E05	



REVISIONS

LTR.	DESCRIPTION	DATE	APVD

① AB 4 POINT ANALOG OUTPUT CARD
1762-OF4

② AB 16 POINT RELAY OUTPUT CARD
1762-OW16

LEGEND

—— SOLID LINES INDICATE WIRING BY RJS

— — BROKEN LINES INDICATE WIRING BY OTHERS

☐ INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

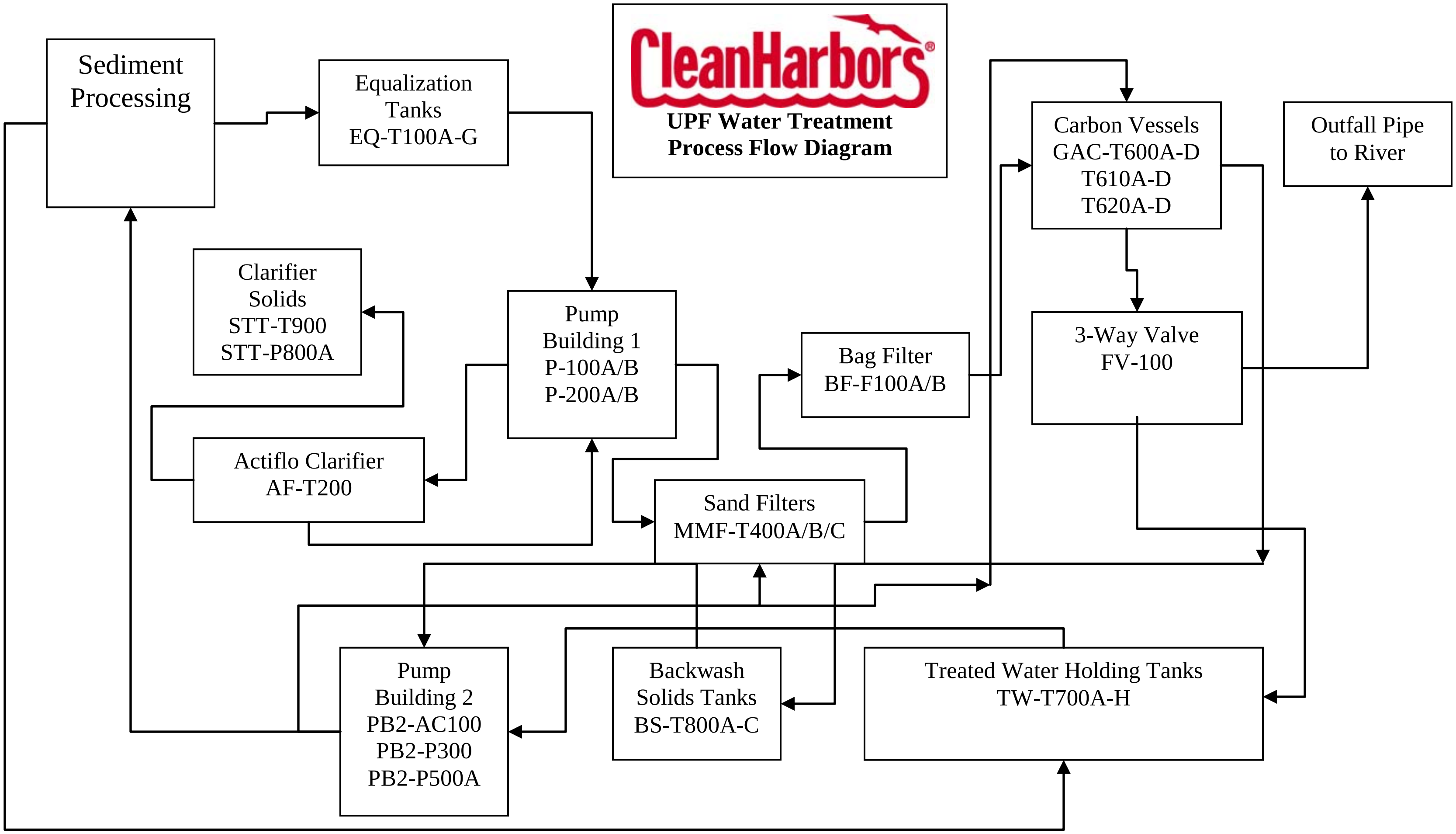
CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# 81680
SITE INFO: LOWER PASSAIC RIVER

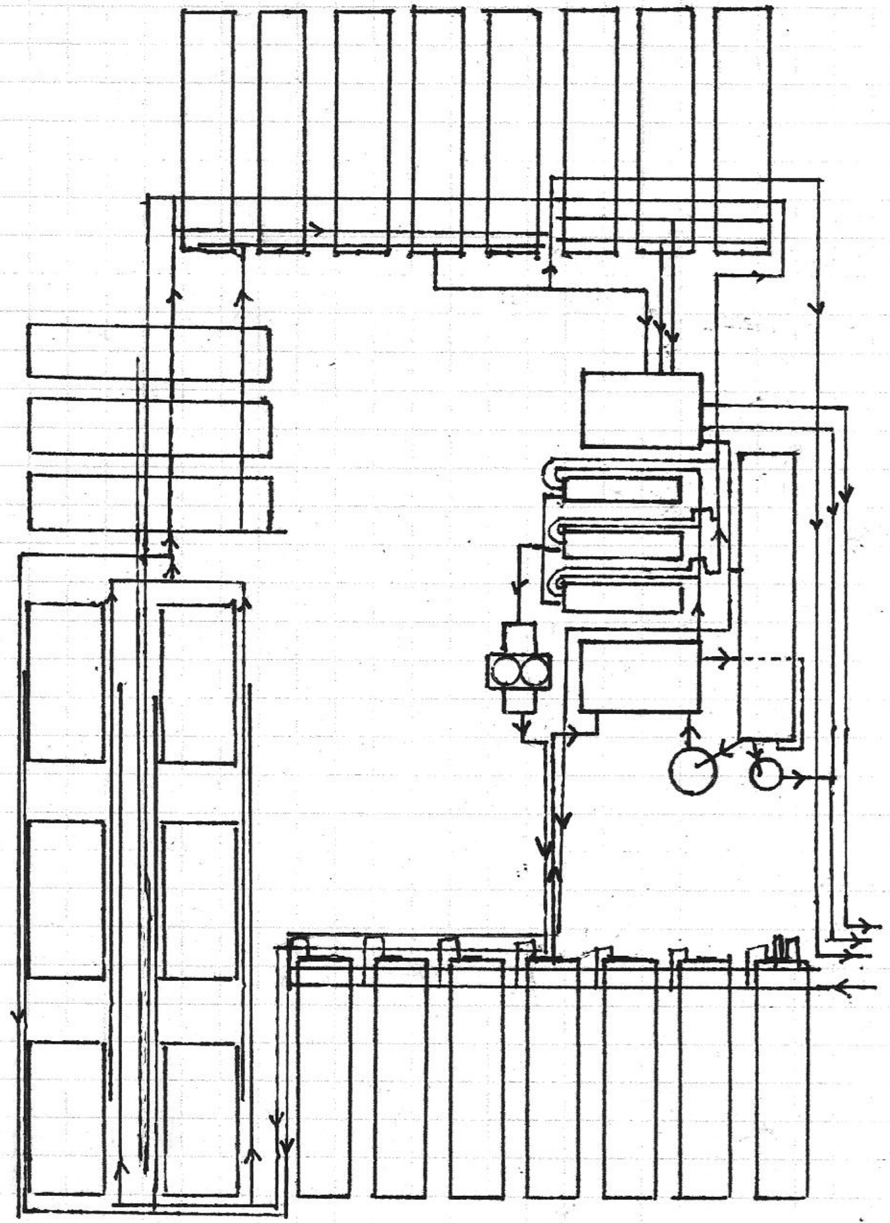
TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

AZ
DO NOT SCALE
10-25-11
I/O SCHEMATIC #4
PLC-E06

Section 5

Treatment System Drawing and Flow Diagram


CleanHarbors
UPF Water Treatment
Process Flow Diagram
Sediment Processing
Equalization Tanks EQ-T100A-G
Clarifier Solids STT-T900 STT-P800A
Pump Building 1 P-100A/B P-200A/B
Actiflo Clarifier AF-T200
Sand Filters MMF-T400A/B/C
Bag Filter BF-F100A/B
Carbon Vessels GAC-T600A-D T610A-D T620A-D
Outfall Pipe to River
3-Way Valve FV-100
Pump Building 2 PB2-AC100 PB2-P300 PB2-P500A
Backwash Solids Tanks BS-T800A-C
Treated Water Holding Tanks TW-T700A-H



Section 6

System Start up Checklist

Clean Harbors
Water Treatment System
Start-up Check List

CHES Operator: ________________________ Date: ___________ Time: ____________
Reason for Previous Shut-Down: ____
Corrective Actions Taken: ____

Step	System ID	Equipment ID	Tasks to Perform	Initial /Notes
01	EQ	EQ-T100A	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Check LE/LT-100A sensor is free of any obstructions.	
02	EQ	EQ- T100B	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
03	EQ	EQ- T100C	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
04	EQ	EQ- T100D	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
05	EQ	EQ- T100E	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
06	EQ	EQ- T100F	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
07	EQ	EQ- T100G	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
08	PB1	PB1	- Ensure inlet and outlet process line valves are open. - Turn on electrical disconnect.	
09	PB1	PB1-P100A	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
10	PB1	PB1-P100B	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
11	AF	AF-T200	- Ensure inlet and outlet pump line valves are open. - Close all sample ports and drains.	

			- Turn on main power. - Set Actiflo PLC to Auto Run. (see Actiflo O&M Manual if applicable) - Check tank levels. - Check Polymer and Coagulant settings.	
12	STT	STT-T900	- Ensure inlet and outlet line valves are open. - Close all sample ports and drains. - Check tank for leaks and punctures. - Check LE/LT-900A sensor is free of any obstructions.	
13	PST	PST-T300	- Ensure inlet and outlet line valves are open. - Close all sample ports and drains. - Check tank for leaks and punctures. - Check LE/LT-300, LS-300B sensors is free of any obstructions.	
14	PB1	PB1-P200A	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto.	
15	PB1	PB1-P200B	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto.	
16	MMF	MMF-T400A	(If skid is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all sand filter tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Set back wash cycle to Auto (see sand filter O&M Manual if applicable)	
17	MMF	MMF-T400B	(If skid is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all sand filter tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Set back wash cycle to Auto (see sand filter O&M Manual if applicable)	
18	MMF	MMF-T400C	(If skid is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all sand filter tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Set back wash cycle to Auto (see sand filter O&M Manual if applicable)	
19	BF	BF-F100A	- Ensure bag filter cover is bolted down and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves.	
20	BF	BF-F100B	- Ensure bag filter cover is bolted down and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves.	
21	GAC	GAC-T600A	(If vessel is on stand-by status, close all influent	

			and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
22	GAC	GAC-T600B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
23	GAC	GAC-T610A	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
24	GAC	GAC-T610B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
25	GAC	GAC-T620A	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
26	GAC	GAC-T620B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
27	GAC	GAC-T600C	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
28	GAC	GAC-T600D	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	

29	GAC	GAC-T610C	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
30	GAC	GAC-T610D	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
31	GAC	GAC-T620A	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
32	GAC	GAC-T620B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
33	FV	FV-100	- Ensure inlet and outlet line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
34	TW	TW-T700A	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
35	TW	TW-T700B	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves - Check LE/LT-700A sensor is free of any obstructions.	
36	TW	TW-T700C	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
37	TW	TW-T700D	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
38	TW	TW-T700E	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains.	

			- Open Inlet and Outlet butterfly valves	
39	TW	TW-T700F	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
40	TW	TW-T700G	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
41	TW	TW-T700H	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
42	BS	BS-T800A	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
43	BS	BS-T800B	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
44	BS	BS-T800C	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Check LE/LT-800 sensor is free of any obstructions.	
45	PB2	PB2	- Ensure inlet and outlet process line valves are open. - Turn on electrical disconnect.	
46	PB2	PB2-AC100	- Turn on main power. - Set Compressor PLC to Auto Run. (see Kaeser O&M Manual if applicable)	
47	PB2	PB2-AR-100	- Ensure inlet and outlet air line valves are open.	
48	PB2	PB2-AD-100	- Ensure inlet and outlet air line valves are open.	
49	PB2	PB2-P300	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
50	PB2	PB2-P500A	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
51	PB2	PB2-P500B	- Ensure manual air supply and inlet and out valves are closed. (Backwash solids transfer conducted by hand when needed.)	

Section 7

Equipment and Material Testing Form

Water Treatment System Equipment/Material Testing Form

Date:	**Test Section:**	**Equipment ID:**

	Test Start Time:
	Pressure/Flow Testing: Fluid or Air
	Max Equipment/Material Operating Pressure/GPM:
	Max Operating Pressure/GPM * 1.33 =______________= Max Testing PSI/GPM
	Notes:

	Equipment/Material Testing	**Circle**
01	**Charge line/equipment up too 50% Operating Pressure/GPM**	**Y/N**
	After 30 Minutes:	
	-Leaks?	**Y/N**
	-Bulges/deformations?	**Y/N**
	-Vibrations?	**Y/N**
02	**Charge line/equipment up too 100% Operating Pressure/GPM**	**Y/N**
	After 30 Minutes:	
	-Leaks?	**Y/N**
	-Bulges/deformations?	**Y/N**
	-Vibrations?	**Y/N**
03	**Charge line/equipment up too 133% Operating Pressure/GPM**	**Y/N**
	After 30 minutes:	
	-Leaks?	**Y/N**
	-Bulges/deformations?	**Y/N**
	-Vibrations?	**Y/N**
04	**Maintain line/equipment at 133% Operating Pressure/GPM**	
	For a maximum of 3 hours	**Y/N**
	-Leaks?	**Y/N**
	-Bulges/deformations?	**Y/N**
	-Vibrations?	**Y/N**
05	**After (up too 3 hours) or by engineer approval depressurize**	
	line/equipment	**Y/N**
	-Leaks?	**Y/N**
	-Bulges/deformations?	**Y/N**
	-Vibrations?	**Y/N**

Test Section: ______________________ Equipment ID:_____________ Pass / Fail

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: __________________Sign: _____________________Date: _________
Arcadis : Print: __________________Sign: _____________________Date: _________

Section 8

Equipment and Material Deficiency Form

Water Treatment System Deficiency Report		
Date:	**Test Number:**	**Equipment ID:**

01	**Equipment Model:**	
02	**Equipment Size:**	
03	**Location of Equipment:**	
04		
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	**Y/N**
07	**Was the equipment/material installed correctly?**	**Y/N**
08	**Was the equipment/material set-up correctly?**	**Y/N**
09	**Was the equipment/material affected by another piece of equipment?**	**Y/N**
10	**Corrective Actions:**	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer’s and contractor’s approval.

Clean Harbors Print: __________________Sign: _____________________Date: ________
Arcadis : Print: __________________Sign: _____________________Date: ________

Section 9

O & M Manuals

Section 10

Equipment and Material Cut Sheets

☒ REVIEWED ☐ REVIEWED & NOTED

REVIEWED SOLELY FOR GENERAL
COMPLIANCE WITH CONTRACT DOCUMENTS
ARCADIS

SIGNATURE

12/13/11 SYR
Date Office Location

☐ RESUBMIT ☐ REJECTED

ARCADIS SUBMITTAL # PC-061-R2

CleanHarbors
ENVIRONMENTAL SERVICES®

42 Longwater Drive, Norwell, MA 02061
(781) 385-9813
Lis.Justin@cleanharbors.com
www.cleanharbors.com

Project Submittal

December, 9th 2011

Project Name: Lower Passaic River Phase I Sediment Removal Action

Engineer: Rob Romagnoli, (QCA) Engineer of Record (ARCADIS)

Address: 6723 Towpath Road, Syracuse, NY 13214

Subcontractor:

Address:

Manufacturer:

Address:

Supplier:

Address:

Submittal: ML-021-R2

Specification/Drawing Reference: Specs 01 75 00, 40 90 01, 44 42 00

Transmittal Record	Attention	Sent	Received	Due	Quantity	Received
Contractor to Engineer	Rob Romagnoli (QCA) Scott Murphy (TM)	12/9/2011		12/15/11	1	
Engineer to Contractor	Justin Lis					

Review Action Code:
1. Reviewed/No exception taken
2. Make corrections noted
3. Revise as noted and resubmit
4. Incomplete submittal, resubmit
5. Rejected. Resubmit as specified

1	2	3	4	5	Drawing/Item	Dated	Description
					1	12/9/11	Clean Harbors' Responses and Clarifications to Arcadis' Questions for Submittal ML-021-R1
					2	12/9/11	Clean Harbors' Water Treatment System Start-up and Testing Plan for water treatment
					-	-	system to be installed at the UPF water treatment site.

COMMENTS:

Clean Harbors requests approval of the attached Water Treatment System Start-up and Testing Plan. Clean Harbors will utilize the Water Treatment System Start-up and Testing Plan to successfully start, test and confirm functionality of the water treatment system to be installed at the UPF water treatment site.

Note: Section 9, O & M Manuals and section 10, Equipment/Material Cut Sheets were omitted to limit the size of this document. The hard copy document, which will be on file and used at the site will have all treatment system manuals and cut sheets included. Please feel free to request these if needed.

Authorized Reviewer: ______________ Date: 12/9/11

Notations do not authorize changes to contract sum or time. If you are authorized to proceed with the work identified in this submittal, it is assumed that no change in the contract amount or completion date is required. If a change in the work affecting your contract amount or completion is involved, notify the CM immediately.

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General Comments

- The PLC Schematics provided are difficult to read.
  *CHES will provide appropriate sized PLC Schematics with the as built submittal.
- Tanks T-100 and T-300 are provided with level switches as well as pressure transducers. The level switches are intended to provide redundant high level sensing.
  *Yes, understood.
- The EQ tanks (T100A-G) are intended to provide a minimum of 80,000 gallons of storm water storage capacity at all times.
  *Yes, understood.
- Pumps P-100 and P-200 are equipped with Variable Frequency Drives (VFDs).
  *Yes.
- The Actiflo clarifier should not be allowed to empty during normal daily operation. If flow is stopped, it can take up to one hour to re-start the clarifier. The clarifier should only need to be placed into startup one time per week, after shutdown on the weekend.
  *Yes, understood.
- The pump discharge pressure for each pump should be verified on the pressure gauge and noted.
  *Yes. The pump pressures will be noted on the electrical testing from.
- Proofing system components appears to occur with the pumps in Hand, by testing the system in Hand, rather than Auto certain system features can't be tested.
  *The pumps will be proofed in hand to ensure correct rotation, speed etc and then turned back to auto during the system testing.
- Where redundant pumps are provided, ensure both pumps are tested individually during startup.
  *Yes, understood.
- What does the manufacturer recommend in terms of calibrating and testing the turbidity meter?
  *The Hach calibration instructions are located in the O & M manual and will be incorporated into the CHES Passaic River Water Treatment System Operation and Maintenance Manual . The use of Hach 800 NTU Turbidity Solution and Zero Point deionized water is recommended for accurate calibration. The Turbidimeter will not be calibrated till spring.
- When is the audible alarm tested in relation to high level alarms?
  *Every time.
- On the control panel drawings there is not a HOA switch for the Effluent Valve (FV-100), is manual operation of the valve possible?
  *Yes.
- ARCADIS recommends that instead of using two outputs to open and close a valve, change the output to energize a relay which will open and close the valve. This way only the relay burns out and requires replacement and no wiring changes or changes the PLC code are required.
  *Ok. CHES will make this wiring change.
- On the control panel drawings there is not a HOA switch or output for P-500A. Possibly mislabeled as P-800A.
  *The HOA for P-500A is on the control panel drawings.
- On the control panel drawings there is a pressure transmitter (PIT-200) called out this was removed on the final drawings.
  *The PIT -200 will not be installed.
- There is no provision for a VFD feedback signal from the VFD to the PLC, so that the PLC knows what the VFD is running at.
  *The panel view shows what the output is that the PLC is telling the VFD's to operate at. The HIM modules, for the VFD's, are mounted 5 feet away so the operator can verify the hertz that the drives are running at.

- This MicroLogix PLC I/O is almost at the maximum. ARCADIS generally does not maximize the I/O on a PLC for a variety of reasons. ARCADIS recommends using the next PLC up from this one which would be either Compactlogix or SLC 5/05.

  *The PLC specified was used and is capable of running at its current load. There is still space for an analog and a few discrete left.
- On I/O Schematic #1, what valve is reference by “Incoming Valve”?

  *During the planning stages of the E-Stop a pneumatic valve was to be placed to shut off influent water from sediment processing in case an emergency arose where the influent water needed to be shut off. After discussions with SECI, the preferred method, to stop incoming water in the case of an emergency, will be to supply them with an IO signal to notify them to shut down flow. This was accomplished by providing SECI with two series wires connected to our 4 E-Stops.

Startup Forms

ARCADIS recommends adding the following forms to the Start-up Submittal

1. Provide Electrical Testing Form for All Motors (Pumps and Compressor)
    a. Confirm that Pump has been wired correctly – (Example: 230VAC three phase or 480vac three phase)
    b. Include Megaohms of Power Cable from MCE or MCC to the Pump – Certify that the reading is to ARCADIS Specifications
    c. Include Pre-Start-up Electrical Power Reading – Check Against Required Power
    d. Include Pre-Start-Up Motor Megaohm Readings – Check Against Manufacturer Required Readings
    e. Include engineering approval prior to start-up.
    f. Include Motor Rotation Check
    g. Include VFD Programming Check (If VFD is controlling Motor)
    h. Include VFD Operation in “Hand” Check (If VFD is controlling Motor)
    i. Include VFD Operation in “Auto” Check (If VFD is controlling Motor)
    j. Confirm “Remote Run Switch” is working correct
    k. Confirm HOA is working correctly

    *This all will be included in the electrical checklist form.

2. Provide Electrical Testing Form for Motor Start Enclosure (MCE) or Motor Control Center (MCC)
    a. Confirm Motor Starter is connected to the correct Motor.
    b. Confirm Motor Starter trip setting are set correct for the motor that it is connected to.
    c. Confirm Power Reading is correct coming into the panel and going to each motor starter.

    *This will all be included in the electrical checklist form.

3. Provide Electrical Testing Form for the Control Panel
    a. Confirm Power Coming into the panel.
    b. Include engineering approval prior to powering on panel.
    c. Confirm power supplies are working correctly.
    d. Confirm Instrumentation is connected to the correct location in the control panel

    *This will all be included in the electrical checklist form.

4. Provide Electrical Instrumentation and Switch Testing Form

a. Confirm wires coming from the control panel are going to the correct instrument or switch.
b. Confirm correct power is being supplied to the instrument or switch.
c. Confirm that the instrument or switch is wired correctly.
d. Include engineering approval prior to powering on instrument.
e. For switches, confirm that PLC is see switch being activated.
f. For switches, during test operations confirm that the switch causes the correct reaction with-in the system.
g. For instrumentation, simulate a 4-20 ma signal back to the PLC to confirm that the PLC is seeing the signal correctly.
h. For instrumentation, during testing operations confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system.
i. For instrumentation, provide all calibration certifications from manufacturer.

*This will all be included in the electrical checklist form.

Testing Procedures Comments

Interlock Proofing (LS100A, LT100A, LT700B)

Specific to Tank T-100, these specific tests are not described

- LS100A is for redundant high level sensing only (LAHH). It should not be tested in Steps 5, 6, and 7 as indicated.

  *Understood.
- In Step 4 the High High interlock (LAHH) should disable the storm water pumping station, this should be verified during testing.

  *Understood.
- In Step 5 the High interlock (LAH) should set the VFD (on Pumps P-100A or B) to produce a flow rate of 830 gallons per minute.

  *With the new pump control set-up the pumps will maintain a set point level in the EQ tanks. At the point that the LAH is hit the P-100 pumps will be at full flow capacity.
- In Step 6 the Low interlock (LAL) should enable pump P-100 A or B, and the VFD should be set to a flow rate equal to the flow rate registered at FE-101, the influent flow meter from sediment processing

  *With the new pump control set-up the pumps will maintain a set point level in the EQ tanks. At the point that the LAL is hit the P-100 pumps will be at lowest flow capacity.

Specific to Tank T-700, these specific tests are not described

- In Step 4 the High – High level interlock should enable FV-100 to divert water to the river outfall.

  *Understood. This will be checked on the mechanical testing form.
- In Step 6 the Low level interlock should enable FV-100 to divert water the treated water holding tanks

  *Understood. This will be checked on the mechanical testing form.

Proof Solids and Surge Tank pumps and transmitters

Specific to Tank T300, these specific tests are not described

- LS 300 is for redundant high level sensing only (LAHH). It should not be tested in Steps 4, 5 and 6.

  *Understood.
- Step 4 the Low-Low interlock (LALL) should disable pumps P-200A or B

  *Understood. This will be checked on the mechanical testing form.
- Step 5 the Low interlock (LAL) should enable pump P-200 A or B

*Understood. This will be checked on the mechanical testing form.

- Step 6 the High interlock (LAH) should disable P-100 A/B

*Understood. This will be checked on the mechanical testing form.

Specific to Tank T900, this specific test is not described

- In Step 7 the High-High interlock (LAHH) should disable P-100A/B

*Understood. This will be checked on the mechanical testing form.

Backwash solids tank pump and transmitter proofing

Specific to Tank 800 Backwash Solids Tank

- In step 4 the High-High interlock (LAHH) should disable the backwash pump

*Understood. This will be checked on the mechanical testing form.

200,000 gallon full scale system test and discharge

Step 9 indicates the operator will start at the end of the system and isolate every tank, vessel and process line to perform pressure test. Is that test being conducted with the system pumps? If so, does that mean those pumps will be "dead headed"? Also, what equipment will be isolated during the pressure test to prevent potential damage as described in Section 44 42 00?

*The operator will start from the back of the system and test every valve, pipe, hose and tank by diverting flow incrementally so that every piece of the system has pressured water pass through or into it simulating the full run process. Pumps will not be deadheaded.

Clean Harbors Environmental Services

GX3741007	WTS Start Up and Testing Plan	B0009964.0001

Water Treatment System
Start Up and Testing Plan

Upland Processing Facility
Water Treatment System Construction
2011-2012

Client………………. Arcadis-US
Location……………. 117 Blanchard St. Newark, New Jersey
Project Number…….. GX3741007
Project Manager……. Justin Lis

Start Up and Testing Plan - Communication List			
No.	Company	Project Function/Title	Name
01	ARCADIS	Client's Authorized Representative	Matthew Bowman
02	ARCADIS	Client's Construction Manager	Coleman King
03	CHES	Project Manager	Justin Lis
04	CHES	Construction Supervisor	Josh Stringer
05	CHES	Electrician and PLC Programmer	Bob Shoprey
Notes:			

Start Up and Testing Plan - Revision Tracking				
Revision	Reason and Section Revised	Prepared	Checked	Approved
0.0	Arcadis Re-submittal secs 6,7,8	JL	JL	
1.0				
2.0				

Start Up and Testing Plan Sections

Section 1 - Water Treatment System Construction Overview
Section 2 - December 2011 Start Up and Testing Schedule
Section 3 - Equipment and Material ID Sheets
Section 4 - Electrical Drawings and Instrument Matrix
Section 5 - Treatment System Drawing and Flow Diagram
Section 6 - System Start up Checklist
Section 7 - Equipment, Material and Electrical Testing Forms
Section 8 - Equipment, Material and Electrical Deficiency Form
Section 9 - O & M Manuals
Section 10- Equipment and Material Cut Sheets

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Section 1

Water Treatment System Construction Overview

Water Treatment System Start Up and Testing Plan Overview

Clean Harbors Environmental Services (Clean Harbors) has prepared this Water Treatment System Start Up and Testing Plan for ARCADIS-US to detail the means and methodology to be employed to confirm the construction and functionality of the temporary water treatment facility at the upland processing facility for the Lower Passaic River Phase I Removal Project.

General Requirements - Introduction

In general, the System Start Up and Testing will include, but not limited to, the following:

- Post Construction Start Up and Testing 2011 Schedule
- Full System Start Up and Testing 2012 Schedule
- Equipment and Material ID Sheets
- Electrical Drawings and Instrument Matrix
- Treatment System Drawing and Flow Diagram
- System Start up Checklist
- Equipment and Material Testing Form
- Equipment and Material Deficiency Form
- O & M Manuals
- Equipment and Material Cut Sheets

Project Management and QA/QC Staffing Plan

This section presents Clean Harbors' approach to the integration of all testing activities in order to insure a safe, timely and satisfactory completion of the start up and testing work specified for this project. Clean Harbors has developed a system for project/site QA/QC management based upon successful completion of numerous environmental construction projects of similar nature and complexity. Coordination of the total work effort is effected through a management approach characterized as follows:

- Defining, monitoring and control of equipment specifications, procurement, construction, integration and successful implementation.
- Quality control through a firm understanding of project specifications and documentation.

Project Manager/QA/QC Manager

Justin Lis

(Phone)	(781)-385-9813

Project Supervisor/System Operator/QA/QC Supervisor

Josh Stringer

(Phone)	(231)-384-3134

Electrical and PLC Integration QA/QC Supervisor

Bob Shoprey
(Phone)

Material and Equipment Delivery, Storage and Handling

Clean Harbors has procured, delivered, installed and handled all equipment needed for the project in accordance with the contract documents. Clean Harbors' has performed this work by following these guidelines:

- Clean Harbors has used all means necessary and reasonably possible to protect all the project materials before, during and after installation and work in a manor to protect the installed work and materials of other contractors.
- In the event of any damage caused by the failure of materials or equipment, by Clean Harbors or its subcontractors, Clean Harbors will immediately make all repairs and replacements necessary to the approval of the engineer and at no cost to customer.
- Clean Harbors has delivered all applicable pieces of equipment and material to the site in their original containers with labels intact and legible at time of use. These documents have been documented and provided to the customer.
- Clean Harbors has stored all applicable materials and equipment in accordance of the manufacturers recommendations and as approved by engineer.
- Clean Harbors has inspected all materials delivered to the site to ensure they comply with the requirements in the contract documentation.
- Clean Harbors has and will be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-startup during the warranty period.

Material and Equipment Quality Assurance and Warranty

In an effort to ensure quality materials and equipment have been procured and installed correctly in the temporary water treatment system, Clean Harbors has followed these quality assurance, acceptance and warranty procedures:

- To ensure that quality materials, equipment and services were used, Clean Harbors has procured the approved items and services from qualified manufacturers that have a successful history of producing and executing these items in the past.
- Clean Harbors has provided adequate personnel, including but not limited to the Project Manager and Project Supervisor, who have been present at all times during the execution of the work and who are thoroughly familiar with the specified requirements of the materials and methods needed for their execution, and have directed all work performed.
- Clean Harbors has provided an adequate number of qualified workers who are skilled in the necessary crafts and are properly informed of the methods, services, equipment and materials used.
- Clean Harbors has followed the equipment and material manufacturer's installation instructions, as approved by the engineer. These have served as a basis for acceptance or rejection of the work performed.

- Clean Harbors has submitted, to the engineer for approval, all specifications and product data for all equipment and materials installed in the water treatment system.
- Clean Harbors will include manufacturers warranty for any purchased materials with the shop drawing submittals.

Section 2

December 2011 Start Up and Testing Schedule

Water Treatment System

Start Up and Testing Plan Schedule
December 2011

December 2011	
12/12/11 Monday	- Receive 100,000 gallons from Seci. - Flow meter proofing (FIT101, 201) Pump control proofing (P100A/B P200A/B). - Actiflo primary clarifier proofing. - System run and pressure testing with 100,000 gallons.
12/13/11 Tuesday	- System run and pressure testing with 100,000 gallons. - CHES/Seci Interlock proofing (LS100A, LT100A, LT700B) - Proof Solids and Surge Tank pumps and transmitters (LS300, LT300, LT900, P800A, P800B).
12/14/11 Wednesday	- System run and pressure testing with 100,000 gallons. - Backwash solids tank pump and transmitter proofing (LT800, P500A, P300). - Pressure transmitter, turbidimeter, audible alarms and 3 way valve proofing (PIT200, AIT100, FV100).
12/15/11 Thursday	- System run and pressure testing with 100,000 gallons and discharge per Arcadis direction. - Storm water testing and proofing. - Conduct 200,000 gallon full scale system test and discharge per Arcadis direction.
12/16/11 Friday	- Contingency test day.
12/17/11 Saturday	- Contingency test day.
12/18/11 Sunday	- No work planned.
12/19/11 Monday	- Start system shut-down and winterization.

December 12, 2011

100,000 Gallon Transfer from Sediment Processing -

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 - System operator shall open inlet valves to all EQ tanks (T100A-G).

Step 4 - System operator shall close outlet valves to all EQ tanks (T100A-G).

Step 5 - System operator shall start 100,000 gallon transfer from sediment processing.

Step 6 - System operator shall observe and balance flow evenly into all EQ tanks (T100A-G).

Step 7 - When 100,000 gallons has been transferred, the system operator shall stop water flow to EQ tanks (T100A-G).

Step 8 - System operator shall complete all testing reports.

Flow Meter Proofing (FIT101, 201) Pump Control Proofing (P100A/B P200A/B) –

Note: The testing of flow meter (FIT101) will be performed in conjunction with the 100,000 Gallon Transfer from Sediment Processing.

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 - System operator shall open inlet valves to all EQ tanks (T100A-G).

Step 4 - System operator shall close outlet valves to all EQ tanks (T100A-G).

Step 5 - System operator shall start 100,000 gallon transfer from sediment processing.

Step 6 - System operator shall start proofing of (FIT101). The system operator will confirm flow rates from sediment processing to check calibration of flow meter.

Step 7 - When 100,000 gallons has been transferred, system operator shall stop water flow to EQ tanks (T100A-G).

Step 8 - System operator shall open outlet valves to all EQ tanks (T100A-G).

Step 9 - System operator shall open all inlet and outlet valves to actiflo primary clarifier.

Step 10 - System operator shall open all inlet and outlet valves to sand filters.

Step 11 - System operator shall open all inlet and outlet valves to bag filters.

Step 12 - System operator shall open all inlet and outlet valves to carbon vessels.

Step 13 - System operator shall close FV100 valve outfall line and open FV100 valve treated water line.

Step 14 - System operator shall close all inlet and outlet valves to temporary treated water holding tanks (T700D-H).

Step 15 - System operator shall open all inlet valves to treated water holding tanks (T700A/B/C).

Step 16 - System operator shall close all outlet valves to treated water holding tanks (T700A/B/C).

Step 17 - System operator shall open valves to (P100A/B) and turn pump switches to hand. The system operator shall begin filling the actiflo primary clarifier and surge tank.

Step 18 - When the surge tank is ¾ full the system operator shall open valves to (P200A/B) and turn pump switches to hand. The system operator shall run both (P100A/B and P200A/B pumps simultaneously and test.

Step 19 - System operator shall start proofing of (P100A/B and P200A/B pumps and FIT201).

Step 20 - The system operator will perform pipe pressure and vessel inspections and functionality tests of the sand filters, bag filters, carbon vessels and all interconnecting piping, during the transfer of 80,000 gallons of water from the EQ tanks to the treated water holding tanks.

Step 21 - When 80,000 gallons has been transferred, the system operator shall stop water flow from EQ tanks (T100B-G). Operator will ensure T100A is left filled with 20,000 gallons of water and T700B is filled with 20,000 gallons of water for the interlock proofing of (LS100A, LT100A, LT700B).

Step 22 - System operator shall complete all testing reports.

December 13, 2011

CHES/Seci Interlock proofing (LS100A, LT100A, LT700B) -

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 - System operator will hook-up (2) 4” trash pumps to the outlet lines of (T100A and T700B) and set-up discharge to (T100B and T800B)

Step 4 - System operator will draw both (T100A and T700B) tanks down to 90% capacity and CHES and SECI will set (LS100A, LT100A, LT700B) to High High interlock. LAHH will disable storm water pumping station.

Step 5 - System operator will draw both (T100A and T700B) tanks down to 60% capacity and CHES and SECI will set (LT100A, LT700B) to High interlock.

Step 6 - System operator will draw both (T100A and T700B) tanks down to 40% capacity and CHES and SECI will set (LT100A, LT700B) to Low interlock.

Step 7 - System operator will draw both (T100A and T700B) tanks down to 20% capacity and CHES and SECI will set (LT100A, LT700B) to Low Low interlock.

Step 8 - System operator shall complete all testing reports. System operator shall confirm all Material Testing Forms are complete and no deficiencies are present. If deficiencies are observed, the system operator shall complete deficiency report and repair or replace part/equipment and repeat test.

Proof Solids and Surge Tank pumps and transmitters (LS300, LT300, LT900, P800A, P800B) -

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 - System operator will hook-up (1) 4” trash pump to the outlet line of (T100B) and set-up discharge to (T300 and T900) tanks.

Step 4 - System operator will fill both (T300 and T900) tanks to 10% capacity and the system operator will set (LT300, LT900) to Low Low interlock.

Step 5 - System operator will fill (T300 and T900) tanks to 50% and 20% capacity (respectively) and the system operator will set (LT300, LT900) to Low interlock.

Step 6 - System operator will fill (T300 and T900) tanks to 70% and 50% capacity (respectively) and the system operator will set (LT300, LT900) to High interlock.

Step 7 - System operator will fill (T300 and T900) tanks to 90% and 70% capacity (respectively) and the system operator will set (LS300, LT300, LT900) to High High interlock.

Step 8 - System operator shall complete all testing reports. System operator shall confirm all Material Testing Forms are complete and no deficiencies are present. If deficiencies are observed, the system operator shall complete deficiency report and repair or replace part/equipment and repeat test.

December 14, 2011

Backwash solids tank pump and transmitter proofing (LT800, P500, P300) -

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 - System operator will open all discharge valves for (T800B) and turn (P500A) pump on hand.

Step 4 - System operator will draw (T800B) tank down to 90% capacity and system operator will set (LT800) to High High interlock.

Step 5 - System operator will draw (T800B) tank down to 70% capacity and system operator will set (LT800) to High interlock.

Step 6 - System operator will draw (T800B) tank down to 40% capacity and system operator will set (LT800) to Low interlock.

Step 7 – System operator will turn (P500A) to off position. System operator will utilize (P500B) pump to empty tank further.

Step 8 - System operator will draw (T800B) tank down to 10% capacity and system operator will set (LT800) to Low Low interlock.

Step 9 - System operator shall complete all testing reports. System operator shall confirm all Material Testing Forms are complete and no deficiencies are present. If deficiencies are observed, the system operator shall complete deficiency report and repair or replace part/equipment and repeat test.

Pressure transmitter, turbidimeter, audible alarms and 3 way valve proofing (PIT200, AIT100, FV100) -

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 – System operator shall open EQ tank (T100A) outlet, (P100A/B and P200A/B) inlets and outlets and Actiflo, sand filter, bag house and carbon vessel inlets and outlets.
Step 4 - System operator shall switch (P100A/B and P200A/B) pumps to hand and run water through system.

Step 5 - System operator shall proof pressure transmitter (PIT 200) by slowly closing down stream valve, incrementally, to set pressure interlocks.

Step 6 - System operator shall proof (FV-100) valve by lowering clarified holding tank (T700B) to set interlocks.

Step 7 - System operator shall proof turbidimeter after (FV-100) valve is working properly and send water to the outfall pipe.

Step 8 - System operator shall complete all testing reports. System operator shall confirm all Material Testing Forms are complete and no deficiencies are present. If deficiencies are observed, the system operator shall complete deficiency report and repair or replace part/equipment and repeat test.

December 15, 2011

Conduct 200,000 gallon full scale system test and discharge -

Step 1 - System operator shall confirm the Mechanical Equipment Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 1.

Step 2 - System operator shall confirm Start-up Check List is complete and no deficiencies are present. If deficiencies are observed, operator shall complete deficiency report and repair or replace part/equipment and repeat step 2.

Step 3 - System operator shall open inlet valves to all EQ tanks (T100A-G).

Step 4 - System operator shall open outlet valves to all EQ tanks (T100A-G).

Step 5 - System operator shall open all inlet and outlet valves to actiflo, sand filters, bag filters, carbon vessels and treated water holding tanks.

Step 6 - System operator shall open all pump inlets and outlets and set pumps to auto.

Step 7 - System operator shall start 200,000 gallon transfer from sediment processing.

Step 8 - System operator shall observe and balance flow evenly into all EQ tanks (T100A-G).

Step 9 - System operator will start at the end of the system and isolate every tank, vessel and process line to perform pressure tests. The system operator will utilize the pressure indicators throughout the system to satisfy the pressure testing requirements.

Step 10 - When 200,000 gallons has been transferred, the system operator shall run water flow from EQ tanks (T100A-G) till the Low Low alarm is tripped.

Step 11 - System shall shut down system.

Step 12 - System operator shall complete all testing reports. System operator shall confirm all Material Testing Forms and complete and no deficiencies are present. If deficiencies are observed, the system operator shall complete deficiency report and repair or replace part/equipment and repeat test.

Section 3

Equipment and Material ID Sheets

Clean Harbors Water Treatment System
Mechanical Equipment Check List

Clean Harbors’ Inspection Conducted By: ________________________Date: ____________
Arcadis Inspection Conducted By: _______________________________Date: ____________
Weather: ____
Notes:
____
____
____

Equipment ID		Equipment Installed	Y/N	Equipment Inlet Process Connection	Y/N	Equipment Outlet Process Connection	Y/N
EQ	EQ-T100A	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
EQ	EQ-T100B	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
EQ	EQ-T100C	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
EQ	EQ-T100D	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
EQ	EQ-T100E	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
EQ	EQ-T100F	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
EQ	EQ-T100G	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
PB1	PB1	18’ x 8’ x 7.5’ Building	Y/N	(2) 8” Process Lines	Y/N	(2) 8” Process Lines	Y/N
PB1	PB1-P100A	20 HP Pump EQ Transfer Pump	Y/N	(1) 8” Process Line x 6” Inlet	Y/N	(1) 4” Outlet x 8” Process Line	Y/N
PB1	PB1-P100B	20 HP Pump EQ Transfer Pump	Y/N	(1) 8” Process Line x 6” Inlet	Y/N	(1) 4” Outlet x 8” Process Line	Y/N
AF	AF-T200	ActiFlo Primary Clarifier	Y/N	(1) 8” Process Line x 10” Inlet	Y/N	(1) 12” Flange x 10” Process Line (1) 2” Flange x 2” Gravity Line	Y/N
STT	STT-T900	Solids Transfer Tank 1000 Gallon Poly Tank	Y/N	(1) 2” Gravity Line Inlet	Y/N	(1) 2” Outlet Solids Line	Y/N
PST	PST-T300	Process Surge Tank 2500 Gallon Poly Tank	Y/N	(1) 8” Inlet x 10” Gravity Process Line	Y/N	(1) 6” Outlet x 8” Process Line	Y/N
PB1	PB1-P200A	40 HP Pump PST-T300 Transfer Pump	Y/N	(1) 8” Process Line x 6” Inlet	Y/N	(1) 4” Outlet x 8” Process Line	Y/N
PB1	PB1-P200B	40 HP Pump PST-T300 Transfer Pump	Y/N	(1) 8” Process Line x 6” Inlet	Y/N	(1) 4” Outlet x 8” Process Line	Y/N
MMF	MMF-T400A	1000 GPM Sand Filter Skid	Y/N	(1) 6” Flange x 8” Process Header (1) 6” Inlet x 8” Clarified Backwash Line	Y/N	(1) 6” Outlet x 8” Process Header (1) 4” Flange x 4” Backwash Line	Y/N
MMF	MMF-T400B	1000 GPM Sand Filter Skid	Y/N	(1) 6” Flange x 8” Process Header (1) 6” Inlet x 8” Clarified Backwash Line	Y/N	(1) 6” Outlet x 8” Process Header (1) 4” Outlet x 4” Backwash Line	Y/N
MMF	MMF-T400C	1000 GPM Sand Filter Skid	Y/N	(1) 6” Flange x 8” Process Header (1) 6” Inlet x 8” Clarified Backwash Line	Y/N	(1) 6” Outlet x 8” Process Header (1) 4” Outlet x 4” Backwash Line	Y/N
BF	BF-F100A	1600 GPM 8 Bag Filter	Y/N	(1) 6” Inlet x 8” Process Header	Y/N	(1) 6” Outlet x 8” Process Header	Y/N

BF	BF-F100B	1600 GPM 8 Bag Filter	Y/N	(1) 6” Inlet x 8” Process Header	Y/N	(1) 6” Outlet x 8” Process Header	Y/N
GAC	GAC-T600A	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T600B	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T610A	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T610B	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T620A	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T620B	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T600C	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T600D	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T610C	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T610D	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T620A	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T620B	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
FV	FV-100	3-Way Flow Valve and Actuator	Y/N	(1) 8” Process Line	Y/N	(2) 8” Outlet Process Lines	Y/N
TW	TW-T700A	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700B	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700C	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700D	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700E	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700F	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700G	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700H	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N

BS	BS-T800A	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
BS	BS-T800B	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
BS	BS-T800C	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
PB2	PB2	18’ x 8’ x 7.5’ Building	Y/N	(3) Process Lines (8”,4” & 3”)	Y/N	(4) Process Lines (8”, 3”, 3” & ¾”)	Y/N
PB2	PB2-AC100	25 HP Air Compressor	Y/N	NA	Y/N	(1) ¾” Air Line	Y/N
PB2	PB2-AR-100	Air Receiver Tank	Y/N	(1) ¾” Air Line	Y/N	(1) ¾” Air Line (1) ½” Drain	Y/N
PB2	PB2-AD-100	Desiccant Air Dryer	Y/N	(1) ¾” Air Line	Y/N	(1) ¾” Air Line (1) ½” Drain	Y/N
PB2	PB2-P300	15 HP SF & GAC Clarified Backwash Pump	Y/N	(1) 8” Transfer Line x 4” Inlet	Y/N	(1) 3” Outlet x 8” Transfer Line	Y/N
PB2	PB2-P500A	2.25 HP Backwash Supernatant Transfer Pump	Y/N	(1) 8” Transfer Line x 4” Inlet	Y/N	(1) 3” Outlet x 4” Transfer Line	Y/N
PB2	PB2-P500B	100 scfm Backwash SolidsTransfer Pump	Y/N	(1) 3” Transfer Line x 3” Inlet	Y/N	(1) 3” Outlet x 3” Transfer Line	Y/N

Deficiency:	Corrective Actions:
1.________________________________	1.________________________________
2.________________________________	2.________________________________
3.________________________________	3.________________________________
4.________________________________	4.________________________________
5.________________________________	5.________________________________
6.________________________________	6.________________________________
7.________________________________	7.________________________________
8.________________________________	8.________________________________
9.________________________________	9.________________________________

Notes:
____
____
____

I certify that all mechanical equipment included on this checklist has been supplied and installed per contract specifications and by acceptance of the Engineer (Arcadis).

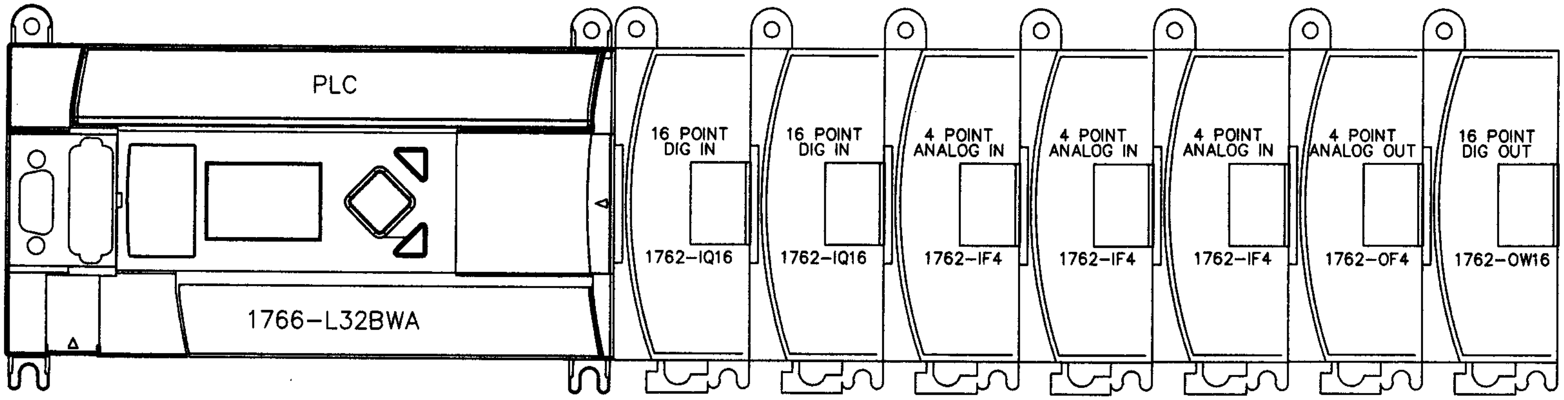
Clean Harbors Print: __________________Sign: ______________________Date: _________
Arcadis : Print: __________________Sign: ______________________Date: _________

Section 4

Electrical Drawings and Instrument Matrix

/// REVISIONS ///

LTR.	DESCRIPTION	DATE	APVD



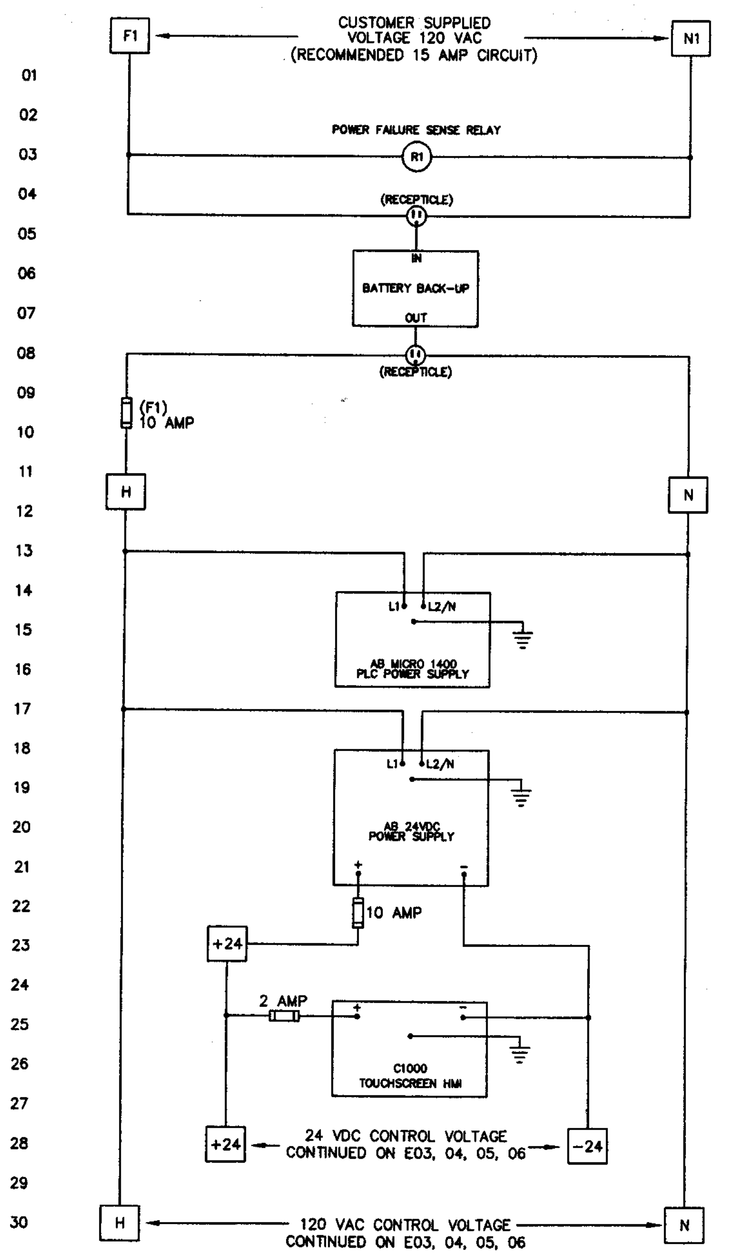
RJS ELECTRIC
WATER TREATMENT SKID

DWG #	DESCRIPTION	PANEL
PLC–E01	DWG LIST	
PLC–E02	CONTROL POWER SCHEMATIC	PLC PANEL
PLC–E03	I/O SCHEMATIC #1	PLC PANEL
PLC–E04	I/O SCHEMATIC #2	PLC PANEL
PLC–E05	I/O SCHEMATIC #3	PLC PANEL
PLC–E06	I/O SCHEMATIC #4	PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# B1680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390–5008 & (989) 370–3351

DRAWN BY: AZ
CHECKED BY:
DO NOT SCALE
DATE: 10–25–11
DWG TITLE: DWG LIST & DETAIL
DRAWING No: PLC–E01
REV.



/// REVISIONS ///

LTR.	DESCRIPTION	DATE	APVD

LEGEND

——— SOLID LINES INDICATE WIRING BY RJS

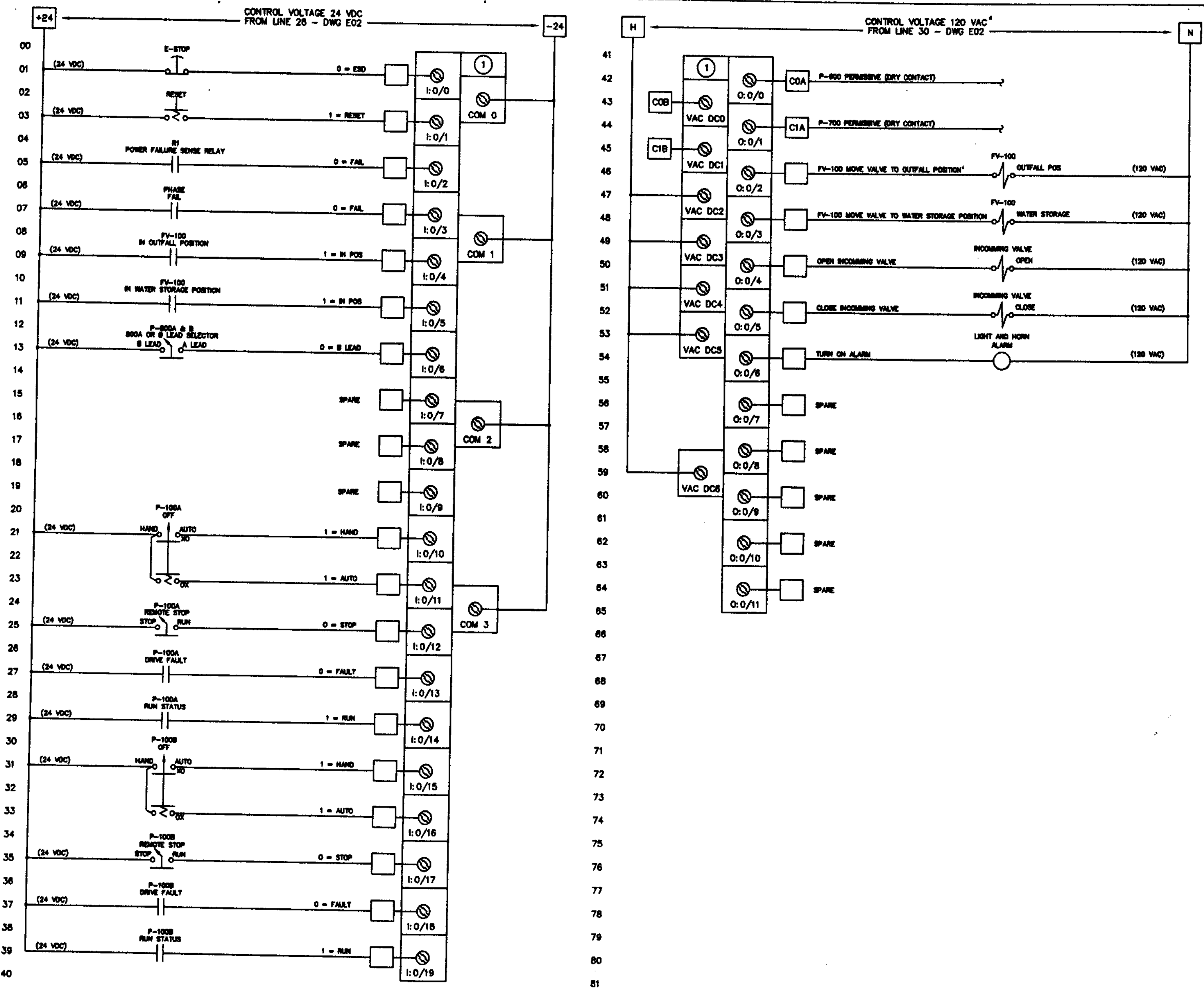
– – – BROKEN LINES INDICATE WIRING BY OTHERS

# INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# B1680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

DRAWN BY: AZ
CHECKED BY:
DO NOT SCALE
DATE: 10-25-11
DWG TITLE: CONTROL POWER SCHEMATIC
DRAWING No.: PLC-E02
REV.



REVISIONS			
LTR.	DESCRIPTION	DATE	APVD

① AB MICRO LOGIX 1400 BASE UNIT
1766-L32BWA

LEGEND

——— SOLID LINES INDICATE WIRING BY RJS

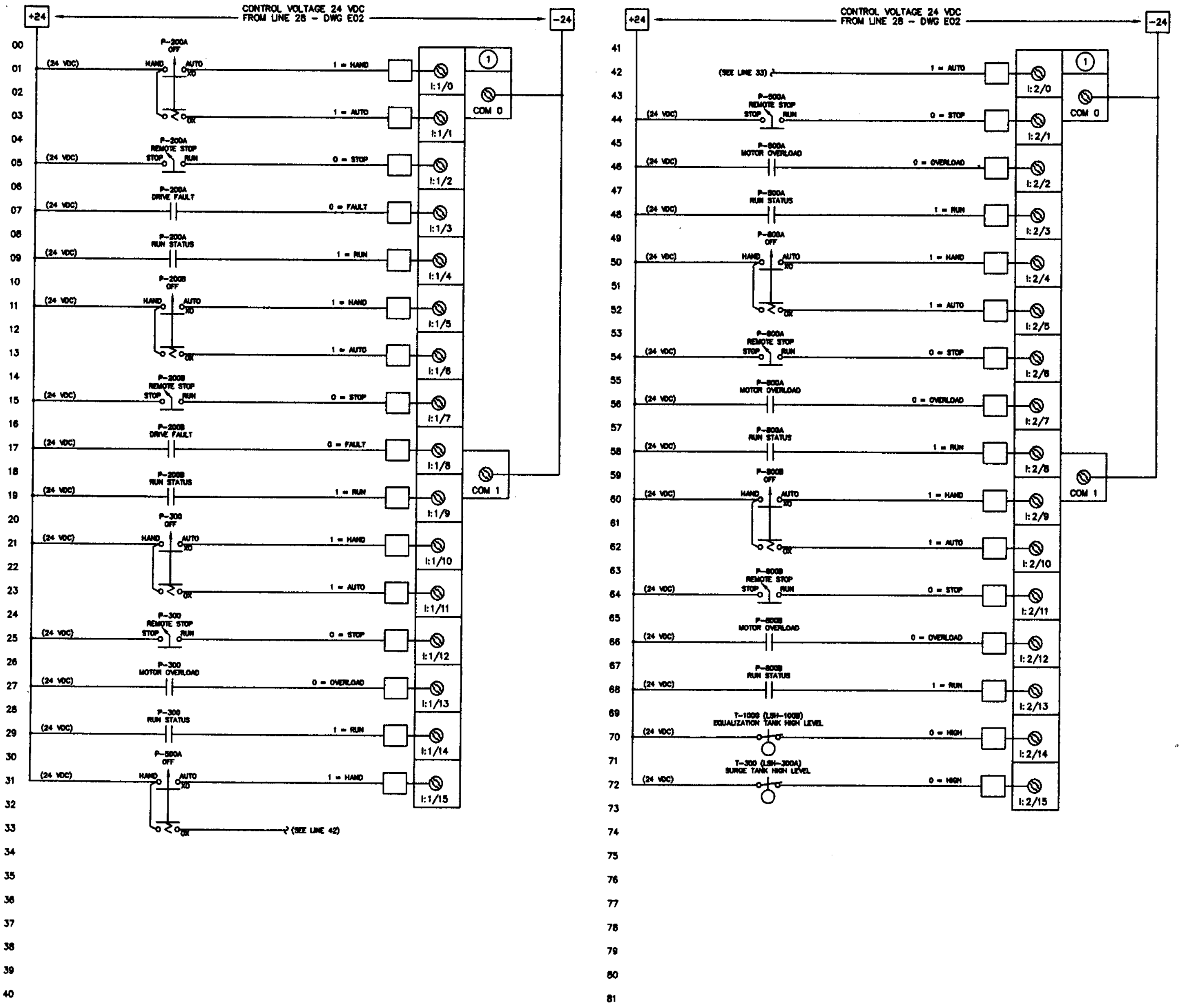
— — BROKEN LINES INDICATE WIRING BY OTHERS

☐ # INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# 81680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

DRAWN BY AZ
DO NOT SCALE
DATE 10-28-11
I/O SCHEMATIC #1



REVISIONS			
LTR.	DESCRIPTION	DATE	APVD

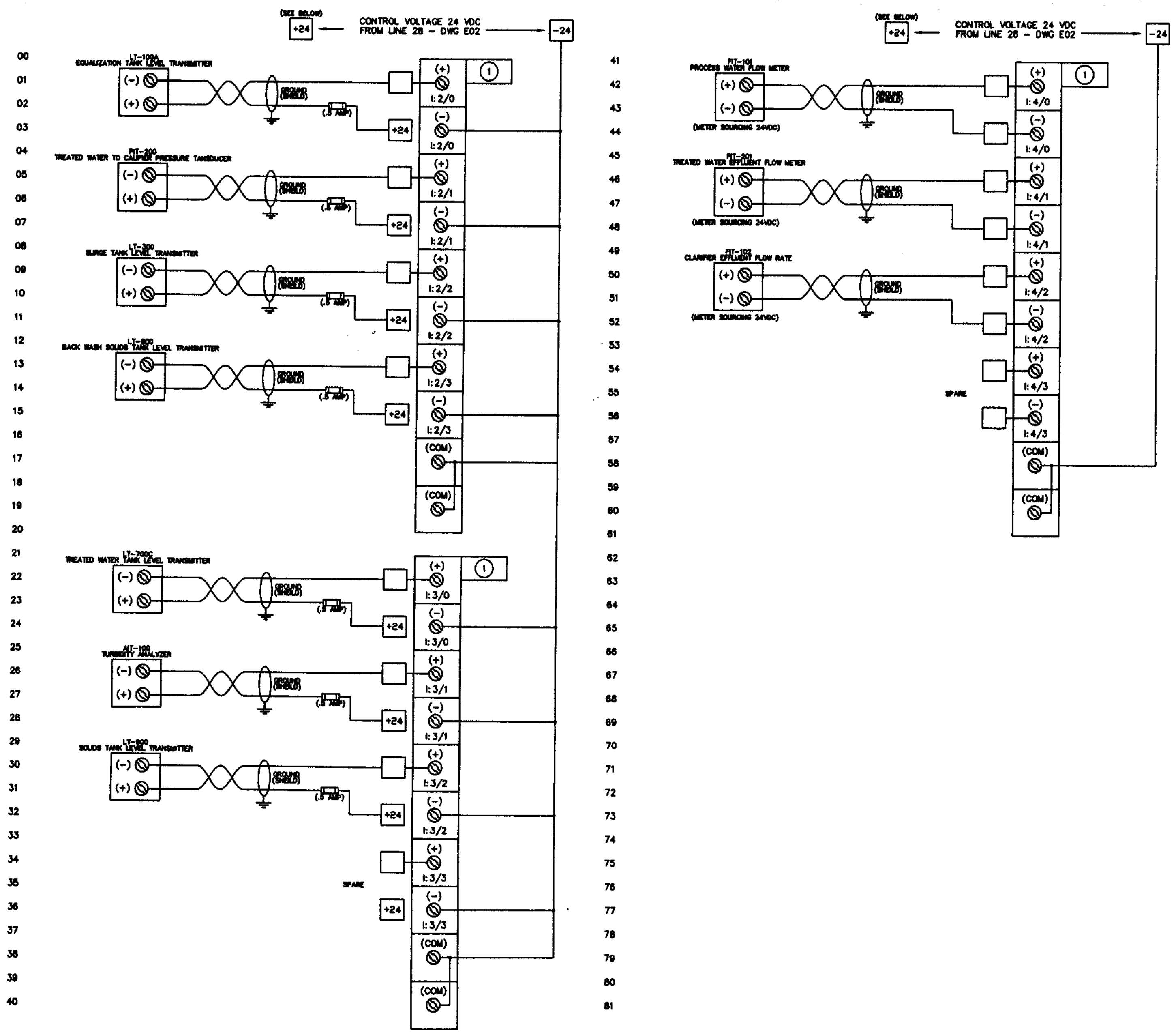
① (2) AB 24VDC, 16 POINT DIGITAL INPUT CARD
1762-IQ16

LEGEND

——	SOLID LINES INDICATE WIRING BY RJS
— —	BROKEN LINES INDICATE WIRING BY OTHERS
▢ #	INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# B1680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351
AZ
DO NOT SCALE
10-28-11
I/O SCHEMATIC #2
PLC-E04



// REVISIONS //

LTR.	DESCRIPTION	DATE	APVD

① (3) AB 4 POINT ANALOG INPUT CARD 1762-IF4

LEGEND

— SOLID LINES INDICATE WIRING BY RJS

— — BROKEN LINES INDICATE WIRING BY OTHERS

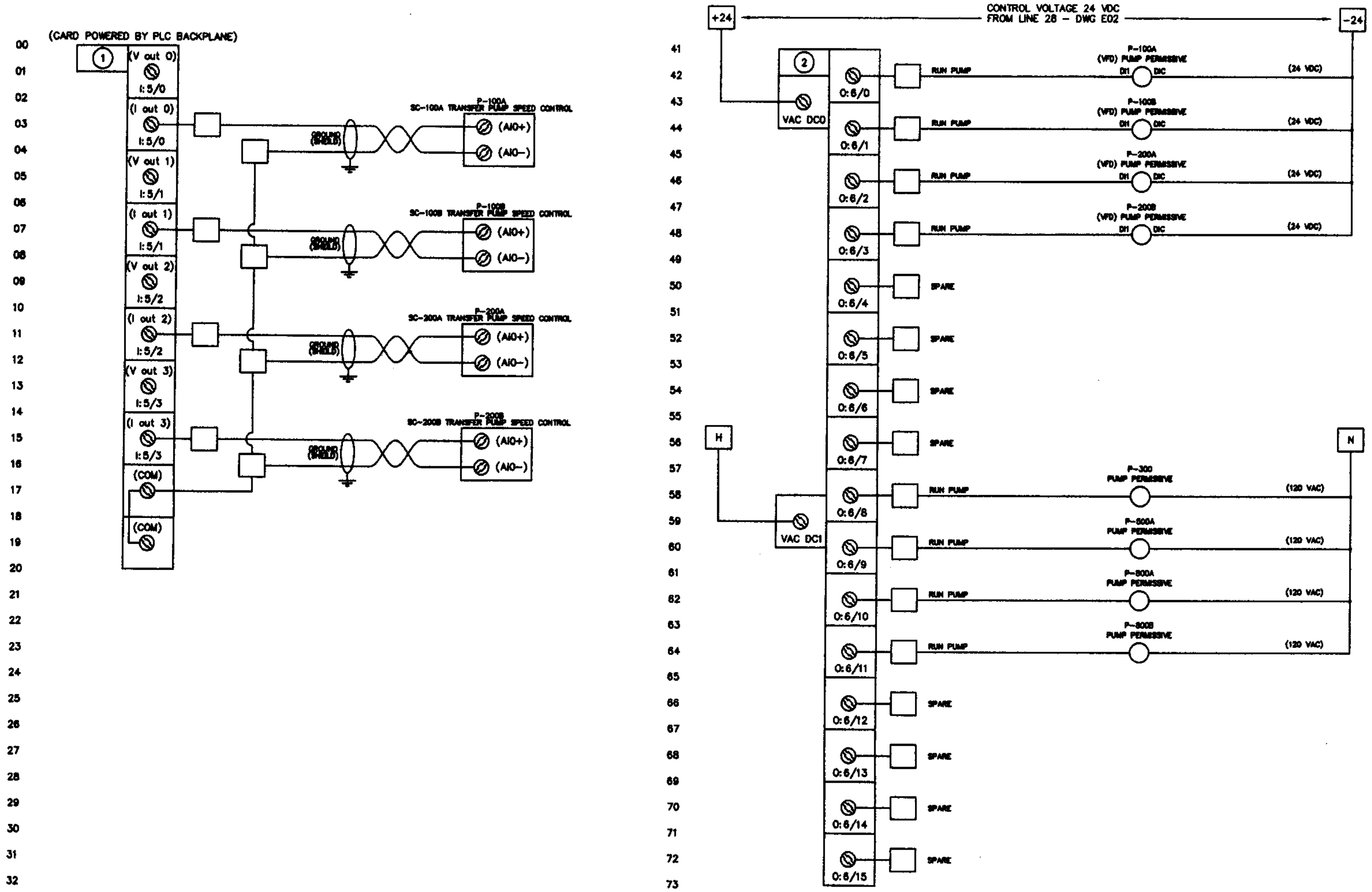
# INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# B1680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

AZ
DO NOT SCALE
10-24-11

I/O SCHEMATIC #3
PLC-E05



REVISIONS

LTR.	DESCRIPTION	DATE	APVD

① AB 4 POINT ANALOG OUTPUT CARD
1762-OF4

② AB 16 POINT RELAY OUTPUT CARD
1762-OW16

LEGEND

—— SOLID LINES INDICATE WIRING BY RJS

– – BROKEN LINES INDICATE WIRING BY OTHERS

▢ INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# 81680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

AZ
DO NOT SCALE
10-25-11
I/O SCHEMATIC #4
PLC-E06

RJS ELECTRIC

WATER TREATMENT SKID

PROGRAMMED BY: TEMPEST ENTERPRISES ENGINEER:
BRIAN THERIAULT 989 390-5008

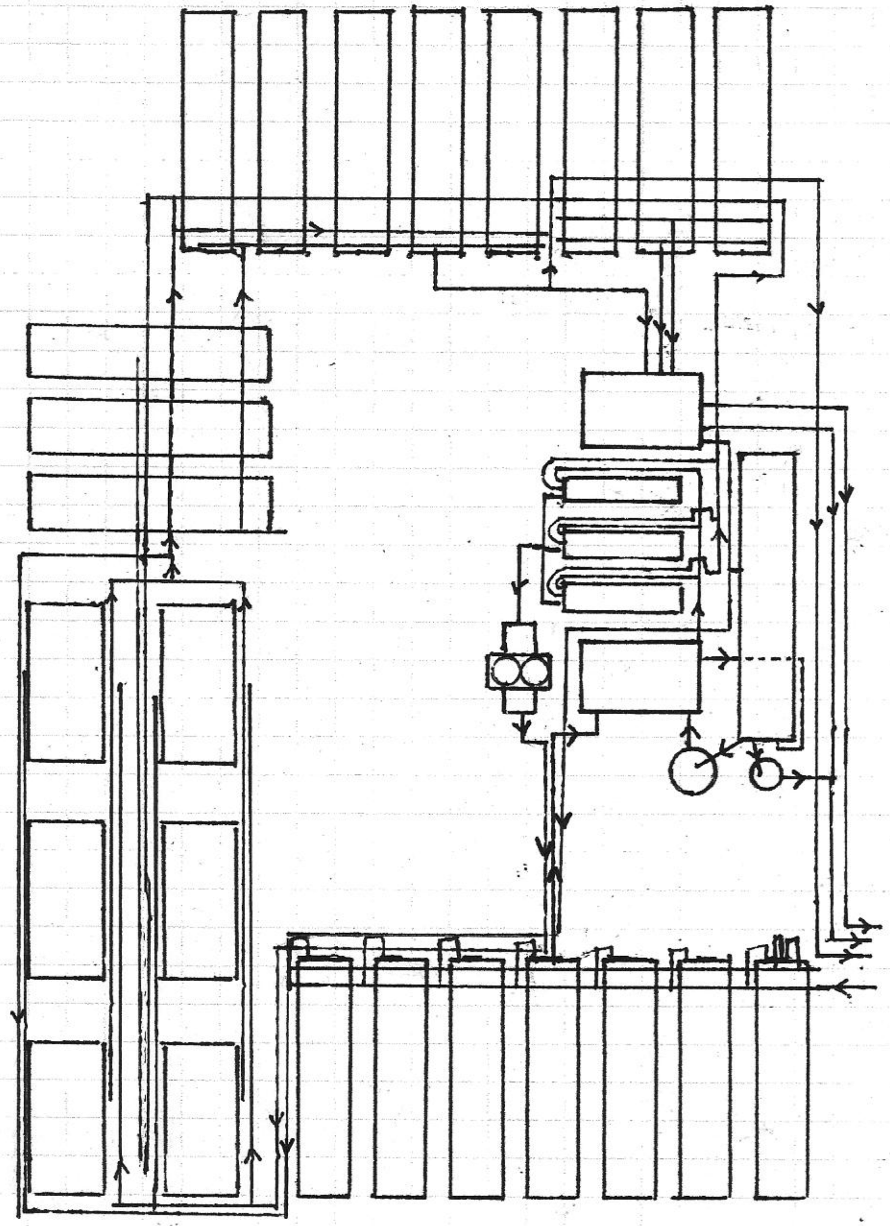
CAUSE & EFFECT MATRIX

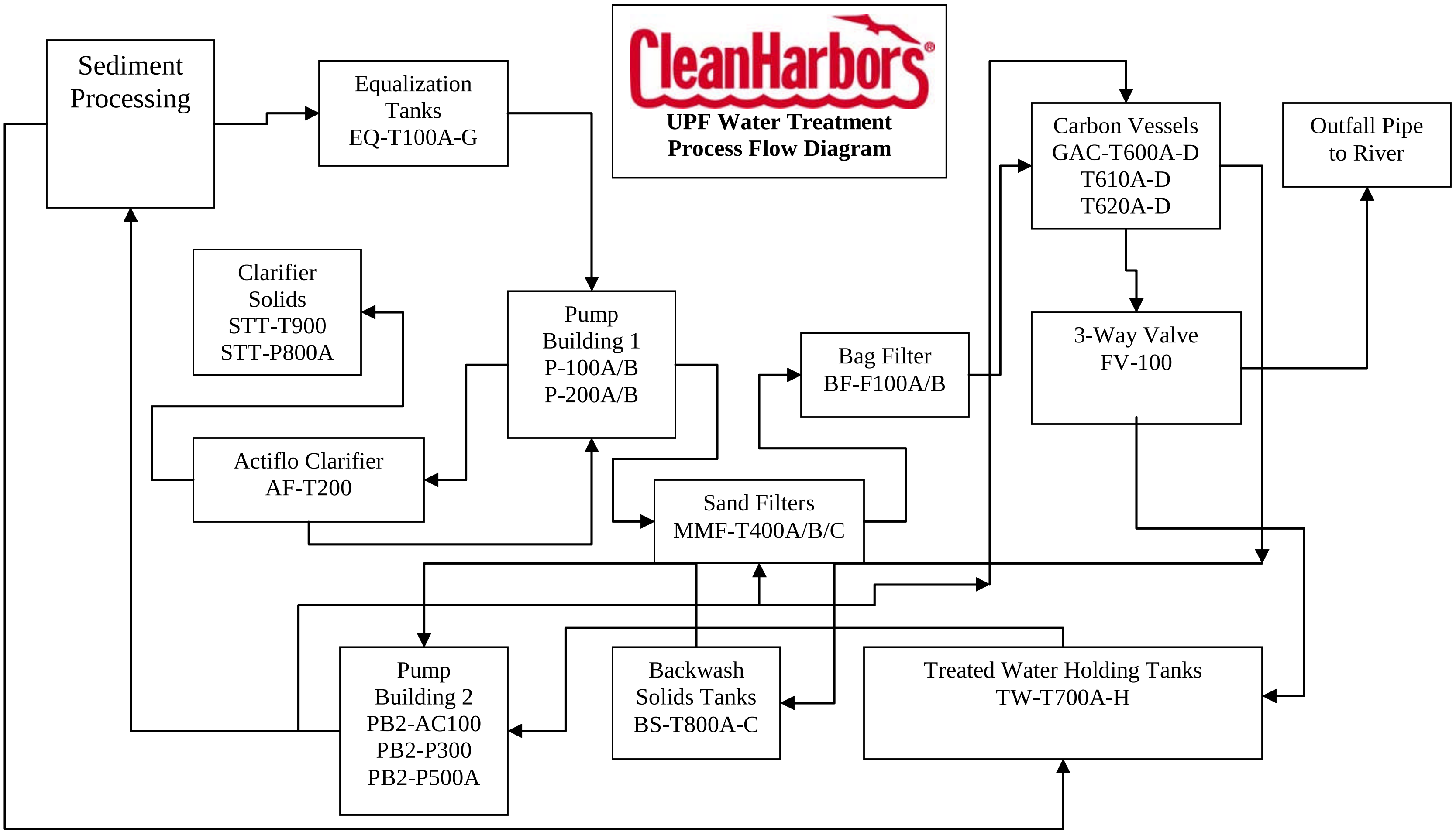
10/28/2011

					DESCRIPTION / ACTION	PUMP PERMISSIVE	PUMP PERMISSIVE	MOVE VALVE TO OUTFALL POSITION	MOVE VALVE TO TREATED WATER STORAGE POS	OPEN INCOMMING VALVE	CLOSE INCOMMING VALVE	LIGHT AND HORN ALARM	SPARE	SPARE	SPARE	SPARE	SPARE		SC-100A TRANSFER PUMP SPEED CONTROL	SC-100B TRANSFER PUMP SPEED CONTROL	SC-200A TRANSFER PUMP SPEED CONTROL	SC-200B TRANSFER PUMP SPEED CONTROL		TRANSFER PUMP PERMISSIVE	TRANSFER PUMP PERMISSIVE	TRANSFER PUMP PERMISSIVE	TRANSFER PUMP PERMISSIVE	SPARE	SPARE	SPARE	SPARE	BACKWASH PUMP PERMISSIVE	SUPERNATANT TRANSFER PUMP PERMISSIVE	PUMP PERMISSIVE	PUMP PERMISSIVE	SPARE	SPARE	SPARE	SPARE	
					END DEVICE	P-600	P-700	FV-100	FV-100										P-100A	P-100B	P-200A	P-200B		P-100A	P-100B	P-200A	P-200B					P-300	P-500A	P-600A	P-600B					
					PLC Address	O:0.0	O:0.1	O:0.2	O:0.3	O:0.4	O:0.5	O:0.6	O:0.7	O:0.8	O:0.9	O:0.10	O:0.11		O:6.0	O:6.1	O:6.2	O:6.3		O:7.0	O:7.1	O:7.2	O:7.3	O:7.4	O:7.5	O:7.6	O:7.7	O:7.8	O:7.9	O:7.10	O:7.11	O:7.12	O:7.13	O:7.14	O:7.15	
TAG	EQUIPMENT	DESCRIPTION / ANNUNCIATE	SET POINT (Scale)	PLC Address	I/O TYPE	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO		AO	AO	AO	AO		DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	
ESD-100		E-STOP	0=ESD	I:0.0	DI	X	X	X	X	X	X	X							X	X	X	X		X	X	X	X					X	X	X	X					
HS-100		RESET	1=RESET	I:0.1	DI																																			
ESL-100		POWER FAILURE SENSE RELAY (R1)	0=FAIL	I:0.2	DI	X	X		X		X	X							X	X	X	X		X	X	X	X					X	X	X	X					
ESL-101		PHASE FAIL	0=FAIL	I:0.3	DI	X	X			X	X	X							X	X	X	X		X	X	X	X					X	X	X	X					
ZX1-100	FV-100	IN OUTFALL POSITION	1=IN POS	I:0.4	DI																																			
ZX2-100	FV-100	IN TREATED WATER STORAGE POSITION	1=IN POS	I:0.5	DI																																			
HS-600_L		P-600A&B LEAD/LAG	1= A LEAD	I:0.6	DI																													X	X					
		SPARE		I:0.7	DI																																			
		SPARE		I:0.8	DI																																			
		SPARE		I:0.9	DI																																			
HS-100A_H	P-100A	HAND	1=HAND	I:0.10	DI														X					X																
HS-100A_A	P-100A	AUTO	1=AUTO	I:0.11	DI														X					X																
HS-100A_R	P-100A	REMOTE STOP	0=STOP	I:0.12	DI														X					X																
FS-100A	P-100A	DRIVE FAULT	0=FAULT	I:0.13	DI							X																												
YI-100A	P-100A	RUN STATUS	1=RUN	I:0.14	DI							X																												
HS-100B_H	P-100B	HAND	1=HAND	I:0.15	DI															X					X															
HS-100B_A	P-100B	AUTO	1=AUTO	I:0.16	DI															X					X															
HS-100B_R	P-100B	REMOTE STOP	0=STOP	I:0.17	DI															X					X															
FS-100B	P-100B	DRIVE FAULT	0=FAULT	I:0.18	DI							X																												
YI-100B	P-100B	RUN STATUS	1=RUN	I:0.19	DI							X																												
HS-200A_H	P-200A	HAND	1=HAND	I:1.0	DI																X					X														
HS-200A_A	P-200A	AUTO	1=AUTO	I:1.1	DI																X					X														
HS-200A_R	P-200A	REMOTE STOP	0=STOP	I:1.2	DI																X					X														
FS-200A	P-200A	DRIVE FAULT	0=FAULT	I:1.3	DI							X																												
YI-200A	P-200A	RUN STATUS	1=RUN	I:1.4	DI							X																												
HS-200B_H	P-200B	HAND	1=HAND	I:1.5	DI																	X					X													
HS-200B_A	P-200B	AUTO	1=AUTO	I:1.6	DI																	X					X													
HS-200B_R	P-200B	REMOTE STOP	0=STOP	I:1.7	DI																	X					X													
FS-200B	P-200B	DRIVE FAULT	0=FAULT	I:1.8	DI							X																												
YI-200B	P-200B	RUN STATUS	1=RUN	I:1.9	DI							X																												
HS-300_H	P-300	HAND	1=HAND	I:1.10	DI																											X								
HS-300_A	P-300	AUTO	1=AUTO	I:1.11	DI																											X								
HS-300_R	P-300	REMOTE STOP	0=STOP	I:1.12	DI																											X								
OS-300	P-300	MOTOR OVERLOADS	0=OVERLOAD	I:1.13	DI							X																												
YI-300	P-300	RUN STATUS	1=RUN	I:1.14	DI							X																												
HS-500A_H	P-500A	HAND	1=HAND	I:1.15	DI																												X							
HS-500A_A	P-500A	AUTO	1=AUTO	I:2.0	DI																												X							
HS-500A_R	P-500A	REMOTE STOP	0=STOP	I:2.1	DI																												X							
OS-500A	P-500A	MOTOR OVERLOADS	0=OVERLOAD	I:2.2	DI							X																												
YI-500A	P-500A	RUN STATUS	1=RUN	I:2.3	DI							X																												
HS-600A_H	P-600A	HAND	1=HAND	I:2.4	DI																													X						
HS-600A_A	P-600A	AUTO	1=AUTO	I:2.5	DI																													X						
HS-600A_R	P-600A	REMOTE STOP	0=STOP	I:2.6	DI																													X						
OS-600A	P-600A	MOTOR OVERLOADS	0=OVERLOAD	I:2.7	DI							X																												
YI-600A	P-600A	RUN STATUS	1=RUN	I:2.8	DI							X																												
HS-600B_H	P-600B	HAND	1=HAND	I:2.9	DI																														X					
HS-600B_A	P-600B	AUTO	1=AUTO	I:2.10	DI																														X					
HS-600B_R	P-600B	REMOTE STOP	0=STOP	I:2.11	DI																														X					
OS-600B	P-600B	MOTOR OVERLOADS	0=OVERLOAD	I:2.12	DI							X																												
YI-600B	P-600B	RUN STATUS	1=RUN	I:2.13	DI							X																												
LSH-100B	T-100G	EQUALIZATION TANK HIGH LEVEL	0=HIGH	I:2.14	DI	X				X	X	X																												
LSH-300A	T-300	SURGE TANK HIGH LEVEL ALARM & SHUTDOWN	0=HIGH	I:2.15	DI							X							X	X				X	X															
LT-100A	T-100G	EQUALIZATION TANK LEVEL TRANSMITTER	0-100%	I:3.0	AI																																			
LALL-100A	T-100G	EQUALIZATION TANK LOW LOW LEVEL SHUTDOWN			BIT							X							X	X				X	X															
LAL-100A	T-100G	ENABLE VFD ON P-100X to EQUAL FE-101			BIT														X	X				X	X															
LAH-100A	T-100G	ENABLE VFD ON P-100X to 830 GPM			BIT														X	X				X	X															
LAHH-100A	T-100G	EQUALIZATION TANK HIGH HIGH LEVEL SHUTDOWN			BIT	X	X			X	X	X																												
PIT-200		TREATED WATER TO CALIFIER PRESSURE TRANS		I:3.1	AI																																			
PAH-200		TREATED WATER TO CALIFIER PRESS HIGH ALARM			BIT							X																												
PAL-200		TREATED WATER TO CALIFIER PRESS LOW ALARM AND SD			BIT							X							X	X				X	X															
LT-300	T-300	SURGE TANK LEVEL TRANS	0-100%	I:3.2	AI																																			
LALL-300	T-300	SURGE TANK LOW LOW SHUTDOWN			BIT							X									X	X				X	X													
LAL-300	T-300	SURGE TANK LOW START			BIT																X	X				X	X													
LAH-300	T-300	SURGE TANK HIGH SHUTDOWN AND ALARM			BIT							X							X	X				X	X															
LT-600	T-600C	BACK WASH SOLIDS TANK LEVEL TRANS	0-100%	I:3.3	AI																																			
LAL-600	T-600C	BACK WASH SOLIDS TANK LEVEL LOW ALARM			BIT							X																												
LAH-600	T-600C	BACK WASH SOLIDS TANK LEVEL HIGH ALARM			BIT							X																												
LAHH-600	T-600C	BACK WASH SOLIDS TANK LEVEL HIGH HIGH ALARM & SD			BIT							X																				X								
LT-700A	T-700C	TREATED WATER LEVEL TRANS	0-100%	I:4.0	AI																																			
LAL-700A	T-700C	TREATED WATER LEVEL LOW OPEN TREATED			BIT				X																															
LAH-700A	T-700C	TREATED WATER LEVEL HIGH OPEN OUTFALL			BIT			X																																
LAHH-700A	T-700C	TREATED WATER LEVEL HIGH HIGH ALARM			BIT							X																												
LALL-700A	T-700C	TREATED WATER LEVEL LOW LOW ALARM			BIT							X																												
AIT-100		TURBIDITY ANALYZER	0-100%	I:4.1	AI																																			
AAL-100		TURBIDITY LOW ALARM			BIT							X																												
AAH-100		TURBIDITY HIGH ALARM			BIT							X																												
LT-900	T-900	SOLIDS TANK LEVEL TRANS	0-100%	I:4.2	AI																																			
LAL-900	T-900	BACK WASH SOLIDS TANK LEVEL LOW STOP			BIT																													X	X					
LAH-900	T-900	BACK WASH SOLIDS TANK LEVEL HIGH START			BIT																													X	X					
LAHH-900	T-900	BACK WASH SOLIDS TANK LEVEL HIGH HIGH SHUTDOWN			BIT							X							X	X				X	X															
		SPARE		I:4.3	AI																																			
FIT-101	FE-101	PROCESS WATER FLOW METER	3-956 GPM	I:5.0	AI														X	X	X	X																		
FIT-201	FE-201	TREATED WATER EFFLUENT FLOW RATE	3-956 GPM	I:5.1	AI																																			
FIT-102	FE-102	CLARIFIER EFFLUENT FLOW RATE	3-956 GPM	I:5.2	AI																X	X																		
		SPARE		I:5.3	AI																																			

Section 5

Treatment System Drawing and Flow Diagram





UPF Water Treatment Process Flow Diagram

Section 6

System Start up Checklist

Clean Harbors
Water Treatment System
Start-up Check List

CHES Operator: _________________________ Date: ___________ Time: ____________
Reason for Previous Shut-Down: ____
Corrective Actions Taken: ____

Step	System ID	Equipment ID	Tasks to Perform	Initial /Notes
01	EQ	EQ-T100A	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Check LE/LT-100A sensor is free of any obstructions.	
02	EQ	EQ- T100B	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
03	EQ	EQ- T100C	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
04	EQ	EQ- T100D	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
05	EQ	EQ- T100E	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
06	EQ	EQ- T100F	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
07	EQ	EQ- T100G	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
08	PB1	PB1	- Ensure inlet and outlet process line valves are open. - Turn on electrical disconnect.	
09	PB1	PB1-P100A	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
10	PB1	PB1-P100B	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
11	AF	AF-T200	- Ensure inlet and outlet pump line valves are open. - Close all sample ports and drains.	

			- Turn on main power. - Set Actiflo PLC to Auto Run. (see Actiflo O&M Manual if applicable) - Check tank levels. - Check Polymer and Coagulant settings.	
12	STT	STT-T900	- Ensure inlet and outlet line valves are open. - Close all sample ports and drains. - Check tank for leaks and punctures. - Check LE/LT-900A sensor is free of any obstructions.	
13	PST	PST-T300	- Ensure inlet and outlet line valves are open. - Close all sample ports and drains. - Check tank for leaks and punctures. - Check LE/LT-300, LS-300B sensors is free of any obstructions.	
14	PB1	PB1-P200A	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto.	
15	PB1	PB1-P200B	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto.	
16	MMF	MMF-T400A	(If skid is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all sand filter tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Set back wash cycle to Auto (see sand filter O&M Manual if applicable)	
17	MMF	MMF-T400B	(If skid is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all sand filter tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Set back wash cycle to Auto (see sand filter O&M Manual if applicable)	
18	MMF	MMF-T400C	(If skid is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all sand filter tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Set back wash cycle to Auto (see sand filter O&M Manual if applicable)	
19	BF	BF-F100A	- Ensure bag filter cover is bolted down and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves.	
20	BF	BF-F100B	- Ensure bag filter cover is bolted down and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves.	
21	GAC	GAC-T600A	(If vessel is on stand-by status, close all influent	

			and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
22	GAC	GAC-T600B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
23	GAC	GAC-T610A	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
24	GAC	GAC-T610B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
25	GAC	GAC-T620A	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
26	GAC	GAC-T620B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
27	GAC	GAC-T600C	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
28	GAC	GAC-T600D	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	

29	GAC	GAC-T610C	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
30	GAC	GAC-T610D	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
31	GAC	GAC-T620A	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
32	GAC	GAC-T620B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
33	FV	FV-100	- Ensure inlet and outlet line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
34	TW	TW-T700A	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
35	TW	TW-T700B	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves - Check LE/LT-700A sensor is free of any obstructions.	
36	TW	TW-T700C	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
37	TW	TW-T700D	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
38	TW	TW-T700E	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains.	

			- Open Inlet and Outlet butterfly valves	
39	TW	TW-T700F	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
40	TW	TW-T700G	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
41	TW	TW-T700H	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
42	BS	BS-T800A	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
43	BS	BS-T800B	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
44	BS	BS-T800C	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Check LE/LT-800 sensor is free of any obstructions.	
45	PB2	PB2	- Ensure inlet and outlet process line valves are open. - Turn on electrical disconnect.	
46	PB2	PB2-AC100	- Turn on main power. - Set Compressor PLC to Auto Run. (see Kaeser O&M Manual if applicable)	
47	PB2	PB2-AR-100	- Ensure inlet and outlet air line valves are open.	
48	PB2	PB2-AD-100	- Ensure inlet and outlet air line valves are open.	
49	PB2	PB2-P300	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
50	PB2	PB2-P500A	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
51	PB2	PB2-P500B	- Ensure manual air supply and inlet and out valves are closed. (Backwash solids transfer conducted by hand when needed.)	

Section 7

Equipment, Material and Electrical Testing Forms

Water Treatment System Equipment/Material Testing Form

Date:	**Test Section:**	**Equipment ID:**
	Test Start Time:	
	Pressure/Flow Testing: Fluid or Air	
	Max Equipment/Material Operating Pressure/GPM:	
	Max Operating Pressure/GPM * 1.33 =_____________= Max Testing PSI/GPM	
	Notes:	
	Equipment/Material Testing	**Circle**
01	**Charge line/equipment up too 50% Operating Pressure/GPM**	**Y/N**
	After 30 Minutes:	
	-Leaks?	**Y/N**
	-Bulges/deformations?	**Y/N**
	-Vibrations?	**Y/N**
02	**Charge line/equipment up too 100% Operating Pressure/GPM**	**Y/N**
	After 30 Minutes:	
	-Leaks?	**Y/N**
	-Bulges/deformations?	**Y/N**
	-Vibrations?	**Y/N**
03	**Charge line/equipment up too 133% Operating Pressure/GPM**	**Y/N**
	After 30 minutes:	
	-Leaks?	**Y/N**
	-Bulges/deformations?	**Y/N**
	-Vibrations?	**Y/N**
04	**Maintain line/equipment at 133% Operating Pressure/GPM**	
	For a maximum of 3 hours	**Y/N**
	-Leaks?	**Y/N**
	-Bulges/deformations?	**Y/N**
	-Vibrations?	**Y/N**
05	**After (up too 3 hours) or by engineer approval depressurize line/equipment**	**Y/N**
	-Leaks?	**Y/N**
	-Bulges/deformations?	**Y/N**
	-Vibrations?	**Y/N**

Test Section: ____________________ Equipment ID:____________ Pass / Fail

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: ________________Sign: ___________________Date: ________
Arcadis : Print: ________________Sign: ___________________Date: ________

Water Treatment System Electrical Testing Form (Control Panel)		
Date:	**Test Section:**	**Equipment ID:**
	Test Start Time:	
	Electrical Tests for Control Panel	**Circle/Notes**
01	Confirm Power coming into the panel Comments:	_______________
02	Engineer approval to power panel. Comments:	_______________
03	Confirm power supplies are working correctly. Comments:	**Y/N**
04	Confirm instrumentation is connected to the correct location in the control panel.	
	1.	**Y/N**
	2.	**Y/N**
	3.	**Y/N**
	4.	**Y/N**
	5.	**Y/N**
	6.	**Y/N**
	7.	**Y/N**
	8.	**Y/N**
	9.	**Y/N**
	10.	**Y/N**
	11.	**Y/N**
	12	**Y/N**
	13.	**Y/N**
	14.	**Y/N**
	15.	**Y/N**
	16	**Y/N**
	17.	**Y/N**
	18.	**Y/N**
	19.	**Y/N**
	20.	**Y/N**

Test Section: ______________________ Equipment ID:_____________ Pass / Fail

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer’s and contractor’s approval.

Clean Harbors Print: __________________Sign: _____________________Date: ________
Arcadis : Print: __________________Sign: _____________________Date: ________

Water Treatment System Electrical Testing Form (Instrumentation and Switches)		
Date:	**Test Section:**	**Equipment ID:**
	Test Start Time:	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	**Y/N**
02	Confirm correct power is being supplied to the instrument or switch Comments:	**Y/N**
03	Confirm that the instrument or switch is wired correctly. Comments:	**Y/N**
04	Engineer approval to supply power to instrument. Comments:	________________
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	**Y/N**
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	**Y/N**
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	**Y/N**
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	**Y/N**

Test Section: ______________________ Equipment ID:_____________ Pass / Fail

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: __________________Sign: _____________________Date: ________
Arcadis : Print: __________________Sign: _____________________Date: ________

Water Treatment System Electrical Testing Form (Motor Control Center)		
Date:	**Test Section:**	**Equipment ID:**

	Test Start Time:	
	Electrical Tests for MCC	**Circle/Notes**
01	Confirm that motor starter is connected to the correct motor. Comments:	**Y/N**
02	Confirm motor starter trip settings are correct for the motor that it is controlling. Comments:	**Y/N**
03	Confirm power reading is correct coming into the panel and going to each motor starter. Comments:	**Y/N**

Test Section: ______________________ Equipment ID:_____________ Pass / Fail

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer’s and contractor’s approval.

Clean Harbors Print: __________________Sign: _____________________Date: ________
Arcadis : Print: __________________Sign: _____________________Date: ________

Water Treatment System Electrical Testing Form (Pumps and Compressor)

Date:	**Test Section:**	**Equipment ID:**

	Test Start Time:	
	Pressure/Flow Testing: Fluid or Air	
	Max Equipment/Material Operating Pressure/GPM:	
	Max Operating Pressure/GPM * 1.33 =______________= Max Testing PSI/GPM	
	Notes:	
	Electrical Tests for Pumps and Compressor	**Circle/Notes**
01	Confirm that Pump has Been wired correctly. What is the power requirement?	**Y/N** ________________
02	What are the Mega ohms of the power cable from the MCC to the Pump? Is the reading per Arcadis Specifications?	________________ **Y/N**
03	What is the Pre-Start-Up Electrical Power Reading? What is the power requirement?	________________ ________________
04	What is the Pre-Start-Up Mega Ohhm Reading? What is the manufacturer requirement?	________________ ________________
05	Engineer approval prior to start-up.	________________
06	Is the pump direction correct?	**Y/N**
07	Is VFD controller working correctly?	**Y/N**
08	Conduct VFD operation in “hand” check. Is it working correctly?	**Y/N**
09	Conduct VFD operation in “auto” check. Is it working correctly?	**Y/N**
10	Confirm “remote run switch” is working correctly?	**Y/N**
11	Confirm “HOA” is working correctly?	**Y/N**

Test Section: ______________________ Equipment ID:_____________ Pass / Fail

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer’s and contractor’s approval.

Clean Harbors Print: _________________Sign: ____________________Date: ________
Arcadis : Print: _________________Sign: ____________________Date: ________

Section 8

Equipment, Material and Electrical Deficiency Form

Water Treatment System Deficiency Report

Date:	**Test Number:**	**Equipment ID:**
01	**Equipment Model:**	
02	**Equipment Size:**	
03	**Location of Equipment:**	
04		
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	**Y/N**
07	**Was the equipment/material installed correctly?**	**Y/N**
08	**Was the equipment/material set-up correctly?**	**Y/N**
09	**Was the equipment/material affected by another piece of equipment?**	**Y/N**
10	**Corrective Actions:**	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer’s and contractor’s approval.

Clean Harbors Print: __________________Sign: _____________________Date: ________
Arcadis : Print: __________________Sign: _____________________Date: ________

Section 9

O & M Manuals

Section 10

Equipment and Material Cut Sheets

ARCADIS SUBMITTAL # PC-068-R1

CleanHarbors
ENVIRONMENTAL SERVICES®

42 Longwater Drive, Norwell, MA 02061
(781) 385-9813
Lis.Justin@cleanharbors.com
www.cleanharbors.com

Project Submittal

Project Name: Lower Passaic River Phase I Sediment Removal Action

March 2, 2012

Engineer: Rob Romagnoli, (QCA) Engineer of Record (ARCADIS)
Address: 6723 Towpath Road, Syracuse, NY 13214
Subcontractor:
Address:
Manufacturer:
Address:
Supplier:
Address:
Submittal: ML-028-R1
Specification/Drawing Reference: Specs 01 75 00, 40 90 01, 44 42 00

Transmittal Record	Attention	Sent	Received	Due	Quantity	Received
Contractor to Engineer	Rob Romagnoli (QCA) Scott Murphy (TM)	03/2/12		03/5/12	1	
Engineer to Contractor	Justin Lis					

Review Action Code:
1. Reviewed/No exception taken
2. Make corrections noted
3. Revise as noted and resubmit
4. Incomplete submittal, resubmit
5. Rejected. Resubmit as specified

☒ REVIEWED ☐ REVIEWED & NOTED

REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

ARCADIS

SIGNATURE

3/5/12
Date

Syr
Office Location

☐ RESUBMIT ☐ REJECTED

Description

n Spring 2012 Start-up and Testing Plan for water
'PF water treatment site.

lean Harbors will utilize the Water Treatment System
tem to be installed at the UPF water treatment site.

ize of this document. The hard copy document,
se feel free to request these if needed.

3/2/12

fied in this submittal, it is assumed that no change in
ompletion is involved, notify the CM immediately.

Environment"

Clean Harbors Environmental Services

GX3741007	WTS Start Up and Testing Plan	B0009964.0001

Water Treatment System
Start Up and Testing Plan

Upland Processing Facility
Water Treatment System Construction

March 2012

Client………………. Arcadis-US
Location……………. 117 Blanchard St. Newark, New Jersey
Project Number…….. GX3741007
Project Manager……. Justin Lis

Start Up and Testing Plan - Communication List			
No.	Company	Project Function/Title	Name
01	ARCADIS	Client’s Authorized Representative	Matthew Bowman
02	ARCADIS	Client’s Construction Manager	Coleman King
03	CHES	Project Manager	Justin Lis
04	CHES	Construction Supervisor	Josh Stringer
05	CHES	Electrician and PLC Programmer	Bob Shoprey
Notes:			

Start Up and Testing Plan - Revision Tracking				
Revision	Reason and Section Revised	Prepared	Checked	Approved
0.0	Arcadis Re-submittal secs 6,7,8	JL	JL	
1.0	Spring Start-up Revision secs 2,9	JL	JL	
2.0				

Start Up and Testing Plan Sections

Section 1 - Water Treatment System Construction Overview
Section 2 - March 2012 Start Up and Testing Schedule
Section 3 - Equipment and Material ID Sheets
Section 4 - Electrical Drawings and Instrument Matrix
Section 5 - Treatment System Drawing and Flow Diagram
Section 6 - System Start up Checklist
Section 7 - Equipment, Material and Electrical Testing Forms
Section 8 - Equipment, Material and Electrical Deficiency Form
Section 9 - Fall 2011 Testing and Deficiency Forms
Section 10 - O & M Manuals
Section 11 - Equipment and Material Cut Sheets

“People and Technology Creating a Better Environment”

Water Treatment System
Start Up and Testing Plan

Section 1

Water Treatment System Construction Overview

Water Treatment System Start Up and Testing Plan Overview

Clean Harbors Environmental Services (Clean Harbors) has prepared this Water Treatment System Start Up and Testing Plan for ARCADIS-US to detail the means and methodology to be employed to confirm the construction and functionality of the temporary water treatment facility at the upland processing facility for the Lower Passaic River Phase I Removal Project.

General Requirements - Introduction

In general, the System Start Up and Testing will include, but not limited to, the following:

- Post Construction Start Up and Testing 2011 Schedule
- Full System Start Up and Testing 2012 Schedule
- Equipment and Material ID Sheets
- Electrical Drawings and Instrument Matrix
- Treatment System Drawing and Flow Diagram
- System Start up Checklist
- Equipment and Material Testing Form
- Equipment and Material Deficiency Form
- O & M Manuals
- Equipment and Material Cut Sheets

Project Management and QA/QC Staffing Plan

This section presents Clean Harbors' approach to the integration of all testing activities in order to insure a safe, timely and satisfactory completion of the start up and testing work specified for this project. Clean Harbors has developed a system for project/site QA/QC management based upon successful completion of numerous environmental construction projects of similar nature and complexity. Coordination of the total work effort is effected through a management approach characterized as follows:

- Defining, monitoring and control of equipment specifications, procurement, construction, integration and successful implementation.
- Quality control through a firm understanding of project specifications and documentation.

Project Manager/QA/QC Manager

Justin Lis
(Phone) (781)-385-9813

Project Supervisor/System Operator/QA/QC Supervisor

Josh Stringer
(Phone) (231)-384-3134

Electrical and PLC Integration QA/QC Supervisor

Bob Shoprey
(Phone)

Material and Equipment Delivery, Storage and Handling

Clean Harbors has procured, delivered, installed and handled all equipment needed for the project in accordance with the contract documents. Clean Harbors' has performed this work by following these guidelines:

- Clean Harbors has used all means necessary and reasonably possible to protect all the project materials before, during and after installation and work in a manor to protect the installed work and materials of other contractors.
- In the event of any damage caused by the failure of materials or equipment, by Clean Harbors or its subcontractors, Clean Harbors will immediately make all repairs and replacements necessary to the approval of the engineer and at no cost to customer.
- Clean Harbors has delivered all applicable pieces of equipment and material to the site in their original containers with labels intact and legible at time of use. These documents have been documented and provided to the customer.
- Clean Harbors has stored all applicable materials and equipment in accordance of the manufacturers recommendations and as approved by engineer.
- Clean Harbors has inspected all materials delivered to the site to ensure they comply with the requirements in the contract documentation.
- Clean Harbors has and will be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-startup during the warranty period.

Material and Equipment Quality Assurance and Warranty

In an effort to ensure quality materials and equipment have been procured and installed correctly in the temporary water treatment system, Clean Harbors has followed these quality assurance, acceptance and warranty procedures:

- To ensure that quality materials, equipment and services were used, Clean Harbors has procured the approved items and services from qualified manufacturers that have a successful history of producing and executing these items in the past.
- Clean Harbors has provided adequate personnel, including but not limited to the Project Manager and Project Supervisor, who have been present at all times during the execution of the work and who are thoroughly familiar with the specified requirements of the materials and methods needed for their execution, and have directed all work performed.
- Clean Harbors has provided an adequate number of qualified workers who are skilled in the necessary crafts and are properly informed of the methods, services, equipment and materials used.
- Clean Harbors has followed the equipment and material manufacturer's installation instructions, as approved by the engineer. These have served as a basis for acceptance or rejection of the work performed.

- Clean Harbors has submitted, to the engineer for approval, all specifications and product data for all equipment and materials installed in the water treatment system.
- Clean Harbors will include manufacturers warranty for any purchased materials with the shop drawing submittals.

Section 2

March 2012 Start Up and Testing Schedule

Water Treatment System

Start Up and Testing Plan Schedule
Spring 2012

Spring 2012	
03/5/12 Monday	• 100,000 gallons in EQ tanks from Weeks Marine via slurry line. (2/24/12) • Confirm pump control (P100A/B P200A/B) • Actiflo primary clarifier proofing • Confirm pressure test of GAC vessels • System run and pressure testing with 100,000 gallons • CHES/SECI Interlock proofing (LS100A, LT100A, LT700B) • Confirm solids and surge tank pumps and transmitters (LS300, LT300, LT900, P800A, P800B)
03/6/12 Tuesday	• Sand filter proofing and backwash test. • Confirm backwash solids tank pump and transmitter (LT800, P500A, P300) • Confirm pressure transmitter, turbidimeter, audible alarms and 3 way valve (PIT200, AIT100, FV100) • Confirm FV-100 and river discharge test
03/7/12 Wednesday	• Fall 2011 failure report repair confirmation • Storm water testing and proofing. • SECI interface testing
03/8/12 Thursday	• Fall 2011 failure report repair confirmation • Weeks/SECI/CHES system testing and discharge • Actiflo polymer and coagulant delivery and set-up • Full system run and testing • Operator Training • Repairs/Issues
03/9/12 Friday	• Full system run and testing • Operator Training • Repairs/Issues
03/10/12 Saturday	• Full system run and testing • Operator Training • Repairs/Issues
03/11/12 Sunday	• No work planned
03/12/12 Saturday	• System commissioning and batch mode process start

Section 3

Equipment and Material ID Sheets

Clean Harbors Water Treatment System
Mechanical Equipment Check List

Clean Harbors' Inspection Conducted By: _______________________Date: ____________

Arcadis Inspection Conducted By: ______________________________Date: ____________

Weather: ____

Notes:

____

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Equipment ID		Equipment Installed	Y/N	Equipment Inlet Process Connection	Y/N	Equipment Outlet Process Connection	Y/N
EQ	EQ-T100A	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
EQ	EQ-T100B	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
EQ	EQ-T100C	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
EQ	EQ-T100D	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
EQ	EQ-T100E	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
EQ	EQ-T100F	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
EQ	EQ-T100G	21,000 Gallon Frac Tank	Y/N	(1) 4" Line x 8" Header	Y/N	(2) 4" Lines x 8" Header	Y/N
PB1	PB1	18' x 8' x 7.5' Building	Y/N	(2) 8" Process Lines	Y/N	(2) 8" Process Lines	Y/N
PB1	PB1-P100A	20 HP Pump EQ Transfer Pump	Y/N	(1) 8" Process Line x 6" Inlet	Y/N	(1) 4" Outlet x 8" Process Line	Y/N
PB1	PB1-P100B	20 HP Pump EQ Transfer Pump	Y/N	(1) 8" Process Line x 6" Inlet	Y/N	(1) 4" Outlet x 8" Process Line	Y/N
AF	AF-T200	ActiFlo Primary Clarifier	Y/N	(1) 8" Process Line x 10" Inlet	Y/N	(1) 12" Flange x 10" Process Line (1) 2" Flange x 2" Gravity Line	Y/N
STT	STT-T900	Solids Transfer Tank 1000 Gallon Poly Tank	Y/N	(1) 2" Gravity Line Inlet	Y/N	(1) 2" Outlet Solids Line	Y/N
PST	PST-T300	Process Surge Tank 2500 Gallon Poly Tank	Y/N	(1) 8" Inlet x 10" Gravity Process Line	Y/N	(1) 6" Outlet x 8" Process Line	Y/N
PB1	PB1-P200A	40 HP Pump PST-T300 Transfer Pump	Y/N	(1) 8" Process Line x 6" Inlet	Y/N	(1) 4" Outlet x 8" Process Line	Y/N
PB1	PB1-P200B	40 HP Pump PST-T300 Transfer Pump	Y/N	(1) 8" Process Line x 6" Inlet	Y/N	(1) 4" Outlet x 8" Process Line	Y/N
MMF	MMF-T400A	1000 GPM Sand Filter Skid	Y/N	(1) 6" Flange x 8" Process Header (1) 6" Inlet x 8" Clarified Backwash Line	Y/N	(1) 6" Outlet x 8" Process Header (1) 4" Flange x 4" Backwash Line	Y/N
MMF	MMF-T400B	1000 GPM Sand Filter Skid	Y/N	(1) 6" Flange x 8" Process Header (1) 6" Inlet x 8" Clarified Backwash Line	Y/N	(1) 6" Outlet x 8" Process Header (1) 4" Outlet x 4" Backwash Line	Y/N
MMF	MMF-T400C	1000 GPM Sand Filter Skid	Y/N	(1) 6" Flange x 8" Process Header (1) 6" Inlet x 8" Clarified Backwash Line	Y/N	(1) 6" Outlet x 8" Process Header (1) 4" Outlet x 4" Backwash Line	Y/N
BF	BF-F100A	1600 GPM 8 Bag Filter	Y/N	(1) 6" Inlet x 8" Process Header	Y/N	(1) 6" Outlet x 8" Process Header	Y/N

BF	BF-F100B	1600 GPM 8 Bag Filter	Y/N	(1) 6” Inlet x 8” Process Header	Y/N	(1) 6” Outlet x 8” Process Header	Y/N
GAC	GAC-T600A	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T600B	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T610A	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T610B	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T620A	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T620B	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T600C	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T600D	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T610C	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T610D	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T620A	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
GAC	GAC-T620B	20,000 lb Granulated Carbon Vessel	Y/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	Y/N
FV	FV-100	3-Way Flow Valve and Actuator	Y/N	(1) 8” Process Line	Y/N	(2) 8” Outlet Process Lines	Y/N
TW	TW-T700A	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700B	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700C	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700D	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700E	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700F	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700G	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
TW	TW-T700H	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N

BS	BS-T800A	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
BS	BS-T800B	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
BS	BS-T800C	21,000 Gallon Frac Tank	Y/N	(1) 4” Line x 8” Header	Y/N	(2) 4” Lines x 8” Header	Y/N
PB2	PB2	18’ x 8’ x 7.5’ Building	Y/N	(3) Process Lines (8”,4” & 3”)	Y/N	(4) Process Lines (8”, 3”, 3” & ¾”)	Y/N
PB2	PB2-AC100	25 HP Air Compressor	Y/N	NA	Y/N	(1) ¾” Air Line	Y/N
PB2	PB2-AR-100	Air Receiver Tank	Y/N	(1) ¾” Air Line	Y/N	(1) ¾” Air Line (1) ½” Drain	Y/N
PB2	PB2-AD-100	Desiccant Air Dryer	Y/N	(1) ¾” Air Line	Y/N	(1) ¾” Air Line (1) ½” Drain	Y/N
PB2	PB2-P300	15 HP SF & GAC Clarified Backwash Pump	Y/N	(1) 8” Transfer Line x 4” Inlet	Y/N	(1) 3” Outlet x 8” Transfer Line	Y/N
PB2	PB2-P500A	2.25 HP Backwash Supernatant Transfer Pump	Y/N	(1) 8” Transfer Line x 4” Inlet	Y/N	(1) 3” Outlet x 4” Transfer Line	Y/N
PB2	PB2-P500B	100 scfm Backwash SolidsTransfer Pump	Y/N	(1) 3” Transfer Line x 3” Inlet	Y/N	(1) 3” Outlet x 3” Transfer Line	Y/N

Deficiency:

1.________________________________

2.________________________________

3.________________________________

4.________________________________

5.________________________________

6.________________________________

7.________________________________

8.________________________________

9.________________________________

Corrective Actions:

1.________________________________

2.________________________________

3.________________________________

4.________________________________

5.________________________________

6.________________________________

7.________________________________

8.________________________________

9.________________________________

Notes:

I certify that all mechanical equipment included on this checklist has been supplied and installed per contract specifications and by acceptance of the Engineer (Arcadis).

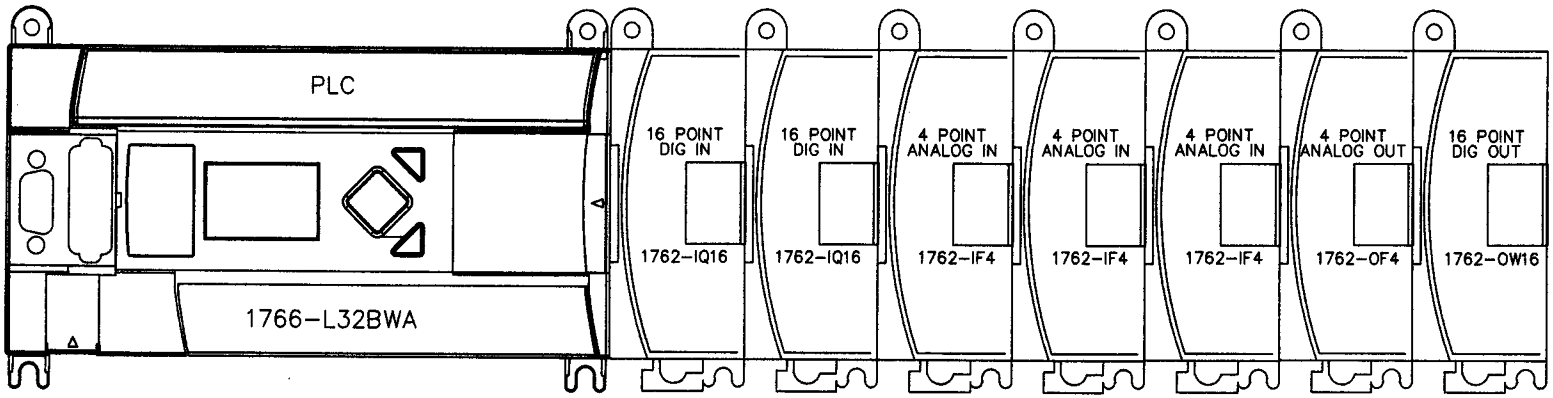
Clean Harbors Print: __________________Sign: _____________________Date: ________
Arcadis : Print: __________________Sign: _____________________Date: ________

Section 4

Electrical Drawings and Instrument Matrix

/// REVISIONS ///

LTR.	DESCRIPTION	DATE	APVD



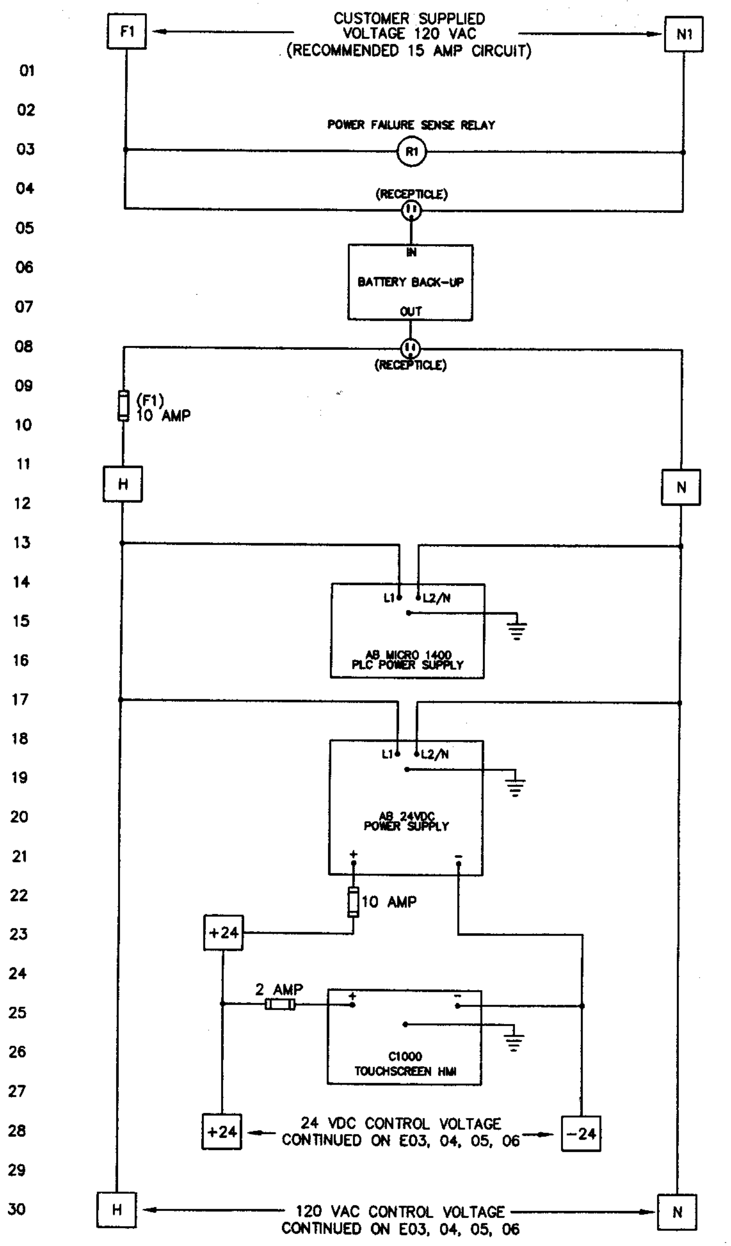
RJS ELECTRIC
WATER TREATMENT SKID

DWG #	DESCRIPTION	PANEL
PLC-E01	DWG LIST	
PLC-E02	CONTROL POWER SCHEMATIC	PLC PANEL
PLC-E03	I/O SCHEMATIC #1	PLC PANEL
PLC-E04	I/O SCHEMATIC #2	PLC PANEL
PLC-E05	I/O SCHEMATIC #3	PLC PANEL
PLC-E06	I/O SCHEMATIC #4	PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# B1680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

DRAWN BY: AZ
CHECKED BY:
DO NOT SCALE
DATE: 10-25-11
DWG TITLE: DWG LIST & DETAIL
DRAWING No: PLC-E01
REV.



/// REVISIONS ///

LTR.	DESCRIPTION	DATE	APVD

LEGEND

—— SOLID LINES INDICATE WIRING BY RJS

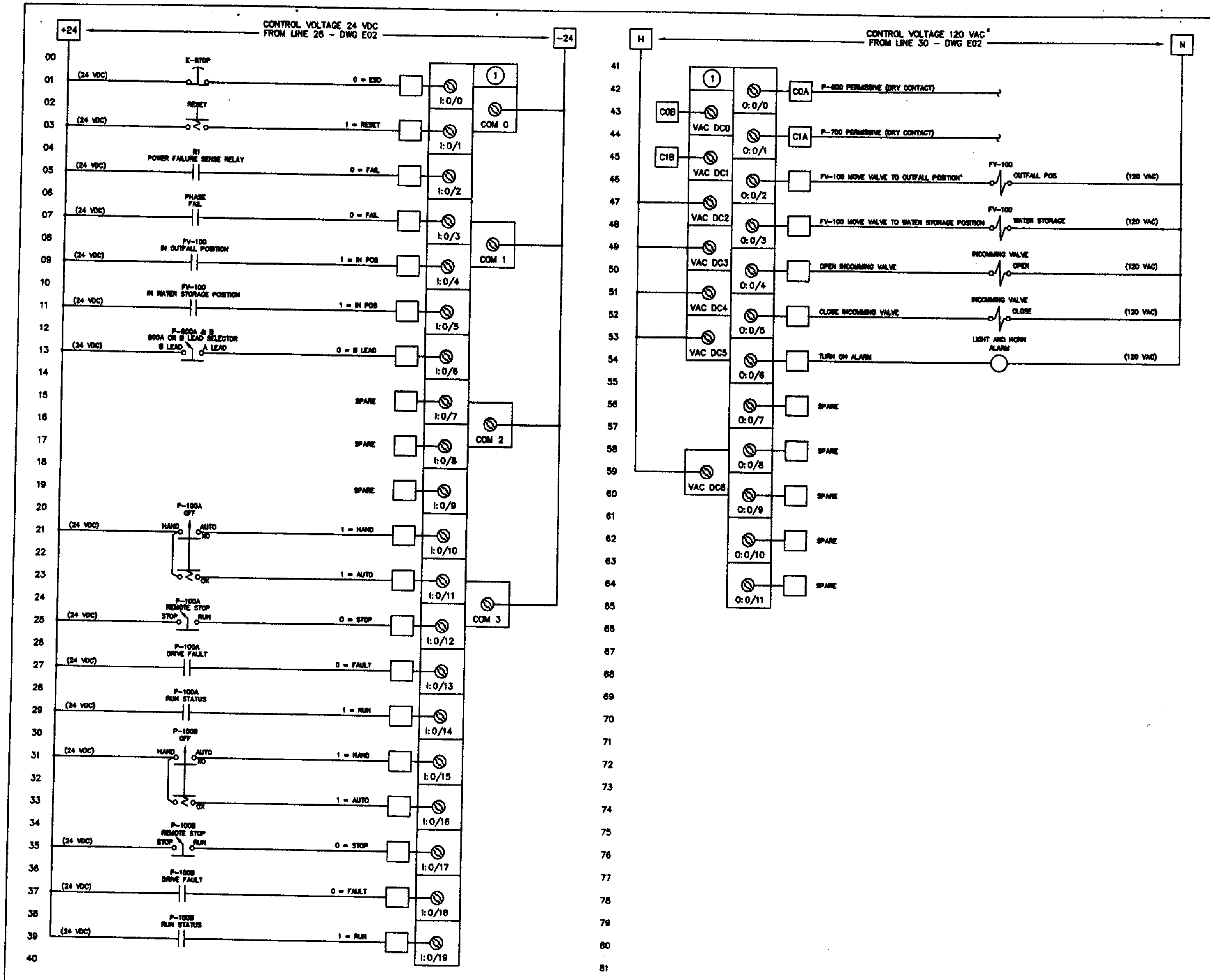
- - - BROKEN LINES INDICATE WIRING BY OTHERS

# INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# B1680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

DRAWN BY: AZ
CHECKED BY:
DO NOT SCALE
DATE: 10-25-11
DWG TITLE: CONTROL POWER SCHEMATIC
DRAWING No.: PLC-E02
REV.



~~ REVISIONS ~~~			
LTR.	DESCRIPTION	DATE	APVD

① AB MICRO LOGIX 1400 BASE UNIT
1766-L32BWA

LEGEND

—— SOLID LINES INDICATE WIRING BY RJS

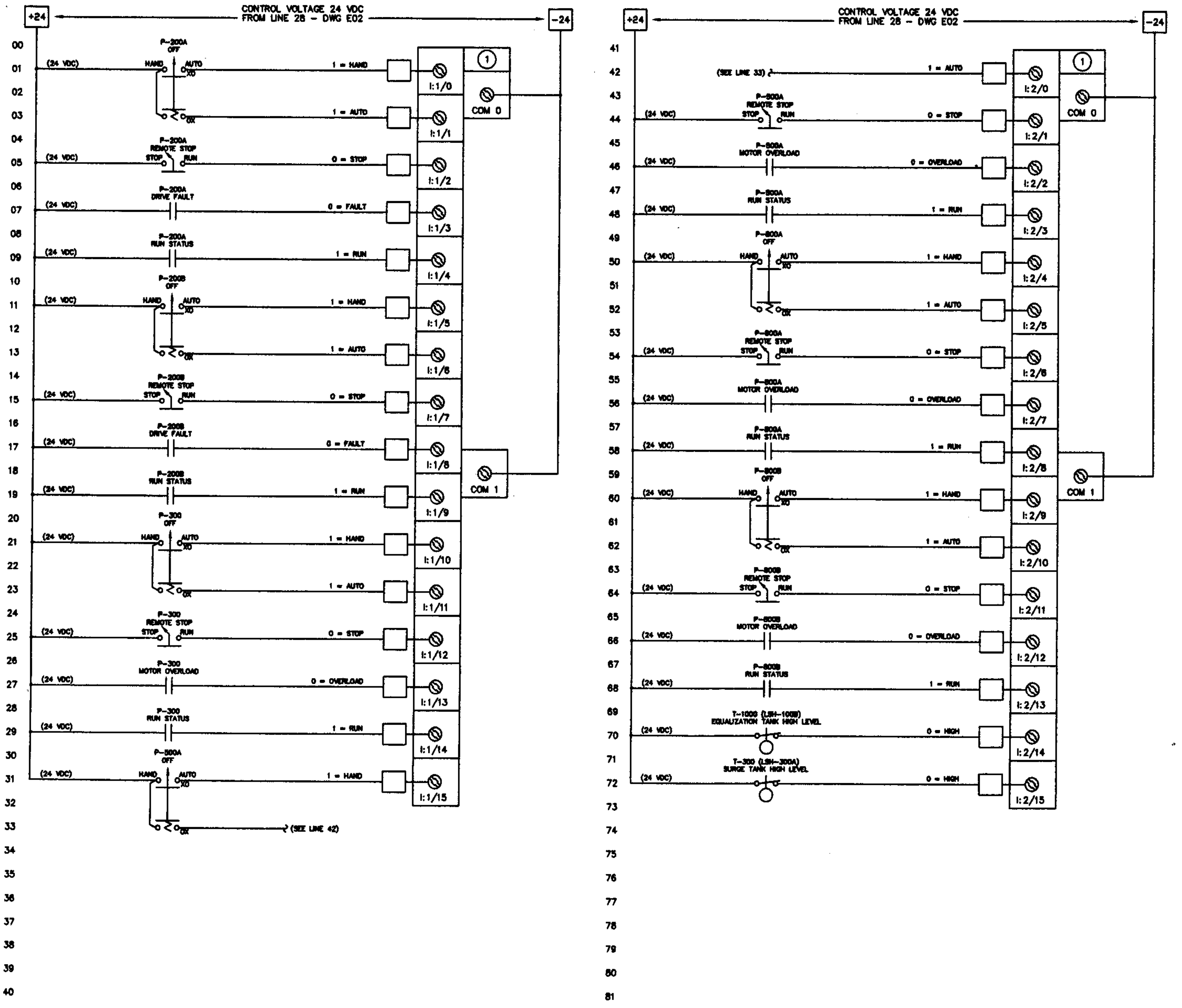
– – BROKEN LINES INDICATE WIRING BY OTHERS

# INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# 81680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

AZ
DO NOT SCALE
10-28-11
I/O SCHEMATIC #1



REVISIONS			
LTR.	DESCRIPTION	DATE	APVD

① (2) AB 24VDC, 16 POINT DIGITAL INPUT CARD 1762-IQ16

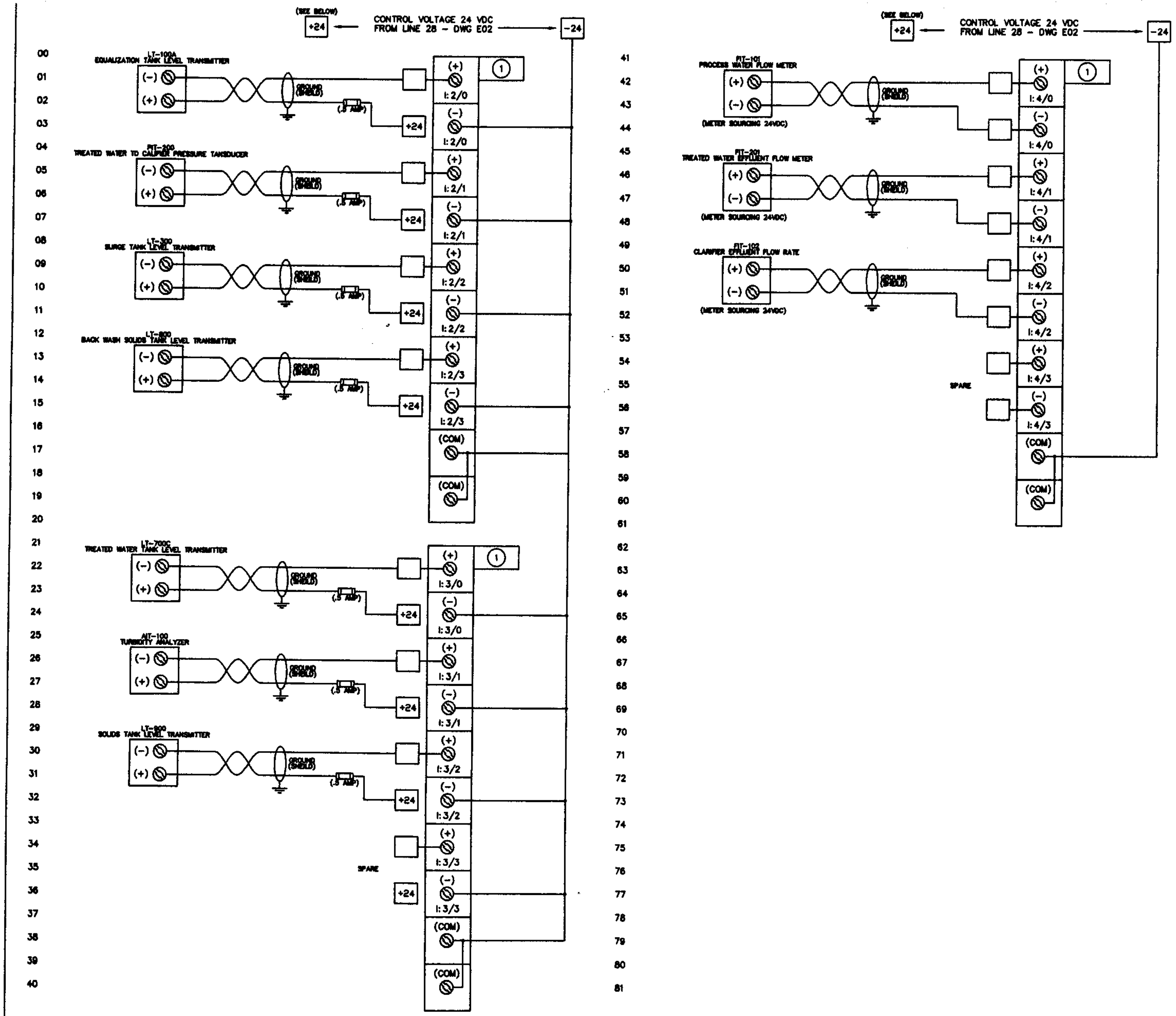
LEGEND

——	SOLID LINES INDICATE WIRING BY RJS
— —	BROKEN LINES INDICATE WIRING BY OTHERS
#	INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# B1680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

AZ
DO NOT SCALE
I/O SCHEMATIC #2
PLC-E04



REVISIONS

LTR.	DESCRIPTION	DATE	APVD

① (3) AB 4 POINT ANALOG INPUT CARD 1762-IF4

LEGEND

—— SOLID LINES INDICATE WIRING BY RJS

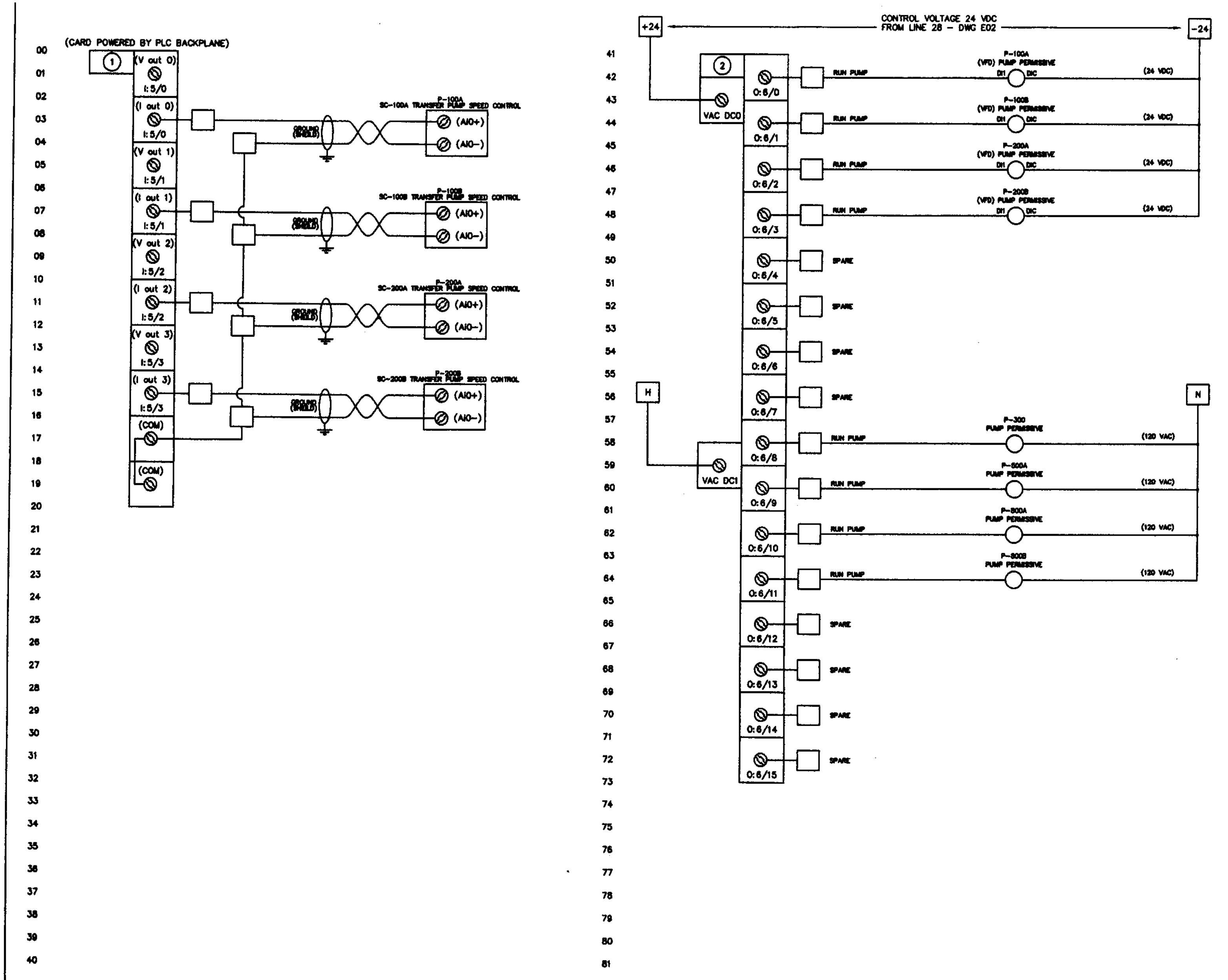
— — BROKEN LINES INDICATE WIRING BY OTHERS

☐ # INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# B1680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

AZ
DO NOT SCALE
10-24-11
I/O SCHEMATIC #3
PLC-E05



REVISIONS

LTR.	DESCRIPTION	DATE	APVD

① AB 4 POINT ANALOG OUTPUT CARD
1762-OF4

② AB 16 POINT RELAY OUTPUT CARD
1762-OW16

LEGEND

- SOLID LINES INDICATE WIRING BY RJS
- BROKEN LINES INDICATE WIRING BY OTHERS
- INDICATES TERMINAL LOCATED IN SUPPLIED PLC PANEL

CUSTOMER: RJS ELECTRIC
CUST INFO: P.O.# 81680
SITE INFO: LOWER PASSAIC RIVER

TEMPEST ENTERPRISES, L.L.C
CONTROLS ENGINEERING
(989) 390-5008 & (989) 370-3351

AZ
DO NOT SCALE
10-28-11
I/O SCHEMATIC #4
PLC-E06

RJS ELECTRIC

WATER TREATMENT SKID

PROGRAMMED BY: TEMPEST ENTERPRISES ENGINEER:
BRIAN THERIAULT 989 390-5008

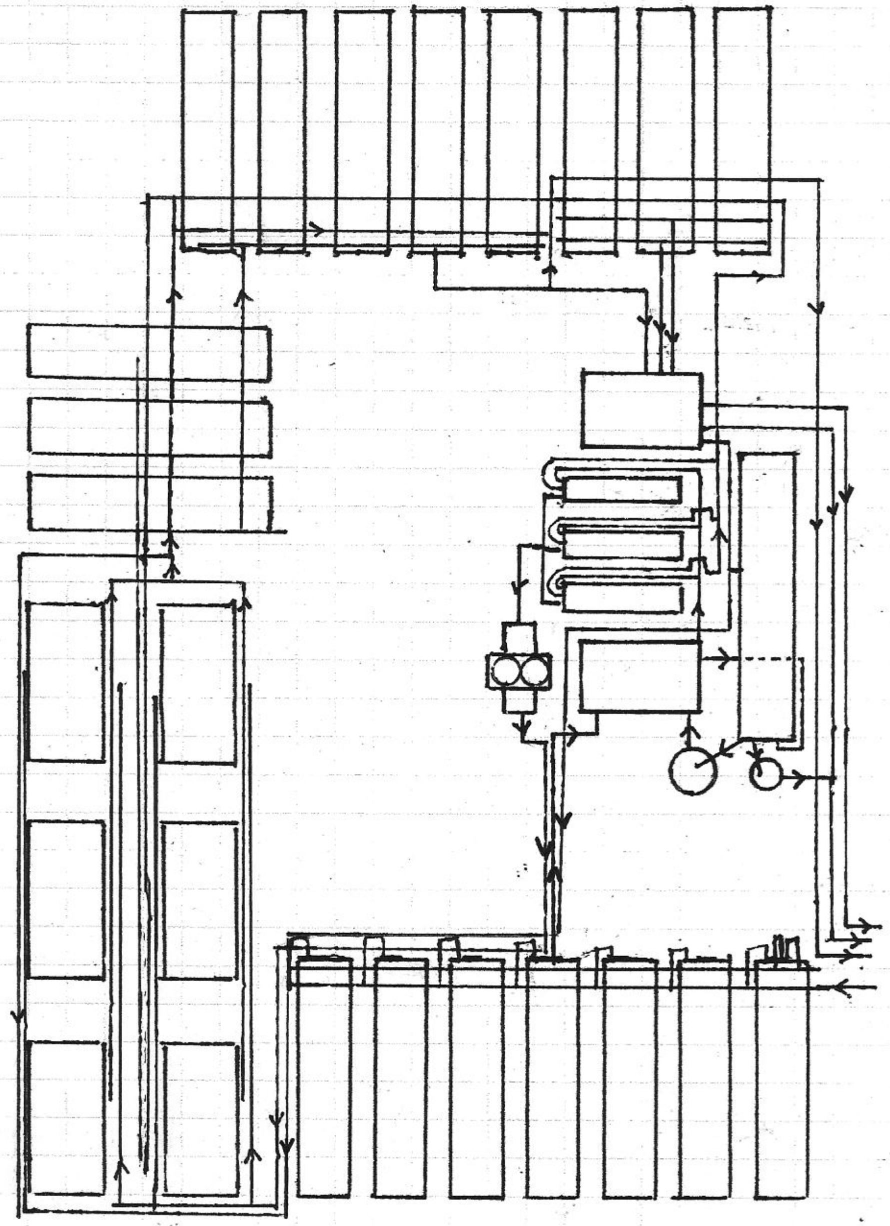
CAUSE & EFFECT MATRIX

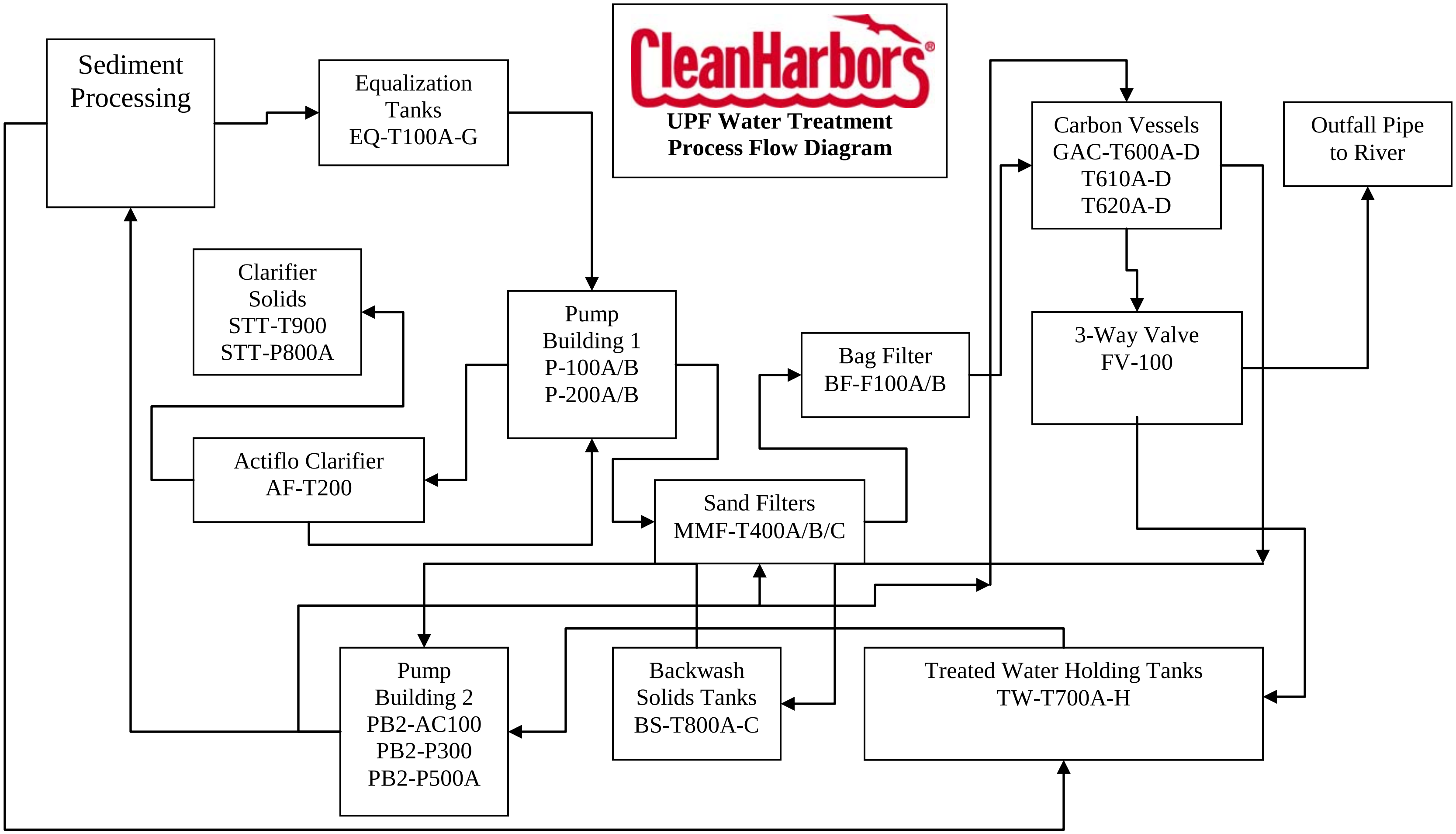
10/28/2011

					DESCRIPTION / ACTION	PUMP PERMISSIVE	PUMP PERMISSIVE	MOVE VALVE TO OUTFALL POSITION	MOVE VALVE TO TREATED WATER STORAGE POS	OPEN INCOMMING VALVE	CLOSE INCOMMING VALVE	LIGHT AND HORN ALARM	SPARE	SPARE	SPARE	SPARE	SPARE	SC-100A TRANSFER PUMP SPEED CONTROL	SC-100B TRANSFER PUMP SPEED CONTROL	SC-200A TRANSFER PUMP SPEED CONTROL	SC-200B TRANSFER PUMP SPEED CONTROL	TRANSFER PUMP PERMISSIVE	TRANSFER PUMP PERMISSIVE	TRANSFER PUMP PERMISSIVE	TRANSFER PUMP PERMISSIVE	SPARE	SPARE	SPARE	SPARE	BACKWASH PUMP PERMISSIVE	SUPERNATANT TRANSFER PUMP PERMISSIVE	PUMP PERMISSIVE	PUMP PERMISIVE	SPARE	SPARE	SPARE	SPARE
					END DEVICE	P-600	P-700	FV-100	FV-100									P-100A	P-100B	P-200A	P-200B	P-100A	P-100B	P-200A	P-200B					P-300	P-500A	P-800A	P-800B				
					PLC Address	O:0.0	O:0.1	O:0.2	O:0.3	O:0.4	O:0.5	O:0.6	O:0.7	O:0.8	O:0.9	O:0.10	O:0.11	O:6.0	O:6.1	O:6.2	O:6.3	O:7.0	O:7.1	O:7.2	O:7.3	O:7.4	O:7.5	O:7.6	O:7.7	O:7.8	O:7.9	O:7.10	O:7.11	O:7.12	O:7.13	O:7.14	O:7.15
TAG	EQUIPMENT	DESCRIPTION / ANNUNCIATE	SET POINT (Scale)	PLC Address	I/O TYPE	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	AO	AO	AO	AO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO
ESD-100		E-STOP	0=ESD	I:0.0	DI	X	X	X	X	X	X	X						X	X	X	X	X	X	X	X					X	X	X	X				
HS-100		RESET	1=RESET	I:0.1	DI																																
ESL-100		POWER FAILURE SENSE RELAY (R1)	0=FAIL	I:0.2	DI	X	X		X		X	X						X	X	X	X	X	X	X	X					X	X	X	X				
ESL-101		PHASE FAIL	0=FAIL	I:0.3	DI	X	X			X	X	X						X	X	X	X	X	X	X	X					X	X	X	X				
ZX1-100	FV-100	IN OUTFALL POSITION	1=IN POS	I:0.4	DI																																
ZX2-100	FV-100	IN TREATED WATER STORAGE POSITION	1=IN POS	I:0.5	DI																																
HS-800_L		P-800A&B LEAD/LAG	1= A LEAD	I:0.6	DI																											X	X				
		SPARE		I:0.7	DI																																
		SPARE		I:0.8	DI																																
		SPARE		I:0.9	DI																																
HS-100A_H	P-100A	HAND	1=HAND	I:0.10	DI													X				X																
HS-100A_A	P-100A	AUTO	1=AUTO	I:0.11	DI													X				X																
HS-100A_R	P-100A	REMOTE STOP	0=STOP	I:0.12	DI													X				X																
FS-100A	P-100A	DRIVE FAULT	0=FAULT	I:0.13	DI							X																								
YI-100A	P-100A	RUN STATUS	1=RUN	I:0.14	DI							X																								
HS-100B_H	P-100B	HAND	1=HAND	I:0.15	DI														X				X															
HS-100B_A	P-100B	AUTO	1=AUTO	I:0.16	DI														X				X															
HS-100B_R	P-100B	REMOTE STOP	0=STOP	I:0.17	DI														X				X															
FS-100B	P-100B	DRIVE FAULT	0=FAULT	I:0.18	DI							X																								
YI-100B	P-100B	RUN STATUS	1=RUN	I:0.19	DI							X																								
HS-200A_H	P-200A	HAND	1=HAND	I:1.0	DI															X				X														
HS-200A_A	P-200A	AUTO	1=AUTO	I:1.1	DI															X				X														
HS-200A_R	P-200A	REMOTE STOP	0=STOP	I:1.2	DI															X				X														
FS-200A	P-200A	DRIVE FAULT	0=FAULT	I:1.3	DI							X																								
YI-200A	P-200A	RUN STATUS	1=RUN	I:1.4	DI							X																								
HS-200B_H	P-200B	HAND	1=HAND	I:1.5	DI																X				X													
HS-200B_A	P-200B	AUTO	1=AUTO	I:1.6	DI																X				X													
HS-200B_R	P-200B	REMOTE STOP	0=STOP	I:1.7	DI																X				X													
FS-200B	P-200B	DRIVE FAULT	0=FAULT	I:1.8	DI							X																								
YI-200B	P-200B	RUN STATUS	1=RUN	I:1.9	DI							X																								
HS-300_H	P-300	HAND	1=HAND	I:1.10	DI																									X							
HS-300_A	P-300	AUTO	1=AUTO	I:1.11	DI																									X							
HS-300_R	P-300	REMOTE STOP	0=STOP	I:1.12	DI																									X							
OS-300	P-300	MOTOR OVERLOADS	0=OVERLOAD	I:1.13	DI							X																								
YI-300	P-300	RUN STATUS	1=RUN	I:1.14	DI							X																								
HS-500A_H	P-500A	HAND	1=HAND	I:1.15	DI																										X						
HS-500A_A	P-500A	AUTO	1=AUTO	I:2.0	DI																										X						
HS-500A_R	P-500A	REMOTE STOP	0=STOP	I:2.1	DI																										X						
OS-500A	P-500A	MOTOR OVERLOADS	0=OVERLOAD	I:2.2	DI							X																								
YI-500A	P-500A	RUN STATUS	1=RUN	I:2.3	DI							X																								
HS-800A_H	P-800A	HAND	1=HAND	I:2.4	DI																											X					
HS-800A_A	P-800A	AUTO	1=AUTO	I:2.5	DI																											X					
HS-800A_R	P-800A	REMOTE STOP	0=STOP	I:2.6	DI																											X					
OS-800A	P-800A	MOTOR OVERLOADS	0=OVERLOAD	I:2.7	DI							X																								
YI-800A	P-800A	RUN STATUS	1=RUN	I:2.8	DI							X																								
HS-800B_H	P-800B	HAND	1=HAND	I:2.9	DI																												X				
HS-800B_A	P-800B	AUTO	1=AUTO	I:2.10	DI																												X				
HS-800B_R	P-800B	REMOTE STOP	0=STOP	I:2.11	DI																												X				
OS-800B	P-800B	MOTOR OVERLOADS	0=OVERLOAD	I:2.12	DI							X																								
YI-800B	P-800B	RUN STATUS	1=RUN	I:2.13	DI							X																								
LSH-100B	T-100G	EQUALIZATION TANK HIGH LEVEL	0=HIGH	I:2.14	DI	X				X	X	X																								
LSH-300A	T-300	SURGE TANK HIGH LEVEL ALARM & SHUTDOWN	0=HIGH	I:2.15	DI							X						X	X			X	X													
LT-100A	T-100G	EQUALIZATION TANK LEVEL TRANSMITTER	0-100%	I:3.0	AI																																
LALL-100A	T-100G	EQUALIZATION TANK LOW LOW LEVEL SHUTDOWN			BIT							X						X	X			X	X													
LAL-100A	T-100G	ENABLE VFD ON P-100X to EQUAL FE-101			BIT													X	X			X	X													
LAH-100A	T-100G	ENABLE VFD ON P-100X to 830 GPM			BIT													X	X			X	X													
LAHH-100A	T-100G	EQUALIZATION TANK HIGH HIGH LEVEL SHUTDOWN			BIT	X	X			X	X	X																								
PIT-200		TREATED WATER TO CALIFIER PRESSURE TRANS		I:3.1	AI																																
PAH-200		TREATED WATER TO CALIFIER PRESS HIGH ALARM			BIT							X																								
PAL-200		TREATED WATER TO CALIFIER PRESS LOW ALARM AND SD			BIT							X						X	X			X	X													
LT-300	T-300	SURGE TANK LEVEL TRANS	0-100%	I:3.2	AI																																
LALL-300	T-300	SURGE TANK LOW LOW SHUTDOWN			BIT							X								X	X			X	X											
LAL-300	T-300	SURGE TANK LOW START			BIT															X	X			X	X											
LAH-300	T-300	SURGE TANK HIGH SHUTDOWN AND ALARM			BIT							X						X	X			X	X													
LT-800	T-800C	BACK WASH SOLIDS TANK LEVEL TRANS	0-100%	I:3.3	AI																																
LAL-800	T-800C	BACK WASH SOLIDS TANK LEVEL LOW ALARM			BIT							X																								
LAH-800	T-800C	BACK WASH SOLIDS TANK LEVEL HIGH ALARM			BIT							X																								
LAHH-800	T-800C	BACK WASH SOLIDS TANK LEVEL HIGH HIGH ALARM & SD			BIT							X																			X							
LT-700A	T-700C	TREATED WATER LEVEL TRANS	0-100%	I:4.0	AI																																
LAL-700A	T-700C	TREATED WATER LEVEL LOW OPEN TREATED			BIT				X																												
LAH-700A	T-700C	TREATED WATER LEVEL HIGH OPEN OUTFALL			BIT			X																													
LAHH-700A	T-700C	TREATED WATER LEVEL HIGH HIGH ALARM			BIT							X																								
LALL-700A	T-700C	TREATED WATER LEVEL LOW LOW ALARM			BIT							X																								
AIT-100		TURBIDITY ANALYZER	0-100%	I:4.1	AI																																
AAL-100		TURBIDITY LOW ALARM			BIT							X																								
AAH-100		TURBIDITY HIGH ALARM			BIT							X																								
LT-900	T-900	SOLIDS TANK LEVEL TRANS	0-100%	I:4.2	AI																																
LAL-900	T-900	BACK WASH SOLIDS TANK LEVEL LOW STOP			BIT																											X	X				
LAH-900	T-900	BACK WASH SOLIDS TANK LEVEL HIGH START			BIT																											X	X				
LAHH-900	T-900	BACK WASH SOLIDS TANK LEVEL HIGH HIGH SHUTDOWN			BIT							X						X	X			X	X													
		SPARE		I:4.3	AI																																
FIT-101	FE-101	PROCESS WATER FLOW METER	3-956 GPM	I:5.0	AI													X	X	X	X																
FIT-201	FE-201	TREATED WATER EFFLUENT FLOW RATE	3-956 GPM	I:5.1	AI																																
FIT-102	FE-102	CLARIFIER EFFLUENT FLOW RATE	3-956 GPM	I:5.2	AI															X	X																
		SPARE		I:5.3	AI																																

Section 5

Treatment System Drawing and Flow Diagram





UPF Water Treatment Process Flow Diagram

Section 6

System Start up Checklist

Clean Harbors
Water Treatment System
Start-up Check List

CHES Operator: ________________________ Date: ___________ Time: ____________
Reason for Previous Shut-Down: ____
Corrective Actions Taken: ____

Step	System ID	Equipment ID	Tasks to Perform	Initial /Notes
01	EQ	EQ-T100A	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Check LE/LT-100A sensor is free of any obstructions.	
02	EQ	EQ- T100B	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
03	EQ	EQ- T100C	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
04	EQ	EQ- T100D	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
05	EQ	EQ- T100E	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
06	EQ	EQ- T100F	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
07	EQ	EQ- T100G	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
08	PB1	PB1	- Ensure inlet and outlet process line valves are open. - Turn on electrical disconnect.	
09	PB1	PB1-P100A	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
10	PB1	PB1-P100B	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
11	AF	AF-T200	- Ensure inlet and outlet pump line valves are open. - Close all sample ports and drains.	

			- Turn on main power. - Set Actiflo PLC to Auto Run. (see Actiflo O&M Manual if applicable) - Check tank levels. - Check Polymer and Coagulant settings.	
12	STT	STT-T900	- Ensure inlet and outlet line valves are open. - Close all sample ports and drains. - Check tank for leaks and punctures. - Check LE/LT-900A sensor is free of any obstructions.	
13	PST	PST-T300	- Ensure inlet and outlet line valves are open. - Close all sample ports and drains. - Check tank for leaks and punctures. - Check LE/LT-300, LS-300B sensors is free of any obstructions.	
14	PB1	PB1-P200A	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto.	
15	PB1	PB1-P200B	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto.	
16	MMF	MMF-T400A	(If skid is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all sand filter tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Set back wash cycle to Auto (see sand filter O&M Manual if applicable)	
17	MMF	MMF-T400B	(If skid is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all sand filter tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Set back wash cycle to Auto (see sand filter O&M Manual if applicable)	
18	MMF	MMF-T400C	(If skid is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all sand filter tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Set back wash cycle to Auto (see sand filter O&M Manual if applicable)	
19	BF	BF-F100A	- Ensure bag filter cover is bolted down and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves.	
20	BF	BF-F100B	- Ensure bag filter cover is bolted down and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves.	
21	GAC	GAC-T600A	(If vessel is on stand-by status, close all influent	

			and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
22	GAC	GAC-T600B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
23	GAC	GAC-T610A	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
24	GAC	GAC-T610B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
25	GAC	GAC-T620A	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
26	GAC	GAC-T620B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
27	GAC	GAC-T600C	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
28	GAC	GAC-T600D	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	

29	GAC	GAC-T610C	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
30	GAC	GAC-T610D	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
31	GAC	GAC-T620A	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
32	GAC	GAC-T620B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	
33	FV	FV-100	- Ensure inlet and outlet line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
34	TW	TW-T700A	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
35	TW	TW-T700B	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves - Check LE/LT-700A sensor is free of any obstructions.	
36	TW	TW-T700C	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
37	TW	TW-T700D	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
38	TW	TW-T700E	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains.	

			- Open Inlet and Outlet butterfly valves	
39	TW	TW-T700F	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
40	TW	TW-T700G	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
41	TW	TW-T700H	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
42	BS	BS-T800A	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
43	BS	BS-T800B	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	
44	BS	BS-T800C	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Check LE/LT-800 sensor is free of any obstructions.	
45	PB2	PB2	- Ensure inlet and outlet process line valves are open. - Turn on electrical disconnect.	
46	PB2	PB2-AC100	- Turn on main power. - Set Compressor PLC to Auto Run. (see Kaeser O&M Manual if applicable)	
47	PB2	PB2-AR-100	- Ensure inlet and outlet air line valves are open.	
48	PB2	PB2-AD-100	- Ensure inlet and outlet air line valves are open.	
49	PB2	PB2-P300	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
50	PB2	PB2-P500A	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	
51	PB2	PB2-P500B	- Ensure manual air supply and inlet and out valves are closed. (Backwash solids transfer conducted by hand when needed.)	

Section 7

Equipment, Material and Electrical Testing Forms

Water Treatment System Equipment/Material Testing Form

Date:	**Test Section:**	**Equipment ID:**

	Test Start Time:	
	Pressure/Flow Testing: Fluid or Air	
	Max Equipment/Material Operating Pressure/GPM:	
	Max Operating Pressure/GPM * 1.33 =______________= Max Testing PSI/GPM	
	Notes:	
	Equipment/Material Testing	**Circle**
01	**Charge line/equipment up too 50% Operating Pressure/GPM** **After 30 Minutes:** **-Leaks?** **-Bulges/deformations?** **-Vibrations?**	**Y/N** **Y/N** **Y/N** **Y/N**
02	**Charge line/equipment up too 100% Operating Pressure/GPM** **After 30 Minutes:** **-Leaks?** **-Bulges/deformations?** **-Vibrations?**	**Y/N** **Y/N** **Y/N** **Y/N**
03	**Charge line/equipment up too 133% Operating Pressure/GPM** **After 30 minutes:** **-Leaks?** **-Bulges/deformations?** **-Vibrations?**	**Y/N** **Y/N** **Y/N** **Y/N**
04	**Maintain line/equipment at 133% Operating Pressure/GPM** **For a maximum of 3 hours** **-Leaks?** **-Bulges/deformations?** **-Vibrations?**	 **Y/N** **Y/N** **Y/N** **Y/N**
05	**After (up too 3 hours) or by engineer approval depressurize line/equipment** **-Leaks?** **-Bulges/deformations?** **-Vibrations?**	 **Y/N** **Y/N** **Y/N** **Y/N**

Test Section: _____________________ Equipment ID:_____________ Pass / Fail

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: _________________Sign: ____________________Date: ________
Arcadis : Print: _________________Sign: ____________________Date: ________

Water Treatment System Electrical Testing Form (Control Panel)

Date:	**Test Section:**	**Equipment ID:**
	Test Start Time:	
	Electrical Tests for Control Panel	**Circle/Notes**
01	Confirm Power coming into the panel Comments:	_______________
02	Engineer approval to power panel. Comments:	_______________
03	Confirm power supplies are working correctly. Comments:	**Y/N**
04	Confirm instrumentation is connected to the correct location in the control panel.	
	1.	**Y/N**
	2.	**Y/N**
	3.	**Y/N**
	4.	**Y/N**
	5.	**Y/N**
	6.	**Y/N**
	7.	**Y/N**
	8.	**Y/N**
	9.	**Y/N**
	10.	**Y/N**
	11.	**Y/N**
	12	**Y/N**
	13.	**Y/N**
	14.	**Y/N**
	15.	**Y/N**
	16	**Y/N**
	17.	**Y/N**
	18.	**Y/N**
	19.	**Y/N**
	20.	**Y/N**

Test Section: _____________________ Equipment ID:_____________ Pass / Fail

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: _________________Sign: ____________________Date: ________
Arcadis : Print: _________________Sign: ____________________Date: ________

Water Treatment System Electrical Testing Form (Instrumentation and Switches)		
Date:	**Test Section:**	**Equipment ID:**

	Test Start Time:	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	**Y/N**
02	Confirm correct power is being supplied to the instrument or switch Comments:	**Y/N**
03	Confirm that the instrument or switch is wired correctly. Comments:	**Y/N**
04	Engineer approval to supply power to instrument. Comments:	________________
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	**Y/N**
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	**Y/N**
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	**Y/N**
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	**Y/N**

Test Section: ______________________ Equipment ID:_____________ Pass / Fail

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: __________________Sign: _____________________Date: ________
Arcadis : Print: __________________Sign: _____________________Date: ________

Water Treatment System Electrical Testing Form (Motor Control Center)		
Date:	**Test Section:**	**Equipment ID:**
	Test Start Time:	
	Electrical Tests for MCC	**Circle/Notes**
01	Confirm that motor starter is connected to the correct motor. Comments:	**Y/N**
02	Confirm motor starter trip settings are correct for the motor that it is controlling. Comments:	**Y/N**
03	Confirm power reading is correct coming into the panel and going to each motor starter. Comments:	**Y/N**

Test Section: ______________________ Equipment ID:_____________ Pass / Fail

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: __________________Sign: _____________________Date: ________
Arcadis : Print: __________________Sign: _____________________Date: ________

Water Treatment System Electrical Testing Form (Pumps and Compressor)

Date:	**Test Section:**	**Equipment ID:**

	Test Start Time:	
	Pressure/Flow Testing: Fluid or Air	
	Max Equipment/Material Operating Pressure/GPM:	
	Max Operating Pressure/GPM * 1.33 =______________= Max Testing PSI/GPM	
	Notes:	
	Electrical Tests for Pumps and Compressor	**Circle/Notes**
01	Confirm that Pump has Been wired correctly. What is the power requirement?	**Y/N** ________________
02	What are the Mega ohms of the power cable from the MCC to the Pump? Is the reading per Arcadis Specifications?	________________ **Y/N**
03	What is the Pre-Start-Up Electrical Power Reading? What is the power requirement?	________________ ________________
04	What is the Pre-Start-Up Mega Ohhm Reading? What is the manufacturer requirement?	________________ ________________
05	Engineer approval prior to start-up.	________________
06	Is the pump direction correct?	**Y/N**
07	Is VFD controller working correctly?	**Y/N**
08	Conduct VFD operation in “hand” check. Is it working correctly?	**Y/N**
09	Conduct VFD operation in “auto” check. Is it working correctly?	**Y/N**
10	Confirm “remote run switch” is working correctly?	**Y/N**
11	Confirm “HOA” is working correctly?	**Y/N**

Test Section: ______________________ Equipment ID:_____________ Pass / Fail

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer’s and contractor’s approval.

Clean Harbors Print: __________________Sign: _____________________Date: ________
Arcadis : Print: __________________Sign: _____________________Date: ________

Section 8

Equipment, Material and Electrical Deficiency Form

Water Treatment System Deficiency Report		
Date:	**Test Number:**	**Equipment ID:**

01	**Equipment Model:**	
02	**Equipment Size:**	
03	**Location of Equipment:**	
04		
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	**Y/N**
07	**Was the equipment/material installed correctly?**	**Y/N**
08	**Was the equipment/material set-up correctly?**	**Y/N**
09	**Was the equipment/material affected by another piece of equipment?**	**Y/N**
10	**Corrective Actions:**	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: ____________________Sign: ______________________Date: _________
Arcadis : Print: ____________________Sign: ______________________Date: _________

Section 9

Fall 2011 Testing and Deficiency Forms

Clean Harbors
Water Treatment System
Start-up Check List

CHES Operator: Justin L's Date: 12/12/11 Time: 0800 - 1130
Reason for Previous Shut-Down: NA / Filling EQ A - E with 100,000 from Sec 2
Corrective Actions Taken: Please See mechanical and Electrical testin forms

All inlet
Hose gasket's
For A, B, C, D, E
Need To Be Replaced
With New one's
They all leak A
Little.

Step	System ID	Equipment ID	Tasks to Perform	Initial /Notes
01	EQ	EQ-T100A	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Check LE/LT-100A sensor is free of any obstructions.	JL MAP JL MAP JL *outlets closed JL
02	EQ	EQ- T100B	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	JL MAP JL JL x outlet closed JL
03	EQ	EQ- T100C	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	JL MAP JL JL x outlet closed JL
04	EQ	EQ- T100D	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	JL MAP JL JL outlet closed
05	EQ	EQ- T100E	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	JL MAP JL JL outlet closed
06	EQ	EQ- T100F	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	JL JL JL outlet closed
07	EQ	EQ- T100G	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	JL JL JL outlet closed
08	PB1	PB1	- Ensure inlet and outlet process line valves are open. - Turn on electrical disconnect.	JL 12/14 JL 12/14
09	PB1	PB1-P100A	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	JL 12/14 JL 12/14
10	PB1	PB1-P100B	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	JL 12/14 JL 12/14
11	AF	AF-T200	- Ensure inlet and outlet pump line valves are open. - Close all sample ports and drains.	JL 12/13 JL 12/13

MAP

			- Turn on main power. - Set Actiflo PLC to Auto Run. (see Actiflo O&M Manual if applicable) - Check tank levels. - Check Polymer and Coagulant settings.	NA NA JL 12/13 NA
12	STT	STT-T900	- Ensure inlet and outlet line valves are open. - Close all sample ports and drains. - Check tank for leaks and punctures. - Check LE/LT-900A sensor is free of any obstructions.	JL 12/13 JL 12/13 JL 12/13 JL 12/13
13	PST	PST-T300	- Ensure inlet and outlet line valves are open. - Close all sample ports and drains.. - Check tank for leaks and punctures. - Check LE/LT-300, LS-300B sensors is free of any obstructions.	JL 12/13 JL 12/13 JL 12/13 JL 12/13
14	PB1	PB1-P200A	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto.	JL 12/14 JL 12/15
15	PB1	PB1-P200B	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto.	JL 12/14 JL 12/15
16	MMF	MMF-T400A	(If skid is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all sand filter tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Set back wash cycle to Auto (see sand filter O&M Manual if applicable)	NA JL 12/15 JL 12/15 JL 12/15 JL 12/16 Power board broken
17	MMF	MMF-T400B	(If skid is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all sand filter tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Set back wash cycle to Auto (see sand filter O&M Manual if applicable)	JL 12/15 JL 12/15 JL 12/15 JL 12/15 JL 12/16
18	MMF	MMF-T400C	(If skid is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all sand filter tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves. - Set back wash cycle to Auto (see sand filter O&M Manual if applicable)	JL 12/15 JL 12/15 JL 12/15 JL 12/15 JL 12/16
19	BF	BF-F100A	- Ensure bag filter cover is bolted down and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves.	JL 12/12 JL 12/12 JL 12/12
20	BF	BF-F100B	- Ensure bag filter cover is bolted down and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves.	JL 12/12 JL 12/12 JL 12/12
21	GAC	GAC-T600A	(If vessel is on stand-by status, close all influent	NA 12/12

			and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	JL 12/13 JL 12/13 JL 12/13 JL 12/13
22	GAC	GAC-T600B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	NA JL 12/13 JL 12/13 JL 12/13
23	GAC	GAC-T610A	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	NA JL 12/13 JL 12/13 JL 12/13 JL 12/13
24	GAC	GAC-T610B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	NA JL 12/13 JL 12/13 JL 12/13 JL 12/13
25	GAC	GAC-T620A	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	NA JL 12/13 JL 12/13 JL 12/13 JL 12/13
26	GAC	GAC-T620B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	NA JL 12/13 JL 12/13 JL 12/13 JL 12/13
27	GAC	GAC-T600C	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	NA JL 12/13 JL 12/13 JL 12/13 JL 12/13
28	GAC	GAC-T600D	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	NA JL 12/13 JL 12/13 JL 12/13 JL 12/13

29	GAC	GAC-T610C	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	NA JL 12/13 JL 12/13 JL 12/13 JL 12/13	
30	GAC	GAC-T610D	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	NA JL 12/13 JL 12/13 JL 12/13 JL 12/13	
31	GAC	GAC-T620A	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	NA JL 12/13 JL 12/13 JL 12/13 JL 12/13	
32	GAC	GAC-T620B	(If vessel is on stand-by status, close all influent and effluent valves) Otherwise: - Ensure all GAC tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. -Close valves for backwash inlet and outlets. - Open Inlet and Outlet butterfly valves.	NA JL 12/13 JL 12/13 JL 12/13 JL 12/13	
33	FV	FV-100	- Ensure inlet and outlet line valves are open. - Ensure Hand/Off/Auto switch is on Auto	JL 12/15 JL 12/15	Outlet orientated incorrectly
34	TW	TW-T700A	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	JL 12/13 JL 12/13 JL outlets closed 12/13	
35	TW	TW-T700B	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves - Check LE/LT-700A sensor is free of any obstructions.	JL 12/13 JL 12/13 JL 12/13 JL 12/13	outlets closed
36	TW	TW-T700C	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	JL 12/13 JL 12/13 JL 12/13	outlets closed
37	TW	TW-T700D	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	NA JL 12/14 JL 12/14 JL 12/14	
38	TW	TW-T700E	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains.	NA JL 12/14 JL 12/14	

			- Open Inlet and Outlet butterfly valves	JL 12/14
39	TW	TW-T700F	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	NA JL 12/14 JL 12/14 JL 12/14
40	TW	TW-T700G	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	NA JL 12/14 JL 12/14 JL 12/14
41	TW	TW-T700H	(If in continuous discharge close inlet and outlet valves.) If in batch discharge: - Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	NA JL 12/14 JL 12/14 JL 12/14
42	BS	BS-T800A	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	JL 12/13 JL 12/13 JL 12/13 outlets closed
43	BS	BS-T800B	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - Open Inlet and Outlet butterfly valves	JL 12/13 JL 12/13 JL 12/13 outlets close senor checked.
44	BS	BS-T800C	- Ensure all tank bulkheads and man ways are shut and water tight. - Close all sample ports and drains. - ~~Open Inlet and Outlet~~ butterfly valves. - Check LE/LT-800 sensor is free of any obstructions.	JL 12/13 JL 12/13 JL 12/13
45	PB2	PB2	- Ensure inlet and outlet process line valves are open. - Turn on electrical disconnect.	JL 12/15 JL 12/15
46	PB2	PB2-AC100	- Turn on main power. - Set Compressor PLC to Auto Run. (see Kaeser O&M Manual if applicable)	JL 12/15 JL 12/16
47	PB2	PB2-AR-100	- Ensure inlet and outlet air line valves are open.	JL 12/15
48	PB2	PB2-AD-100	- Ensure inlet and outlet air line valves are open.	JL 12/15
49	PB2	PB2-P300	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	JL 12/15 JL 12/15
50	PB2	PB2-P500A	- Ensure inlet and outlet pump line valves are open. - Ensure Hand/Off/Auto switch is on Auto	JL 12/15 JL 12/15
51	PB2	PB2-P500B	- Ensure manual air supply and inlet and out valves are closed. (Backwash solids transfer conducted by hand when needed.)	JL 12/15

Clean Harbors Water Treatment System
Mechanical Equipment Check List

Clean Harbors' Inspection Conducted By: Justin Lis Date: 12/12/11
Arcadis Inspection Conducted By: ______ Date: ______
Weather: 30°- 38° Sunny
Notes:

Equipment ID		Equipment Installed	Y/N	Equipment Inlet Process Connection	Y/N	Equipment Outlet Process Connection	Y/N
EQ	EQ-T100A	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
EQ	EQ-T100B	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
EQ	EQ-T100C	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
EQ	EQ-T100D	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
EQ	EQ-T100E	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
EQ	EQ-T100F	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
EQ	EQ-T100G	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
PB1	PB1	18' x 8' x 7.5' Building	[✓ Y]/N	(2) 8" Process Lines	[✓ Y]/N	(2) 8" Process Lines	[✓ Y]/N
PB1	PB1-P100A	20 HP Pump EQ Transfer Pump	[✓ Y]/N	(1) 8" Process Line x 6" Inlet	[✓ Y]/N	(1) 4" Outlet x 8" Process Line	[✓ Y]/N
PB1	PB1-P100B	20 HP Pump EQ Transfer Pump	[✓ Y]/N	(1) 8" Process Line x 6" Inlet	[✓ Y]/N	(1) 4" Outlet x 8" Process Line 14" JL	[✓ Y]/N
AF	AF-T200	ActiFlo Primary Clarifier	[✓ Y]/N	(1) 8" Process Line x 10" Inlet	[✓ Y]/N	(1) ~~12"~~ Flange x 10" Process Line (1) 2" Flange x 2" Gravity Line	[✓ Y]/N
STT	STT-T900	Solids Transfer Tank 1000 Gallon Poly Tank	[✓ Y]/N	(1) 2" Gravity Line Inlet	[✓ Y]/N	(1) 2" Outlet Solids Line	[✓ Y]/N
PST	PST-T300	Process Surge Tank 2500? Gallon Poly Tank 3000 JL	[✓ Y]/N	(1) 8" Inlet x 10" Gravity Process Line	[✓ Y]/N	(1) 6" Outlet x ~~8"~~ 6" Process Line	[✓ Y]/N
PB1	PB1-P200A	40 HP Pump PST-T300 Transfer Pump	[✓ Y]/N	(1) 8" Process Line x 6" Inlet	[✓ Y]/N	(1) 4" Outlet x 8" Process Line	[✓ Y]/N
PB1	PB1-P200B	40 HP Pump PST-T300 Transfer Pump	[✓ Y]/N	(1) 8" Process Line x 6" Inlet	[✓ Y]/N	(1) 4" Outlet x 8" Process Line	[✓ Y]/N
MMF	MMF-T400A	1000 GPM Sand Filter Skid	[✓ Y]/N	(1) 6" Flange x 8" Process Header (1) 6" Inlet x 8" Clarified Backwash Line	[✓ Y]/N	(1) 6" Outlet x 8" Process Header (1) 4" Flange x 4" Backwash Line	[✓ Y]/N
MMF	MMF-T400B	1000 GPM Sand Filter Skid	[✓ Y]/N	(1) 6" Flange x 8" Process Header (1) 6" Inlet x 8" Clarified Backwash Line	[✓ Y]/N	(1) 6" Outlet x 8" Process Header (1) 4" Outlet x 4" Backwash Line	[✓ Y]/N
MMF	MMF-T400C	1000 GPM Sand Filter Skid	[✓ Y]/N	(1) 6" Flange x 8" Process Header (1) 6" Inlet x 8" Clarified Backwash Line	[✓ Y]/N	(1) 6" Outlet x 8" Process Header (1) 4" Outlet x 4" Backwash Line	[✓ Y]/N
BF	BF-F100A	1600 GPM 8 Bag Filter	[✓ Y]/N	(1) 6" Inlet x 8" Process Header	[✓ Y]/N	(1) 6" Outlet x 8" Process Header	[✓ Y]/N

BF	BF-F100B	1600 GPM 8 Bag Filter	[✓ Y]/N	(1) 6" Inlet x 8" Process Header	[✓ Y]/N	(1) 6" Outlet x 8" Process Header	[✓ Y]/N
GAC	GAC-T600A	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4" Inlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N	(1) 4" Outlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T600B	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4" Inlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N	(1) 4" Outlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T610A	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4" Inlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N	(1) 4" Outlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T610B	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4" Inlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N	(1) 4" Outlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T620A	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4" Inlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N	(1) 4" Outlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T620B	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4" Inlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N	(1) 4" Outlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T600C	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4" Inlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N	(1) 4" Outlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T600D	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4" Inlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N	(1) 4" Outlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T610C	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4" Inlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N	(1) 4" Outlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T610D	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4" Inlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N	(1) 4" Outlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T620A	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4" Inlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N	(1) 4" Outlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T620B	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4" Inlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N	(1) 4" Outlet x 8" Process Header (1) 3" Inlet x 4" Clarified Backwash Line	[✓ Y]/N
FV	FV-100	3-Way Flow Valve and Actuator	[✓ Y]/N	(1) 8" Process Line	[✓ Y]/N	(2) 8" Outlet Process Lines	[✓ Y]/N
TW	TW-T700A	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
TW	TW-T700B	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
TW	TW-T700C	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
TW	TW-T700D	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
TW	TW-T700E	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
TW	TW-T700F	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
TW	TW-T700G	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
TW	TW-T700H	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N

BS	BS-T800A	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
BS	BS-T800B	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
BS	BS-T800C	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
PB2	PB2	18' x 8' x 7.5' Building	[✓ Y]/N	(3) Process Lines (~~8"~~,4" & 3") 4" sc	Y/N	(4) Process Lines (~~8"~~, 3", 3" & ¾") 4" sc	[✓ Y]/N
PB2	PB2-AC100	25 HP Air Compressor	[✓ Y]/N	NA	Y/N	(1) ¾" Air Line	[✓ Y]/N
PB2	PB2-AR-100	Air Receiver Tank	[✓ Y]/N	(1) ¾" Air Line	[✓ Y]/N	(1) ¾" Air Line (1) ½" Drain	[✓ Y]/N
PB2	PB2-AD-100	Desiccant Air Dryer	[✓ Y]/N	(1) ¾" Air Line	[✓ Y]/N	(1) ¾" Air Line (1) ½" Drain	[✓ Y]/N
PB2	PB2-P300	15 HP SF & GAC Clarified Backwash Pump	[✓ Y]/N	(1) 8" Transfer Line x 4" Inlet	[✓ Y]/N	(1) 3" Outlet x 8" Transfer Line	[✓ Y]/N
PB2	PB2-P500A	2.25 HP Backwash Supernatant Transfer Pump	[✓ Y]/N	(1) ~~8"~~ Transfer Line x 4" Inlet 4" sc	[✓ Y]/N	(1) 3" Outlet x 4" Transfer Line	[✓ Y]/N
PB2	PB2-P500B	100 scfm Backwash SolidsTransfer Pump	[✓ Y]/N	(1) 3" Transfer Line x 3" Inlet	[✓ Y]/N	(1) 3" Outlet x 3" Transfer Line	[✓ Y]/N

1 Solids
1 Super-natant

Deficiency:

- 1. Leaks observed at 4" hoses
on tanks (T100A,B,D,F G)
~~2.~~ (T700A,C,D,G)(T800C)
- 2 Sandfilter's control box
~~3.~~ not operating.
- Sandfilter pressure relief
~~4.~~ Valves leaking.
- (3) Carbon vessels leaking
~~5.~~
~~6.~~
-
~~7.~~
~~8.~~
~~9.~~

Corrective Actions:

1. - New 4" hose gaskets installed.
New hose will be mobilized in Spring.
~~2.~~
- New control boxs are to
3. be installed in Spring.
- New pressure relief valves
4. being ordered and installed in spring.
- Calgon tightened bolts to stop
5. all leaks but 2. new Flanges
and 1 Section of pipe to be
6. installed in Spring.
7.
8.
9.

Notes:

I certify that all mechanical equipment included on this checklist has been supplied and installed per contract specifications and by acceptance of the Engineer (Arcadis).

Clean Harbors Print: Justin Lir Sign: Date: 12/13/11
Arcadis : Print: Mike Pelenski Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/13/11	Test Number:	Equipment ID: T100A-G Inlets
01	Equipment Model: Cam lock hose	
02	Equipment Size: 4"	
03	Location of Equipment: Inlets to frac tanks	
04		
05		
	Questions	
06	Is the equipment/material provided per the specification?	[✓ Y]/N
07	Was the equipment/material installed correctly?	[✓ Y]/N
08	Was the equipment/material set-up correctly?	[✓ Y]/N
09	Was the equipment/material affected by another piece of equipment?	Y/[✓ N]
10	Corrective Actions: Hose connections leaked. Corrective Actions were replacing 4" hose gaskets with new ones. Also new hose will be used in spring.	
11	Notes: The new hose gaskets worked to stop the leaks at the cam fittings. However new hoses will be utilized in the spring.	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Date: 12/19/11
Arcadis : Print: Mike Pelenski Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/19/11	**Test Number:**	**Equipment ID:** T700 Inlet header

01	**Equipment Model:** 8" PVC Flange
02	**Equipment Size:** 8"
03	**Location of Equipment:** Flange on Inlet header between
04	tanks T700C and T700D.
05	

Questions

06	**Is the equipment/material provided per the specification?**	[✓ Y] N
07	**Was the equipment/material installed correctly?**	[✓ Y] N
08	**Was the equipment/material set-up correctly?**	[✓ Y] N
09	**Was the equipment/material affected by another piece of equipment?**	Y [✓ N]
10	**Corrective Actions:** Flange was tightened. No leaks observed after.	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justinlis Sign: Date: 12/19/11
Arcadis : Print: Sign: MAT Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/16/11		**Test Number:**	**Equipment ID:** T700 outlet to SecI
01	**Equipment Model:** PVC SCH-80 Tee		
02	**Equipment Size:** 8"		
03	**Location of Equipment:** Tee located between T700C and		
04	T700D.		
05			
	Questions		
06	**Is the equipment/material provided per the specification?**	[✓ Y]N	
07	**Was the equipment/material installed correctly?**	[✓ Y]N	
08	**Was the equipment/material set-up correctly?**	[✓ Y]N	
09	**Was the equipment/material affected by another piece of equipment?**	Y[✓ N]	
10	**Corrective Actions:** The Tee needs to be cut out and a new one glued back in. This will be performed in Spring due to the need of this line to be used by Arcadis to send water back to SecI.		
11	**Notes:**		

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Date: 12/19/11

Arcadis : Print: Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/13/11	**Test Number:**	**Equipment ID:** T100F (2880)

01	**Equipment Model:** 21,000 gal Frac Tank	
02	**Equipment Size:**	
03	**Location of Equipment:**	
04		
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	Y/[✓ N]
10	**Corrective Actions:** The header for outlet leaked. The corrective action was to clean the threads and tighten again. Leak Fixed,	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Date: 12/13/11
Arcadis : Print: Sign: MAF Date: 12/20/11

Water Treatment System Deficiency Report		
Date: 12/15/11	**Test Number:**	**Equipment ID:** 8" Collar
01	**Equipment Model:** PVC SCH-80 Collar after FU-100	
02	**Equipment Size:**	
03	**Location of Equipment:** adjacent to FU-100 valve	
04		
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	Y/[✓ N]
10	**Corrective Actions:** The collar will need to be cut out and re installed. This will be performed in spring due to the need to use this line to drain the system.	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Date: 12/19/11
Arcadis : Print: Sign: MAF Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/15/11	**Test Number:**	**Equipment ID:** Actiflo Inlet

01	**Equipment Model:** PVC-SCH-80 Elbow	
02	**Equipment Size:** 10"	
03	**Location of Equipment:** Just before inlet Flange on	
04	west end of trailer.	
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	Y/[✓ N]
10	**Corrective Actions:** The Elbow will need to be cut out and reinstalled in spring. This will be done by Crown Solutions in conjunction with the system start-up.	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Justin Lis Date: 12/19/11

Arcadis : Print: Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/15/11	**Test Number:**	**Equipment ID:** P100 A Inlet

01	**Equipment Model:** PVC SCH-80	
02	**Equipment Size:** 8" - 6"	
03	**Location of Equipment:** North Side of pump building	
04	# 7	
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	Y/[✓ N]
10	**Corrective Actions:** The 8" by 6" reducer was cut out and replaced. This corrected the leak.	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Justin Lis Date: 12/14/11

Arcadis : Print: __________ Sign: __________ Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/15/11	**Test Number:**	**Equipment ID:** P100 A outlet

01	**Equipment Model:** PVC SCH-80	
02	**Equipment Size:** 8" → 4"	
03	**Location of Equipment:** Header is located above	
04	pump 100 A.	
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	Y/[✓ N]
10	**Corrective Actions:** The 8-4 reducer will need to be cut out and replaced in spring.	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Date: 12/19/11
Arcadis : Print: Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/15/11	**Test Number:**	**Equipment ID:** FIT 102 3"-8"

01	**Equipment Model:** PVC SCH-80	
02	**Equipment Size:** 3" - 8" reducer	
03	**Location of Equipment:** The 3-8 reducer is inbetween	
04	the sand filters and pump building #1.	
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	Y/[✓ N]
10	**Corrective Actions:** The 3x8 reducer will need to be cut out and replaced. This will occur in spring in conjunction with the FIT 102 re Install.	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: ________ Date: 12/19/11

Arcadis : Print: ________ Sign: ________ Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/16/11	**Test Number:**	**Equipment ID:** Bag Filter B
01	**Equipment Model:** 8 bag Filter	
02	**Equipment Size:** 1600 GPM 6" x 6"	
03	**Location of Equipment:** north of pump building #1	
04		
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y] N
07	**Was the equipment/material installed correctly?**	[✓ Y] N
08	**Was the equipment/material set-up correctly?**	[✓ Y] N
09	**Was the equipment/material affected by another piece of equipment?**	Y [✓ N]
10	**Corrective Actions:** The leaking nipple was tightened which corrected the leak.	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Li Sign: Date: 12/19/11
Arcadis : Print: Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/15/11	**Test Number:**	**Equipment ID:** Elbow

01	**Equipment Model:** PVC SCH-80	
02	**Equipment Size:** 8"	
03	**Location of Equipment:** Elbow is located after bag	
04	filters but before carbon Inlet. The Elbow	
05	is adjacent to T1006	
	Questions	
06	**Is the equipment/material provided per the specification?**	**[✓ Y]/N**
07	**Was the equipment/material installed correctly?**	**[✓ Y]/N**
08	**Was the equipment/material set-up correctly?**	**[✓ Y]/N**
09	**Was the equipment/material affected by another piece of equipment?**	**Y/[✓ N]**
10	**Corrective Actions:** The Elbow will be cut out and Replaced In Spring,	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: ________ Date: 12/19/11

Arcadis : Print: ________ Sign: ________ Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/16/11 | **Test Number:** | **Equipment ID:** GAC 361

01	**Equipment Model:** Dual MoD	
02	**Equipment Size:** (2) 20,000 lb	
03	**Location of Equipment:** Slurry ports on bottom of	
04	tank.	
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	Y/[✓ N]
10	**Corrective Actions:** New gaskets have been ordered and will be replaced by Calgon.	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Date: 12/19/11
Arcadis : Print: Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/15/11	**Test Number:**	**Equipment ID:** 8" Collar

01	**Equipment Model:** PVC SCH-80	
02	**Equipment Size:** 8"	
03	**Location of Equipment:** Collar located between GACS	
04	2 and 3 on train 1	
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	Y/[✓ N]
10	**Corrective Actions:** The 8" Collar will need to cut out and replaced.	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Justin Lis Date: 12/19/11
Arcadis : Print: ____________ Sign: ____________ Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/16/11	**Test Number:**	**Equipment ID:** GAC 378

01	**Equipment Model:** Dual Mod	
02	**Equipment Size:** (2) 20,000 lb	
03	**Location of Equipment:** Flange located ontop of vessel	
04		
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	Y/[✓ N]
10	**Corrective Actions:** The leaking Flange was tightened and stopped the leak	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Date: 12/19/11

Arcadis : Print: Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/15/11 | **Test Number:** | **Equipment ID:** MMF Sand Filters

01 **Equipment Model:** 1000 GPM Sand Filter Skids

02 **Equipment Size:**

03 **Location of Equipment:** ~~Sa~~ Sand Filters are located between

04 pump building 1+2. The pressure relief valves are

05 located above the sand filters.

Questions

06 **Is the equipment/material provided per the specification?** [✓ Y]/N

07 **Was the equipment/material installed correctly?** [✓ Y]/N

08 **Was the equipment/material set-up correctly?** [✓ Y]/N

09 **Was the equipment/material affected by another piece of equipment?** Y/[✓ N]

10 **Corrective Actions:** The 6 leaky pressure relief valves will be replaced with new valves in the spring.

11 **Notes:**

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Date: 12/19/11
Arcadis : Print: Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/15/11	**Test Number:**	**Equipment ID:** MMF Sandfilters

01	**Equipment Model:** 1000 GPm Sandfilters	
02	**Equipment Size:**	
03	**Location of Equipment:** Sand Filters located between	
04	pump buildings 1 + 2. The control boxes	
05	are in the middle of each Skid.	
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	Y/[✓ N]
10	**Corrective Actions:** The electrical logic boards that control the back wash cycles were discovered to have been damaged in transit when powered for the test. New control boxes are being ordered and will be installed in the spring.	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Date: 12/19/11
Arcadis : Print: Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/15/11 **Test Number:** **Equipment ID:** GAC 3013

01	**Equipment Model:** Dual Module	
02	**Equipment Size:** (2) 20,000 lb	
03	**Location of Equipment:** 4" 45° on Fresh water inlet	
04	for backwash.	
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	Y/[✓ N]
10	**Corrective Actions:** The PVC 45' will be cut out and Replaced in Spring.	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Date: 12/19/11
Arcadis : Print: Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/15/11 | **Test Number:** | **Equipment ID:** GAC 364

01	**Equipment Model:** Dual Module
02	**Equipment Size:** (2) 20,000 lb
03	**Location of Equipment:** 4" pvc Tee on influent backwash
04	line
05	
	Questions

06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	Y/[✓ N]
10	**Corrective Actions:** The 4" pvc Tee will be cut out and replaced in the Spring.	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Date: 12/19/11
Arcadis : Print: Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/16/11	**Test Number:**	**Equipment ID:** P500 B

01	**Equipment Model:** 4" PVC 90° Influend to Diaphram pump	
02	**Equipment Size:** 4"	
03	**Location of Equipment:** pump building#2	
04		
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	[✓ Y]/~~N~~
10	**Corrective Actions:** The 90° will be cut out and the line will be replaced with a 3" camlock hose to dampen the force from the DD pump.	
11	**Notes:** The DD Pump pulled the PVC pipe apart at the 90° Elbow. CHES will increase the size of hose so that the PVC will not see any more force from the pump,	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Date: 12/19/11
Arcadis : Print: Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/15/11 | **Test Number:** | **Equipment ID:** Compressor tanks

01	**Equipment Model:** kaeser 25HP	
02	**Equipment Size:** reciever tank	
03	**Location of Equipment:** Pump building #2	
04		
05		
	Questions	
06	**Is the equipment/material provided per the specification?**	[✓ Y]/N
07	**Was the equipment/material installed correctly?**	[✓ Y]/N
08	**Was the equipment/material set-up correctly?**	[✓ Y]/N
09	**Was the equipment/material affected by another piece of equipment?**	Y/[✓ N]
10	**Corrective Actions:** 200 lb gauses were missing from the tank. New 200 lb gauses were installed on the tanks.	
11	**Notes:**	

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Justin Lis Date: 12/19/11
Arcadis : Print: Sign: Date: 12/20/11

Water Treatment System Deficiency Report

Date: 12/17/11	**Test Number:**	**Equipment ID:** FV-100

01	**Equipment Model:** Stainless Steel Actuated 3-Way Valves
02	**Equipment Size:** 8"
03	**Location of Equipment:** between carbon vessells and
04	Clarified tanks.
05	
	Questions
06	**Is the equipment/material provided per the specification?** [✓ Y]/N
07	**Was the equipment/material installed correctly?** [✓ Y]/N
08	**Was the equipment/material set-up correctly?** Y/[✓ N]
09	**Was the equipment/material affected by another piece of equipment?** Y/[✓ N]
10	**Corrective Actions:** When Valve was actuated from the cranfied tanks to the outfall pipe the incorrect installation of the ball valve shot flow from the carbon vessels and back pressored the system. -The corrective action was to take off the actuator and turn the ball
11	**Notes:** Valve 270° clockwise so that it started in the correct orientation. The Valve now operates correctly.

I certify that all equipment/material information included on this deficiency report has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: Justin Lis Date: 12/20/11

Arcadis : Print: ________ Sign: ________ Date: ________

Water Treatment System Electrical Testing Form (Pumps and Compressor)

Date: 12/15/2011 **Test Section:** — **Equipment ID:** P-501A

	Test Start Time: —	
	Pressure/Flow Testing: [✓ Fluid] or Air	
	Max Equipment/Material Operating Pressure/GPM:	
	Max Operating Pressure/GPM * 1.33 =__________**= Max Testing PSI/GPM**	
	Notes:	
	Electrical Tests for Pumps and Compressor	**Circle/Notes**
01	Confirm that Pump has Been wired correctly. What is the power requirement?	[✓ Y]/N Rotation Good
02	What are the Mega ohms of the power cable from the MCC to the Pump? Is the reading per Arcadis Specifications?	______ Y/N
03	What is the Pre-Start-Up Electrical Power Reading? What is the power requirement?	480-VAC 480
04	What is the Pre-Start-Up Mega Ohhm Reading? What is the manufacturer requirement?	OK
05	Engineer approval prior to start-up.	MS 12/13/2011
06	Is the pump direction correct?	Y/N
07	Is VFD controller working correctly?	Y/N
08	Conduct VFD operation in "hand" check. Is it working correctly?	NA ~~Y/N~~
09	Conduct VFD operation in "auto" check. Is it working correctly?	NA ~~Y/N~~
10	Confirm "remote run switch" is working correctly?	[✓ Y]/N
11	Confirm "HOA" is working correctly?	[✓ Y]/N
	Check Overload	[✓ Y]

Remote ON/OFF "OK"

Test Section: __________ **Equipment ID:** P-500A [✓ **Pass**] / **Fail**

Notes:

☑ SCADA HOA OK

☒ Overload Tested (4rc)

☐ Add Low Level Setpoint Tested OK

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: Date: 12/17/2011
Arcadis : Print: Matt Shattuck Sign: Matt Shattuck Date: 12/15/2011

Water Treatment System Electrical Testing Form (Pumps and Compressor)

Date: 12/15/2011 **Test Section:** — **Equipment ID:** Air Compressor

Test Start Time: —

Pressure/Flow Testing: Fluid or Air —

Max Equipment/Material Operating Pressure/GPM: —

Max Operating Pressure/GPM * 1.33 =____________**= Max Testing PSI/GPM**

Notes:

	Electrical Tests for Pumps and Compressor	**Circle/Notes**
01	Confirm that ~~Pump~~ Compressor has Been wired correctly. What is the power requirement?	[✓ Y]/N 460 VAC
02	What are the Mega ohms of the power cable from the MCC to the Pump? Is the reading per Arcadis Specifications?	— ~~Y/N~~
03	What is the Pre-Start-Up Electrical Power Reading? What is the power requirement?	440 VAC 440
04	What is the Pre-Start-Up Mega Ohhm Reading? What is the manufacturer requirement?	NA NA
05	Engineer approval prior to start-up.	MS / 12/15/2011
06	Is the ~~pump~~ direction correct?	Y/N
07	~~Is VFD controller working correctly?~~	NA ~~Y/N~~
08	~~Conduct VFD operation in "hand" check. Is it working correctly?~~	NA ~~Y/N~~
09	~~Conduct VFD operation in "auto" check. Is it working correctly?~~	NA ~~Y/N~~
10	~~Confirm "remote run switch" is working correctly?~~	NA Y/N
11	~~Confirm "HOA" is working correctly?~~	NA Y/N
	Double Diaphram Pump	

→ Raesor onsite to Perform Start-up of Compressor

Test Section: ____________ **Equipment ID:** Air Compressor [✓ **Pass**] / **Fail**

☑ Worked

Notes:

☑ Need Safety Valves on Air Compressor Tanks.
- Add Safety Relief Prior to Start-up
- Add Correctly sized Pressure Switches

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: Date: 12/17/2011
Arcadis : Print: Matt Shattuck Sign: Matt Date: 12/15/2011

Water Treatment System Electrical Testing Form (Pumps and Compressor)

Date: —— **Test Section:** —— **Equipment ID:** P-300A

Test Start Time: ——

Pressure/Flow Testing: [✓ Fluid] or Air 260 -GPM ~ ~~3~~42-PSI

Max Equipment/Material Operating Pressure/GPM: ~ 260 - GPM

Max Operating Pressure/GPM * 1.33 =__________**= Max Testing PSI/GPM**

Notes:

	Electrical Tests for Pumps and Compressor	Circle/Notes
01	Confirm that Pump has Been wired correctly. What is the power requirement?	[✓ Y]/N Rotation Good
02	What are the Mega ohms of the power cable from the MCC to the Pump? Is the reading per Arcadis Specifications?	OK Y /N
03	What is the Pre-Start-Up Electrical Power Reading? What is the power requirement?	480-VAC 480
04	What is the Pre-Start-Up Mega Ohhm Reading? What is the manufacturer requirement?	OK —
05	Engineer approval prior to start-up.	MS / 12/14/2011
06	Is the pump direction correct?	[✓ Y]/N
07	Is VFD controller working correctly?	NA ~~Y/N~~
08	Conduct VFD operation in "hand" check. Is it working correctly?	NA ~~Y/N~~
09	Conduct VFD operation in "auto" check. Is it working correctly?	NA Y/N
10	Confirm "remote run switch" is working correctly?	[✓ Y]/N
11	Confirm "HOA" is working correctly?	[✓ Y]/N
	~~[illegible]~~	~~[illegible]~~

Remote ON/OFF "OK"

Test Section: __________ **Equipment ID:** P-300 [✓ Pass] / Fail

Notes:

☑ SCADA HOA OK

Amp Reading: ~~~8~~ Amps with no Carbon

☑ ~~Motor~~ overload Testing

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: __________ Sign: __________ Date: 12/17/2011

Arcadis : Print: Matt Shattuck Sign: Matt Shattuck Date: 12/15/2014

Water Treatment System Electrical Testing Form (Instrumentation and Switches)		
Date: 12/15/2011	**Test Section:** —	**Equipment ID:** PIT-200
	Test Start Time: —	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS 12/13/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	Y/N N/A
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	[✓ Y]/N
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	Y/N Not Connected - Not Tested
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	Y/N

Test Section: ____________________ **Equipment ID:** PIT-200 **Pass / Fail**

Notes:

1) Potentially Move this to P-100 or ~~P~~ P-200 Pump Discharge.

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: Justin Lis Date: 12/17/2011
Arcadis : Print: Matt Shattuck Sign: Matt Mott Date: 12/15/2011

Water Treatment System Electrical Testing Form (Instrumentation and Switches)

Date: 12/15/2011 **Test Section:** — **Equipment ID:** FIT-101 — EQ Tank Influent Flow Meter

	Test Start Time: —	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS 12/13/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	~~Y/N~~ NA
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	[✓ Y]/N
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	[✓ Y]/N

Test Section: ____________________ **Equipment ID:** FIT-101 [✓ **Pass**] / **Fail**

Notes:

☐ Currently No Alarm Setpoints on Transmitter

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: Date: 12/17/2011
Arcadis : Print: Matt Shultz Sign: Date: 12/15/2011

Water Treatment System Electrical Testing Form (Instrumentation and Switches)

Date: 12/15/2011 **Test Section:** — **Equipment ID:** FIT-102 – Treated Water ~~T~~ to Treated ~~T~~ Water Tanks Flow Motor

Test Start Time: —

	Electrical Tests for Instrumentation and Switches	Circle/Notes
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS/12/13/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	[✓ Y]/N
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	[✓ Y]/N
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	[✓ Y]/N

Test Section: ____________________ **Equipment ID:** FIT-102 [✓ **Pass**] / **Fail**

Notes:

1) Currently no Alarm setpoints in Transmitter

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: Date: 12/17/11
Arcadis : Print: Matt Sluttuck Sign: Matt Date: 12/15/2011

Water Treatment System Electrical Testing Form (Instrumentation and Switches)

Date: 12/15/2011 **Test Section:** —— **Equipment ID:** FIT-201 — Discharge Flow Meter

Test Start Time: ——

	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS 12/13/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	~~Y/N~~ N/A
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	[✓ Y]/N
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	[✓ Y]/N

Test Section: ____________________ **Equipment ID:** FIT-201 [✓ Pass] / Fail

Notes:

D Flow Meter does not initiate any Alarms

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: ____________ Date: 12/17/2011

Arcadis : Print: Matt Shatted Sign: ____________ Date: 12/15/2011

Water Treatment System Electrical Testing Form (Instrumentation and Switches)

Date: 12/15/2011 **Test Section:** —— **Equipment ID:** Control Power Alarm

Test Start Time: ——

	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	NA
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	~~Y/N~~ Yes
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	NA ~~Y/N~~
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	~~Y/N~~ Need UPS OEM Manual

Test Section: __________ **Equipment ID:** Control Power Alarm [✓ **Pass**] / **Fail**

Notes: ☑ Changed Alarm to Latching Alarm.

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS

Clean Harbors Print: Justin Lis Sign: Justin Lis Date: 12/17/2011
Arcadis : Print: Matt Shattuck Sign: Matt Shattuck Date: 12/15/2011

Water Treatment System Electrical Testing Form (Instrumentation and Switches)

Date:	**Test Section:**	**Equipment ID:** 600 Pump 3
	Test Start Time:	Shut OFF
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	———
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	[✓ Y]/N
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	NA ~~Y/N~~
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	NA ~~Y/N~~

Test Section: ____________ **Equipment ID:** P-600 Pumps [✓ **Pass**]/ **Fail**

Tested

Notes:

☑ High High Shunt off → B7 is off Tested Correctly

↳ Storm Water Will Shut Down when high level is hit in EQ Tanks

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RS Clean Harbors Print: Justin Lis Sign: Justin Lis Date: 12/17/2011

Arcadis : Print: Matt Shattuck Sign: Matt Shattuck Date: 12/15/2011

☐ Confirm operation in spring. Pumps were not connected.

Water Treatment System Electrical Testing Form (Motor Control Center)		
Date: 12/15/2011	**Test Section:**	**Equipment ID:** MC PANEL
	Test Start Time:	
	Electrical Tests for MCC	**Circle/Notes**
01	Confirm that motor starter is connected to the correct motor. Comments:	[✓ Y]/N
02	Confirm motor starter trip settings are correct for the motor that it is controlling. Comments:	[✓ Y]/N
03	Confirm power reading is correct coming into the panel and going to each motor starter. Comments:	[✓ Y]/N

Test Section: MCC **Equipment ID:** Mc Panel [✓ **Pass**] / **Fail**

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: Date: 12/17/2011

Arcadis : Print: Matt Shattuck Sign: Date: 12/15/2011

Water Treatment System Electrical Testing Form (Control Panel)		
Date: 12/15/11	**Test Section:**	**Equipment ID:** 1Ø PANEL
	Test Start Time:	
	Electrical Tests for Control Panel	**Circle/Notes**
01	Confirm Power coming into the panel Comments:	120/240
02	Engineer approval to power panel. Comments:	
03	Confirm power supplies are working correctly. Comments:	[✓ Y]/N
04	Confirm instrumentation is connected to the correct location in the control panel.	
	1. MAIN	[✓ Y]/N
	2. MAIN	[✓ Y]/N
	3. CONTROL	[✓ Y]/N
	4. ELEC BLDG PLUG	[✓ Y]/N
	5. P100 BLDG PLUG	[✓ Y]/N
	6. SAND FILTER FS1000	[✓ Y]/N
	7. A/C BLDG PLUG	[✓ Y]/N
	8. SAND FILTER FS1001	[✓ Y]/N
	9. ELEC BLDG FAN	[✓ Y]/N
	10. SAND FILTER FS1002	[✓ Y]/N
	11. ELEC BLDG LTS	[✓ Y]/N
	12 P100 BLDG LTS	[✓ Y]/N
	13. A/C BLDG FAN	[✓ Y]/N
	14. P100 BLDG FAN	[✓ Y]/N
	15. A/C BLDG LTS	[✓ Y]/N
	16 AIR DRYER PLUGS	[✓ Y]/N
	17.	Y/N
	18.	Y/N
	19.	Y/N
	20.	Y/N

Test Section: ____________________ **Equipment ID:** 1Ø Panel [✓ Pass]/Fail

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Matt Shattuck Sign: ____________ Date: 12/15/2011

Arcadis : Print: Justin Lis Sign: ____________ Date: 12/17/2011

Water Treatment System Electrical Testing Form (Control Panel)

Date: 12/14/11	**Test Section:**	**Equipment ID:** 3Ø PANEL

	Test Start Time:	
	Electrical Tests for Control Panel	**Circle/Notes**
01	Confirm Power coming into the panel Comments:	480 ✓
02	Engineer approval to power panel. Comments:	
03	Confirm power supplies are working correctly. Comments:	[✓ Y]/N
04	Confirm instrumentation is connected to the correct location in the control panel.	

1. CLARIFIER	Y			[✓ Y]/N
2. P200 B	Y	22 SPARE		Y/N
3. CLARIFIER	Y	23 Ø RELAY	Y	[✓ Y]/N
4. P200 B	Y	24 SPARE		Y/N
5. CLARIFER	Y	25 P100 B	Y	[✓ Y]/N
6. P200 B	Y	26 P100 A	Y	Y/N
7. P200 A	Y	27 P100 B	Y	[✓ Y]/N
8. A/C	Y	28 P100 A	Y	Y/N
9. P200 A	Y			[✓ Y]/N
10. A/C	Y	29 P100 B	Y	Y/N
11. P200 A	Y	30 P100 A	Y	[✓ Y]/N
12 A/C	Y	31 P300 A	Y	Y/N
13. SPARE		32 P500 A	Y	Y/[✓ N]
14. SPARE		33 P300 A	Y	Y/N
15. TRANS	Y	34 P500 A	Y	Y/N
16 SPARE		35 P300 A	Y	Y/N
17. TRANS	Y	36 P500 A	Y	Y/N
18. SPARE		37 P800 A	Y	Y/N
19. Ø RELAY	Y	38 P800 B	Y	Y/N
20. SPARE		39 P800 A	Y	Y/N

21 Ø RELAY Y

40 P800 B Y

41 P800 A Y

Test Section: ______________ **Equipment ID:** 3Ø Panel [✓ **Pass**] / **Fail**

42 P800 B Y

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: Date: 12/17/11

Arcadis : Print: Matt Shuttluck Sign: Date: 12/14/2011

Water Treatment System Electrical Testing Form (Instrumentation and Switches)

Date: 12/15/11	**Test Section:**	**Equipment ID:** LS-300
	Test Start Time:	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS - 12/13/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	[✓ Y]/N
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	[✓ Y]/N
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	[✓ Y]/N

Surge Tank
High High
Level Alarm

Test Section: ____________________ **Equipment ID:** LS-300 [✓ Pass] / Fail

Notes:

☐ ~~[illegible]~~

☑ P-100's shut off when LS-300 was triggered

~~High High 80%~~

~~Start 50%~~

~~Stop 25%~~

~~Low Low 15%~~

MS ~~Run Setpoint : 60%~~

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: Date: 12/17/2011
Arcadis : Print: Matt Shutt[illegible] Sign: Matt Date: 12/15/2011

Water Treatment System Electrical Testing Form (Instrumentation and Switches)		
Date: 12/13/2011 **Test Section:** ——	**Equipment ID:** LS 100B	
	Test Start Time: ——	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y] N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y] N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y] N
04	Engineer approval to supply power to instrument. Comments:	MS / 12/14/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	[✓ Y] N
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	~~Y~~ ~~Y~~ N N/A
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y/] ~~Y~~ N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	[✓ Y/] ~~Y~~ N

— EQ Tank High Level Switch

Test Section: ____________________ **Equipment ID:** LS100B [✓ **Pass**] / **Fail**

Notes:

☑ HMI Alarm banner incorrect.
Banner was fixed.

☑ Tested Switch at Full Tank
Switch worked.
Note: Tank 6 overflowed
so switch needs to
be lowered

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: ____________ Date: 12/17/2011
Arcadis : Print: Matt Shattuck Sign: Matt ____________ Date: 12/15/2011

Water Treatment System Electrical Testing Form (Instrumentation and Switches)		
Date: 12/15/2011	**Test Section:** —	**Equipment ID:** Discharge Valve — FV-100
	Test Start Time: —	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS / 12/13/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	[✓ Y]/N
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	NA Y/N
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	[✓ Y]/N

Test Section: ____________ **Equipment ID:** FV-100 [✓ **Pass**]/**Fail**

Notes:

☒ Tested Valve to River Operation

☒ Tested Valve to Storage Operation → Position Indication Alarm Timer Adjusted.

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

Clean Harbors Print: Justin Lis Sign: ____________ Date: 12/17/2011
Arcadis : Print: Matt Shattuck Sign: ____________ Date: 12/15/2011

Water Treatment System Electrical Testing Form (Instrumentation and Switches)

Date: 12/15/11 **Test Section:** **Equipment ID:** LT-800B

Backwash Solids Tanks

	Test Start Time:	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS 12/13/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	~~Y/N~~ NA
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	[✓ Y]/N
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	[✓ Y]/N

Test Section: ____________________ **Equipment ID:** LT-800B [✓ Pass] Fail

change to

Tested

Notes:

33inch of Water In tank.

☒ High High ~~80~~ 70 5 % Shuts down P-300

☒ High ~~70~~ 65 % Yes Change to 65

☒ Low ~~40~~% Yes

Change to 30%

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS

Clean Harbors Print: Justin Lis Sign: Justin Lis Date: 12/17/2011

Arcadis : Print: Matt Shattuck Sign: Matt Mott Date: 12/15/2011

Water Treatment System Electrical Testing Form (Instrumentation and Switches)		
Date: 12/5/2011	**Test Section:** —	**Equipment ID:** LT 900
	Test Start Time: —	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS 12/13/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	[✓ Y]/N
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	[✓ Y]/N
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	[✓ Y]/N

Test Section: ____________________ **Equipment ID:** LT-900 [✓ Pass] / Fail

Notes:

	Test
☑ High High 70	Yes
☑ Start: 50	Yes
☑ Stop: 20	Yes

41 Inches of Water In Tank.

☑ Transmitter reading Correctly.

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RSS Clean Harbors Print: Justin Lis Sign: ____________ Date: 12/17/2011
Arcadis : Print: Matt Shotthch Sign: Matt ____________ Date: 12/15/2011

☑ Did High High Shut Off P-100 ~~[illegible]~~ (Tested Correctly)

Water Treatment System Electrical Testing Form (Instrumentation and Switches)

Date: 12/14/2011 **Test Section:** — **Equipment ID:** E-STOP 1

	Test Start Time: —	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	Y [illegible] ~~Y/N~~
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS 12/13/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	[✓ Y]/N
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	NA ~~Y/N~~
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	NA ~~Y/N~~

Test Section: __________ **Equipment ID:** E-STOPS [✓ **Pass**] / **Fail**

Notes: ☐ Change programming to Latch E-STOP Alarms.

☑ Tested E-STOP ~~[illegible]~~ Shut Down System.

☐ E-STOP Signage will be installed ~~[illegible]~~ near E-STOPS outside of Control Room. - Box will ~~[illegible]~~ also be installed to prevent accidental tripping of E-STOP

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

R35 Clean Harbors Print: Justin Lis Sign: Justin Lis Date: 12/17/2011
Arcadis : Print: Matt Shattuck Sign: Matt Date: 12/15/2011

Electrician !

Water Treatment System Electrical Testing Form (Instrumentation and Switches)

Date: 12/15/11 | **Test Section:** | **Equipment ID:** Phase Relay

	Test Start Time:	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS 12/13/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	[✓ Y]/N Yes
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	~~Y/N~~ N/A
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N [✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	[✓ Y]/N

Test Section: ____________________ **Equipment ID:** Phase Relay [✓ Pass] Fail

Notes:

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

R55 Clean Harbors Print: Justin Lis Sign: ____________ Date: 12/17/2011
Arcadis : Print: Matt Slattuch Sign: ____________ Date: 12/15/2011

Water Treatment System Electrical Testing Form (Instrumentation and Switches)

Date: 12/14/2011	**Test Section:** —	**Equipment ID:** LT-700B
	Test Start Time: —	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS 12/13/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	Y/N NA
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	[✓ Y]/N
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	[✓ Y]/N

— Treated Water Holding Tanks

Test Section: ____________ **Equipment ID:** LT-700B [✓ Pass] / Fail

Notes: Tested to shutdown P-100's + P-200's ← High High

48 inches or Water in Tank

	Setpoint	Test
High High	90	Yes
High Level to River	100 %	Yes
to Treated Storage	46%	Yes
Low Low	20%	Yes

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Joseph Lie Sign: Date: 12/17/2011

Arcadis : Print: Matt Shattuck Sign: Matt Date: 12/13/2011

During Batch this needs to be at 100% and, during normal operations this need to be Set at 60%.

☑ Add High high to shut down P-100 + P-200's (Tested Correctly)

Water Treatment System Electrical Testing Form (Instrumentation and Switches)

Date: 12/14/2011 **Test Section:** — **Equipment ID:** LT-300A — Surge Tank

Test Start Time: —

	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS 12/13/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	[✓ Y]/N
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	[✓ Y]/N
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	[✓ Y]/N

Test Section: ____________ **Equipment ID:** LT-300A [✓ **Pass**]/**Fail**

Notes: ☑ Shuts Down P-100 Pumps (Tested correctly) ← High High

Notes for Calibration: → 5 inches of Water in Tank

SETPOINT Test

☑ ~~High High~~ 80% ✓
☑ High 70% ✓
☑ Start 50% ✓
☑ Stop 25% ✓
☑ Low Low 15% ✓

Run Setpoint: 60%

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

R35 Clean Harbors Print: Justin Lis Sign: Justin Lis Date: 12/17/2011
Arcadis : Print: Matt Shatford Sign: Matt Matt Date: 12/15/2011

Water Treatment System Electrical Testing Form (Instrumentation and Switches)

Date: 12/15/11	**Test Section:**	**Equipment ID:** LT 100 A
	Test Start Time:	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS 12/13/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	[✓ Y]/N
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	[✓ Y]/N
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	[✓ Y]/N

Test Section: ____________ **Equipment ID:** ~~EL~~ LT-100A [✓ **Pass**] / **Fail**

Notes:

change to 80%

Tested

Confirm Shut off of Stormwater ← ☑ High High 80% Y

☑ High 36% ~~[illegible]~~ 40% Y

50 Inches of Water in Tank

☑ Low ~~[illegible]~~ 10% Y

☑ LowLow ~~[illegible]~~% 5% Y

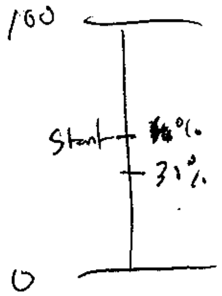
Level setpoint for ~~[illegible]~~ run

Notes: ~~[illegible]~~ Needs to be set at ~~[illegible]~~ 30%. Y

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: Justin Li Date: 12/17/11

Arcadis : Print: Matt Shattuck Sign: Matt Shattuck Date: 12/15/2011



☒ Add Start Pump

☐ Add Stop Pump

☐ Add High Level Audible Alarm.

126,000 →

46,000 → 36%

Water Treatment System Electrical Testing Form (Pumps and Compressor)

Date: 12/15/11 **Test Section:** **Equipment ID:** P-400B

Test Start Time:

Pressure/Flow Testing: Fluid or Air

Max Equipment/Material Operating Pressure/GPM:

Max Operating Pressure/GPM * 1.33 =____________**= Max Testing PSI/GPM**

Notes:

	Electrical Tests for Pumps and Compressor	Circle/Notes
01	Confirm that Pump has Been wired correctly. What is the power requirement?	Y/N ________
02	What are the Mega ohms of the power cable from the MCC to the Pump? Is the reading per Arcadis Specifications?	________ Y/N
03	What is the Pre-Start-Up Electrical Power Reading? What is the power requirement?	480-VAC 480
04	What is the Pre-Start-Up Mega Ohhm Reading? What is the manufacturer requirement?	________ ________
05	Engineer approval prior to start-up.	________
06	Is the pump direction correct?	N/A ~~Y/N~~
07	Is VFD controller working correctly?	N/A ~~Y/N~~
08	Conduct VFD operation in "hand" check. Is it working correctly?	N/A ~~Y/N~~
09	Conduct VFD operation in "auto" check. Is it working correctly?	N/A ~~Y/N~~
10	Confirm "remote run switch" is working correctly?	N/A ~~Y/N~~
11	Confirm "HOA" is working correctly?	N/A ~~Y/N~~

Test Section: ____________ **Equipment ID:**________ [✓ **Pass**] / **Fail**

Notes:

☑ No Pump
Just Check Voltage.

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: Date: 12/17/2011

Arcadis : Print: ________ Sign: ________ Date: ________

Water Treatment System Electrical Testing Form (Pumps and Compressor)

Date: 12/15/11	**Test Section:**	**Equipment ID:** P-200A

	Test Start Time: —
	Pressure/Flow Testing: Fluid or Air 25-PSI
	Max Equipment/Material Operating Pressure/GPM: ~800-gpm
	Max Operating Pressure/GPM * 1.33 =____________= Max Testing PSI/GPM
	Notes:

	Electrical Tests for Pumps and Compressor	**Circle/Notes**
01	Confirm that Pump has Been wired correctly. What is the power requirement?	[✓ Y]/N Rotation Good
02	What are the Mega ohms of the power cable from the MCC to the Pump? Is the reading per Arcadis Specifications?	OK [✓ Y]/N
03	What is the Pre-Start-Up Electrical Power Reading? What is the power requirement?	480-VAC 480
04	What is the Pre-Start-Up Mega Ohhm Reading? What is the manufacturer requirement?	OK
05	Engineer approval prior to start-up.	MS/12/13/2011
06	Is the pump direction correct?	[✓ Y]/N
07	Is VFD controller working correctly?	[✓ Y]/N
08	Conduct VFD operation in "hand" check. Is it working correctly?	[✓ Y]/N
09	Conduct VFD operation in "auto" check. Is it working correctly?	[✓ Y]/N
10	Confirm "remote run switch" is working correctly?	[✓ Y]/N
11	Confirm "HOA" is working correctly?	[✓ Y]/N
	Drive O+M Manual	[✓ Y]

ON/OFF "OK"

Test Section: ____________________ **Equipment ID:** P-200 [✓ **Pass**] / **Fail**

Notes:

☑ Run P-200's Both in Auto

☑ Test VFD Fault audible Alarm

☐ See Note on P-200 A about Valve back the Pump

Amps at FLA: 47 amps

Start-up Operating PSI: 25psi

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: ____________ Date: 12/17/11

Arcadis : Print: Matt Shattach Sign: ____________ Date: 12/15/2011

☑ SCADA HOA Indication OK

Water Treatment System Electrical Testing Form (Pumps and Compressor)

Date: 12/14/2011	**Test Section:**	**Equipment ID:** P-200B

	Test Start Time: —
	Pressure/Flow Testing: Fluid or Air 30-PSI
	Max Equipment/Material Operating Pressure/GPM: ~800-gpm
	Max Operating Pressure/GPM * 1.33 =____________ = Max Testing PSI/GPM
	Notes:

	Electrical Tests for Pumps and Compressor	**Circle/Notes**	
01	Confirm that Pump has Been wired correctly. What is the power requirement?	[✓ Y]/N Rotation Good	ON/OFF "OK"
02	What are the Mega ohms of the power cable from the MCC to the Pump? Is the reading per Arcadis Specifications?	OK [✓ Y]/N	
03	What is the Pre-Start-Up Electrical Power Reading? What is the power requirement?	480-VAC 480	
04	What is the Pre-Start-Up Mega Ohhm Reading? What is the manufacturer requirement?	OK	
05	Engineer approval prior to start-up.	MS 12/13/2011	
06	Is the pump direction correct?	[✓ Y]/N	
07	Is VFD controller working correctly?	Y/N	
08	Conduct VFD operation in "hand" check. Is it working correctly?	Y [✓ Y]/N	
09	Conduct VFD operation in "auto" check. Is it working correctly?	[✓ Y]/N	
10	Confirm "remote run switch" is working correctly?	[✓ Y]/N	
11	Confirm "HOA" is working correctly?	[✓ Y]/N	
	Drive O+M Manual	[✓ Y]	

Test Section: ____________________ **Equipment ID:** P-200B [✓ **Pass**]/ **Fail**

Notes:

Amp [illegible] FLA : 47

Note: No [illegible] Sand filter Media.

Need to Valve back to operate Pump. Operating Pressure : 30psi

☑ Run Both P-200's in Auto At Same time Start-up ~ 800 gpm

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: __________ Date: 12/14/2011
Arcadis : Print: Matt Shattuck Sign: __________ Date: 12/15/2011

☐ Test VFD Fault Audible Alarm

☑ SCADA HOA Indication OK

Water Treatment System Electrical Testing Form (Pumps and Compressor)

Date: 12/14/2011 **Test Section:** **Equipment ID:** P-100A

Test Start Time: —

Pressure/Flow Testing: [✓ Fluid] or Air 32 PSI / ~900-GPM

Max Equipment/Material Operating Pressure/GPM:

Max Operating Pressure/GPM * 1.33 = ______________ **= Max Testing PSI/GPM**

Notes:

	Electrical Tests for Pumps and Compressor	**Circle/Notes**
01	Confirm that Pump has Been wired correctly. What is the power requirement?	[✓ Y]N Rotation Good
02	What are the Mega ohms of the power cable from the MCC to the Pump? Is the reading per Arcadis Specifications?	OK [✓ Y]N
03	What is the Pre-Start-Up Electrical Power Reading? What is the power requirement?	480-VAC 480
04	What is the Pre-Start-Up Mega Ohhm Reading? What is the manufacturer requirement?	OK
05	Engineer approval prior to start-up.	MS / 12/13/2011
06	Is the pump direction correct?	[✓ Y]/N
07	Is VFD controller working correctly?	[✓ Y]/N
08	Conduct VFD operation in "hand" check. Is it working correctly?	[✓ Y]/N
09	Conduct VFD operation in "auto" check. Is it working correctly?	[✓ Y]/N
10	Confirm "remote run switch" is working correctly?	[✓ Y]/N
11	Confirm "HOA" is working correctly?	[✓ Y]/N
	Drive Otm Manual	[✓ Y]

Remote On/OFF "OK"

Test Section: ______________________ **Equipment ID:** P-100A [✓ Pass] / Fail

Notes:

Amp Reading: 22.9 amps

Pressure: 32 psi

☒ Run [illegible]
Setpoint Checked 30%

☒ SCADA HOA ~~Tested~~ Status OK (Yes) Start-up operating

☒ Run Both Pumps at Same time

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RDS Clean Harbors Print: Justin Lis Sign: Date: 12/17/2011
Arcadis : Print: Matt Shattuck Sign: Date: 12/15/2011

~~See Note on P-100B~~ MS

☐ See Note on Pressure Switch or Transmitter on P-100B.

☑ Drive VFD Fault Audible Alarm Checked

Water Treatment System Electrical Testing Form (Pumps and Compressor)

Date: 12/15/2011 **Test Section:** — **Equipment ID:** P-100B

	Test Start Time: —	
	Pressure/Flow Testing: Fluid or Air 5~PSI	
	Max Equipment/Material Operating Pressure/GPM: ~ 900 - GPM	
	Max Operating Pressure/GPM * 1.33 =____________= Max Testing PSI/GPM	
	Notes:	
	Electrical Tests for Pumps and Compressor	**Circle/Notes**
01	Confirm that Pump has Been wired correctly. What is the power requirement?	Y/N Rotation Good
02	What are the Mega ohms of the power cable from the MCC to the Pump? Is the reading per Arcadis Specifications?	— [✓ Y]/N
03	What is the Pre-Start-Up Electrical Power Reading? What is the power requirement?	480 VAC 480
04	What is the Pre-Start-Up Mega Ohhm Reading? What is the manufacturer requirement?	OK
05	Engineer approval prior to start-up.	MS / 12/13/2011
06	Is the pump direction correct?	[✓ Y]/N
07	Is VFD controller working correctly?	[✓ Y]/N
08	Conduct VFD operation in "hand" check. Is it working correctly?	[✓ Y]/N
09	Conduct VFD operation in "auto" check. Is it working correctly?	[✓ Y]/N
10	Confirm "remote run switch" is working correctly?	[✓ Y]/N
11	Confirm "HOA" is working correctly?	[✓ Y]/N
	Drive O&M Manual	[✓ Y]

Remote On/Off Good.

Test Section: ____________________ **Equipment ID:** P-100B [✓ **Pass**] / **Fail**

Notes:

☒ Run SETPOINT Checked 30%

Amp Reading: ~ 22 Amps

☑ SCADA HOA OK (Yes)

Pressure at Start-up: 5 psi

☑ Ran Both Pumps at Same time

☐ Gauge potentially Bad.

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RSS Clean Harbors Print: Justin Lis Sign: Justin Lis Date: 12/17/11

Arcadis : Print: Matt Shuttach Sign: Matt Shutter Date: 12/15/2011

☐ Need to Add high Pressure switch or transmitter to discharge of P-100 Pumps.

☐ ~~Change running both pumps when VFD speed is over 50%~~

~~Only One Pump Can Run when VFD is over 50%~~.

MS

☑ Drive Fault Checked on PLC

Water Treatment System Electrical Testing Form (Instrumentation and Switches)

Date: 12/15/2011	**Test Section:**	**Equipment ID:** AIT-100
	Test Start Time:	
	Electrical Tests for Instrumentation and Switches	**Circle/Notes**
01	Confirm Wires coming from the control panel are going to the correct instrument or switch. Comments:	[✓ Y]/N
02	Confirm correct power is being supplied to the instrument or switch Comments:	[✓ Y]/N
03	Confirm that the instrument or switch is wired correctly. Comments:	[✓ Y]/N
04	Engineer approval to supply power to instrument. Comments:	MS/12/15/2011
05	For switches, confirm that the PLC is reading that the switch is activated. Comments:	~~Y/N~~ N/A
06	For instrumentation, simulate a 4-20 ma signal back to the PLC and confirm that the PLC is seeing the signal correctly. Comments:	[✓ Y]/N
07	For instrumentation, during testing operations, confirm that the reading at the instrument is communicating back to the PLC and that the correct response is occurring due to the reading with-in the system. Comments:	[✓ Y]/N
08	For instruments, provide copies of calibration certifications from the manufacturer to this form. Comments:	[✓ Y]/N

Test Section: ____________________ **Equipment ID:** AIT-100 [✓ **Pass**]/**Fail**

Notes:

Alarms @ 6000 FTU

☐ Need to Confirm What this needs to be set at.

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS Clean Harbors Print: Justin Lis Sign: Date: 12/17/2011
Arcadis : Print: Matt Shattuck Sign: Matt Shattuck Date: 12/13/2011

Electrician :

Water Treatment System Electrical Testing Form (Pumps and Compressor)

Date: 12/15/2011 **Test Section:** —— **Equipment ID:** P-800A

Test Start Time: ——

Pressure/Flow Testing: Fluid or Air

Max Equipment/Material Operating Pressure/GPM:

Max Operating Pressure/GPM * 1.33 =__________**= Max Testing PSI/GPM**

Notes:

	Electrical Tests for Pumps and Compressor	**Circle/Notes**
01	Confirm that Pump has Been wired correctly. What is the power requirement?	[✓ Y]/N Rotation Good
02	What are the Mega ohms of the power cable from the MCC to the Pump? Is the reading per Arcadis Specifications?	OK [✓ Y]/N
03	What is the Pre-Start-Up Electrical Power Reading? What is the power requirement?	480-VAC 480
04	What is the Pre-Start-Up Mega Ohhm Reading? What is the manufacturer requirement?	OK
05	Engineer approval prior to start-up.	MS/12/15/2011
06	Is the pump direction correct?	[✓ Y]/N
07	Is VFD controller working correctly?	Y/N
08	Conduct VFD operation in "hand" check. Is it working correctly?	NA ~~Y/N~~
09	Conduct VFD operation in "auto" check. Is it working correctly?	NA ~~Y/N~~
10	Confirm "remote run switch" is working correctly?	[✓ Y]/N
11	Confirm "HOA" is working correctly?	[✓ Y]/N

Remote "ON/OFF "OK"

Could Not See Flow.

Test Section: __________ **Equipment ID:** P-200A [✓ Pass]/ Fail

Notes:

Amp: 2.2 Amps

Overload Tested

Need to Confirm Pump is operating correctly during Normal Operation

I certify that all equipment/material information included on this Equipment/Material Testing Form has by collected and observed in accordance to both the engineer's and contractor's approval.

RJS

Clean Harbors Print: Justin Lis Sign: Justin Lis Date: 12/17/2011

Arcadis : Print: Matt Shattuck Sign: Matt Shattuck Date: 12/15/2011

Clean Harbors Water Treatment System
Winterization Checklist

Clean Harbors' Inspection Conducted By: Justin Lis Date: 12/20/11
Arcadis Inspection Conducted By: ____________ Date: ______
Weather: Cool 29° - 38°
Notes:
System was drained on 12/16/11, 12/17/11 and 12/19/11

Equipment ID		Equipment Drained	Y/N	Equipment Inlet Line(s) Drained	Y/N	Equipment Outlet Line(s) Drained	Y/N
EQ	EQ-T100A	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
EQ	EQ-T100B	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
EQ	EQ-T100C	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
EQ	EQ-T100D	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
EQ	EQ-T100E	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
EQ	EQ-T100F	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
EQ	EQ-T100G	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
PB1	PB1	18' x 8' x 7.5' Building	[✓ Y]/N	(2) 8" Process Lines	[✓ Y]/N	(2) 8" Process Lines	[✓ Y]/N
PB1	PB1-P100A	20 HP Pump EQ Transfer Pump	[✓ Y]/N	(1) 8" Process Line x 6" Inlet	[✓ Y]/N	(1) 4" Outlet x 8" Process Line	[✓ Y]/N
PB1	PB1-P100B	20 HP Pump EQ Transfer Pump	[✓ Y]/N	(1) 8" Process Line x 6" Inlet	[✓ Y]/N	(1) 4" Outlet x 8" Process Line	[✓ Y]/N
AF	AF-T200	ActiFlo Primary Clarifier	[✓ Y]/N	(1) 8" Process Line x 10" Inlet	[✓ Y]/N	(1) 12" Flange x 10" Process Line (1) 2" Flange x 2" Gravity Line	[✓ Y]/N
STT	STT-T900	Solids Transfer Tank 1000 Gallon Poly Tank	[✓ Y]/N	(1) 2" Gravity Line Inlet	[✓ Y]/N	(1) 2" Outlet Solids Line	[✓ Y]/N
PST	PST-T300	Process Surge Tank 2500 Gallon Poly Tank	[✓ Y]/N	(1) 8" Inlet x 10" Gravity Process Line	[✓ Y]/N	(1) 6" Outlet x 8" Process Line	[✓ Y]/N
PB1	PB1-P200A	40 HP Pump PST-T300 Transfer Pump	[✓ Y]/N	(1) 8" Process Line x 6" Inlet	[✓ Y]/N	(1) 4" Outlet x 8" Process Line	[✓ Y]/N
PB1	PB1-P200B	40 HP Pump PST-T300 Transfer Pump	[✓ Y]/N	(1) 8" Process Line x 6" Inlet	[✓ Y]/N	(1) 4" Outlet x 8" Process Line	[✓ Y]/N
MMF	MMF-T400A	1000 GPM Sand Filter Skid	[✓ Y]/N	(1) 6" Flange x 8" Process Header (1) 6" Inlet x 8" Clarified Backwash Line	[✓ Y]/N	(1) 6" Outlet x 8" Process Header (1) 4" Flange x 4" Backwash Line	[✓ Y]/N
MMF	MMF-T400B	1000 GPM Sand Filter Skid	[✓ Y]/N	(1) 6" Flange x 8" Process Header (1) 6" Inlet x 8" Clarified Backwash Line	[✓ Y]/N	(1) 6" Outlet x 8" Process Header (1) 4" Outlet x 4" Backwash Line	[✓ Y]/N
MMF	MMF-T400C	1000 GPM Sand Filter Skid	[✓ Y]/N	(1) 6" Flange x 8" Process Header (1) 6" Inlet x 8" Clarified Backwash Line	[✓ Y]/N	(1) 6" Outlet x 8" Process Header (1) 4" Outlet x 4" Backwash Line	[✓ Y]/N
BF	BF-F100A	1600 GPM 8 Bag Filter	[✓ Y]/N	(1) 6" Inlet x 8" Process Header	[✓ Y]/N	(1) 6" Outlet x 8" Process Header	[✓ Y]/N

BF	BF-F100B	1600 GPM 8 Bag Filter	[✓ Y]/N	(1) 6” Inlet x 8” Process Header	[✓ Y]/N	(1) 6” Outlet x 8” Process Header	[✓ Y]/N
GAC	GAC-T600A	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T600B	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T610A	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T610B	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T620A	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T620B	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T600C	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T600D	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T610C	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T610D	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T620A	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N
GAC	GAC-T620B	20,000 lb Granulated Carbon Vessel	[✓ Y]/N	(1) 4” Inlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N	(1) 4” Outlet x 8” Process Header (1) 3” Inlet x 4” Clarified Backwash Line	[✓ Y]/N
FV	FV-100	3-Way Flow Valve and Actuator	[✓ Y]/N	(1) 8” Process Line	[✓ Y]/N	(2) 8” Outlet Process Lines	[✓ Y]/N
TW	TW-T700A	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4” Line x 8” Header	[✓ Y]/N	(2) 4” Lines x 8” Header	[✓ Y]/N
TW	TW-T700B	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4” Line x 8” Header	[✓ Y]/N	(2) 4” Lines x 8” Header	[✓ Y]/N
TW	TW-T700C	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4” Line x 8” Header	[✓ Y]/N	(2) 4” Lines x 8” Header	[✓ Y]/N
TW	TW-T700D	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4” Line x 8” Header	[✓ Y]/N	(2) 4” Lines x 8” Header	[✓ Y]/N
TW	TW-T700E	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4” Line x 8” Header	[✓ Y]/N	(2) 4” Lines x 8” Header	[✓ Y]/N
TW	TW-T700F	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4” Line x 8” Header	[✓ Y]/N	(2) 4” Lines x 8” Header	[✓ Y]/N
TW	TW-T700G	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4” Line x 8” Header	[✓ Y]/N	(2) 4” Lines x 8” Header	[✓ Y]/N
TW	TW-T700H	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4” Line x 8” Header	[✓ Y]/N	(2) 4” Lines x 8” Header	[✓ Y]/N

BS	BS-T800A	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
BS	BS-T800B	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
BS	BS-T800C	21,000 Gallon Frac Tank	[✓ Y]/N	(1) 4" Line x 8" Header	[✓ Y]/N	(2) 4" Lines x 8" Header	[✓ Y]/N
PB2	PB2	18' x 8' x 7.5' Building	[✓ Y]/N	(3) Process Lines (8",4" & 3")	[✓ Y]/N	(4) Process Lines (8", 3", 3" & ¾")	[✓ Y]/N
PB2	PB2-AC100	25 HP Air Compressor	[✓ Y]/N	NA	[✓ Y]/N	(1) ¾" Air Line	[✓ Y]/N
PB2	PB2-AR-100	Air Receiver Tank	[✓ Y]/N	(1) ¾" Air Line	[✓ Y]/N	(1) ¾" Air Line (1) ½" Drain	[✓ Y]/N
PB2	PB2-AD-100	Desiccant Air Dryer	[✓ Y]/N	(1) ¾" Air Line	[✓ Y]/N	(1) ¾" Air Line (1) ½" Drain	[✓ Y]/N
PB2	PB2-P300	15 HP SF & GAC Clarified Backwash Pump	[✓ Y]/N	(1) 8" Transfer Line x 4" Inlet	[✓ Y]/N	(1) 3" Outlet x 8" Transfer Line	[✓ Y]/N
PB2	PB2-P500A	2.25 HP Backwash Supernatant Transfer Pump	[✓ Y]/N	(1) 8" Transfer Line x 4" Inlet	[✓ Y]/N	(1) 3" Outlet x 4" Transfer Line	[✓ Y]/N
PB2	PB2-P500B	100 scfm Backwash SolidsTransfer Pump	[✓ Y]/N	(1) 3" Transfer Line x 3" Inlet	[✓ Y]/N	(1) 3" Outlet x 3" Transfer Line	[✓ Y]/N
T100	Inlet Header	8" PVC Inlet Header	[✓ Y]/N				
EQ	Outlet Header	8" PVC Outlet Header	[✓ Y]/N				
P100 Inlet	Inlet Line	8" PVC Inlet Line	[✓ Y]/N				
P100 outlet	Outlet Line	8" PVC Outlet Line to Actiflo	[✓ Y]/N				
Actifl	Actiflo Outlet	10" PVC Outlet line	[✓ Y]/N				
P200 Inlet	Inlet Line	8" PVC Inlet Line	[✓ Y]/N				
P200 outlet	Outlet Line	8" PVC Outlet Line to MMF Filters	[✓ Y]/N				
MMF	Outlet Header	8" PVC Outlet Header to Bag Filters	[✓ Y]/N				
MMF	backwash	4" Backwash Lines to T800 Header	[✓ Y]/N				
Bag Filter	Bag Filter Outlet	8" PVC Outlet and Line to Carbon Inlet Header	[✓ Y]/N				
GAC	Inlet Header	8" PVC Inlet Lines and Header	[✓ Y]/N				
GAC	Outlet Header	8" PVC Outlet Line and Header	[✓ Y]/N				
Loop	Vacuum Loop to Fv100	8" PVC line to FV100	[✓ Y]/N				
Dish	Outlet to River	8" PVC Line to HDPE Discharge Line	[✓ Y]/N				
T700	Inlet Header	8" PVC Inlet Header	[✓ Y]/N				
T700	Outlet Header	8" PVC Outlet Header	[✓ Y]/N				
T800	Inlet Header	4" PVC Outlet Header	[✓ Y]/N				
T800	Outlet Header	4" PVC Solids Outlet Header	[✓ Y]/N				
T800	Outlet Header	4" PVC Supernatant Outlet Header	[✓ Y]/N				
P300	Outlet Line	4"-8" PVC Backwash line	[✓ Y]/N				
P500 A	Outlet Line	4" PVC Line to EQ	[✓ Y]/N				

P500 B	Outlet Line	3" PVC Line to SECI	[✓ Y]/N					
T900	Solids Outlet	2" PVC Solids Outlet to SECI and T800	[✓ Y]/N					
			Y/N					
			Y/N					

I certify that all mechanical equipment and process lines, included on this checklist, have been adequately drained, blown down and or cleared of all water per the winterization requirements and acceptance of the Engineer (Arcadis).

Clean Harbors Print: Justin Lis Sign: _____ Date: 12/20/11

Arcadis : Print: Mike Pelenski Sign: _____ Date: 12/20/11

Section 10

O & M Manuals

Section 11

Equipment and Material Cut Sheets

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 010000-02-A
Date of Submittal: May 16, 2011
Contractor: Weeks
Contract No.: B0009964.001
Subject of Submittal: Notice to Mariners

Specification No. N/A
Par. No. N/A
Drawing No. N/A

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings
☐ Sample
☐ Progress Schedules
☐ O&M Manual
☐ Testing Procedure
☐ Baseline Schedule
☒ First Submission
☐ Second Submission
☐ Third Submission
☐ ______ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
NOTICE TO MARINERS FOR YOUR INFORMATION ONLY	1

Complete either (a) or (b) and ©, in the case of technical Submittals or Progress Schedule Submittals:

a ( ) The Contractor verified that the material, equipment, or other item contained in this Submittal meets all the requirements specified, shown,, or indicated in the Contract Documents with no exceptions.

b ( ) The Contractor has verified that the material, equipment, or other item contained in this Submittal meets all requirements specified, shown, or indicated in the Contract Documents except for variances identified in the following attached documents:

c ( ) The Contractor has stamped or written its approval on each Shop Drawing sheet, or cover sheet in the case of other Submittals, certifying that the Contractor has satisfied its responsibilities with respect to the review of the submission including, but not limited to, the requirements of Article 6 of the General Conditions.

Signed (By the Contractor): ______________________
Claude Dion

LNM INFORMATION FORM

DATE: May 13, 2011

NAME: CLAUDE DION

PHONE NUMBER: 908-230-5279

COMPANY NAME: WEEKS MARINE, INC

TYPE OF WORK: LOWER PASSAIC RIVER PHASE I CERCLA NON-TIME-CRITICAL REMOVAL ACTION (Construction of Enclosure, Removal and transfer of Sediment)

LOCATION WHERE WORK WILL BE DONE:

80 AND 120 LISTER AVENUE, NEWARK, NJ

LAT/LONG: N 40°.740787 W 74°.135828

BEGINNING/ENDING DATES: ENCLOSURE CONST.: JUNE 15, 2011 TO NOVEMBER 30, 2011

SHUTDOWN DECEMBER 1, 2012 TO MARCH 15, 2012 (ENCLOSURE REMAIN IN PLACE)

REMOVAL ACTION: MARCH 15, 2012 TO JUNE 15, 2012

BACKFILL INSIDE ENCLOSURE: JUNE TO JULY, 2011

ENCLOSURE REMOVAL: AUGUST, 2012 TO SEPT, 2012

ADDITIONAL INFORMATION ATTACHED (DRAWINGS AND NARRATIVE)

HOURS OF OPERATION: 7:00 TO 17:00 MONDAY TO SATURDAY

NOTE: EQUIPMENT WILL BE IN POSITION 24 HOURS/7 DAYS/WEEKS DURING CONSTRUCTION

EQUIPMENT TO BE USED: CRANE BARGE, TUG BOAT, BARGES

RADIO FREQUENCY (IF USED) CHANNEL 65 VHF

DISPOSAL SITES (IF USED) N/A

PLEASE FAX FORM TO: Mary Swanson @ 617-223-8291

The LNM (Local Notice to Mariners) can be found on the following website: http://www.navcen.uscg.gov

WEEKS MARINE, INC.

DREDGING – MARINE CONTRACTORS
STEVEDORING – EQUIPMENT RENTALS
TOWING – HEAVY LIFT - SALVAGE

4 COMMERCE DR., 3rd FLOOR, CRANFORD, NEW JERSEY 07016-3598 (908) 272-4010 FAX: (908) 272-8957

NOTICE TO MARINERS

NARRATIVE

Weeks Marine, Inc. will begin construction of a King/Sheet Piles enclosure on the Lower Passaic River on or after June 1, 2011 and will be completed on or before August 30, 2012 for Arcadis US. Inc. The project EPA Docket Number is 02-2008-2020. Construction sequence are as follow:

- Installation of a tie-back system on the existing concrete wall at 80 and 120 Lister Avenue, Newark. The work will be along the bulkhead. A small pontoon will be anchored against the bulkhead. The pontoon will not exceed into the navigable channel. This work will begin on or after June 1, 2011 and will be completed 30 days after its starting date.

- Installation of scour protection sand layer at the Phase I area will begin between June 15 to June 30, 2011. A sand layer of 4 to 6 inches thick will be place prior the installation of the King/Sheet Piles enclosure to act as a buffer, reducing re-suspension of sediment during installation of the enclosure. Attachment A shows the foot print of the scour protection sand layer, equipment to be used and location of the anchoring system in relation with the navigable channel. This operation will have a duration of approximately 8 days.

- Installation of the enclosure will begin after the installation of the scour protection sand layer. Work will begin along the Sherwin-William wall (West of the existing concrete bulkhead) going west for approximately 150 feet. The wall will make a 90 degree going toward the navigable channel for approximately 110 feet. The wall will end approximately 24 feet from the navigable channel. From there the wall will again turn 90 degree going east for approximately 751 feet. Finally, the wall will turn 90 degree toward to the existing concrete bulkhead for a distance of approximately 135 feet. Attachment B shows the foot print of the enclosure wall, equipment to be used and there location relative to the navigable channel. Note that the crane barge will be on spud and no anchoring system will be used for this operation. The duration of the enclosure construction is approximately 4 months. Prior completion of the enclosure dredge barges will be trap inside the enclosure. These barges will be used to dredge the sediment inside the enclosure. Note that the above sequence may be change from east to west for the construction of the enclosure.

- When the construction of the enclosure is completed Weeks will install the scour protection mattresses around the enclosure. The work will involve installation of approximately 130 armor concrete mattresses (40’ x 8’ x 4.75”). Work will begin west of the enclosure going east. Attachment C shows the foot print of the concrete mattresses, equipment to be used and there location relative to the navigable channel. The work will be completed prior to December 1, 2011.

- After or before installation of the scour protection concrete mattresses a 12 inch pipeline (HDPE) will be installed along the shore from the 120 Lister Avenue to the Upland Facility (UPF) approximately 1,300 feet east of the enclosure (See attachment D, map location). The pipeline will be secured using pipe pile at every 250 feet approximately. A small pontoon will be anchored approximately 30 feet from the shore at the UPF to provide access to the pipeline. The pipe piles will be driven using a crane barge. The driving operation will be 2 days. The pipeline will be in operation only during the sediment excavation.

- It is anticipated that during the month of December 2011 through March 15, 2012 no work will be performed. The enclosure will be monitor daily for any damages or movement.

- On March 15, 2012 sediment excavation inside the enclosure will begin. No equipment will be outside the enclosure for a period of 3 months at the exception of skiff boat to monitor the pipeline daily. The 12 inch pipeline will be in operation.

- After completion of the sediment removal a crane barge will be dock along the enclosure. The crane barge will unload sand scow (backfill material) into the enclosure. Please refer to attachment B for equipment location which will be similar to the driving operation. This operation will be completed within 1 month.

- At completion of the backfill operation the crane barge utilized to backfill will be demobilized and the driving crane barge, with material barges, will be mobilized to remove the pipeline, concrete mattresses and enclosure. The operation will be performed within 2 months.

Note:

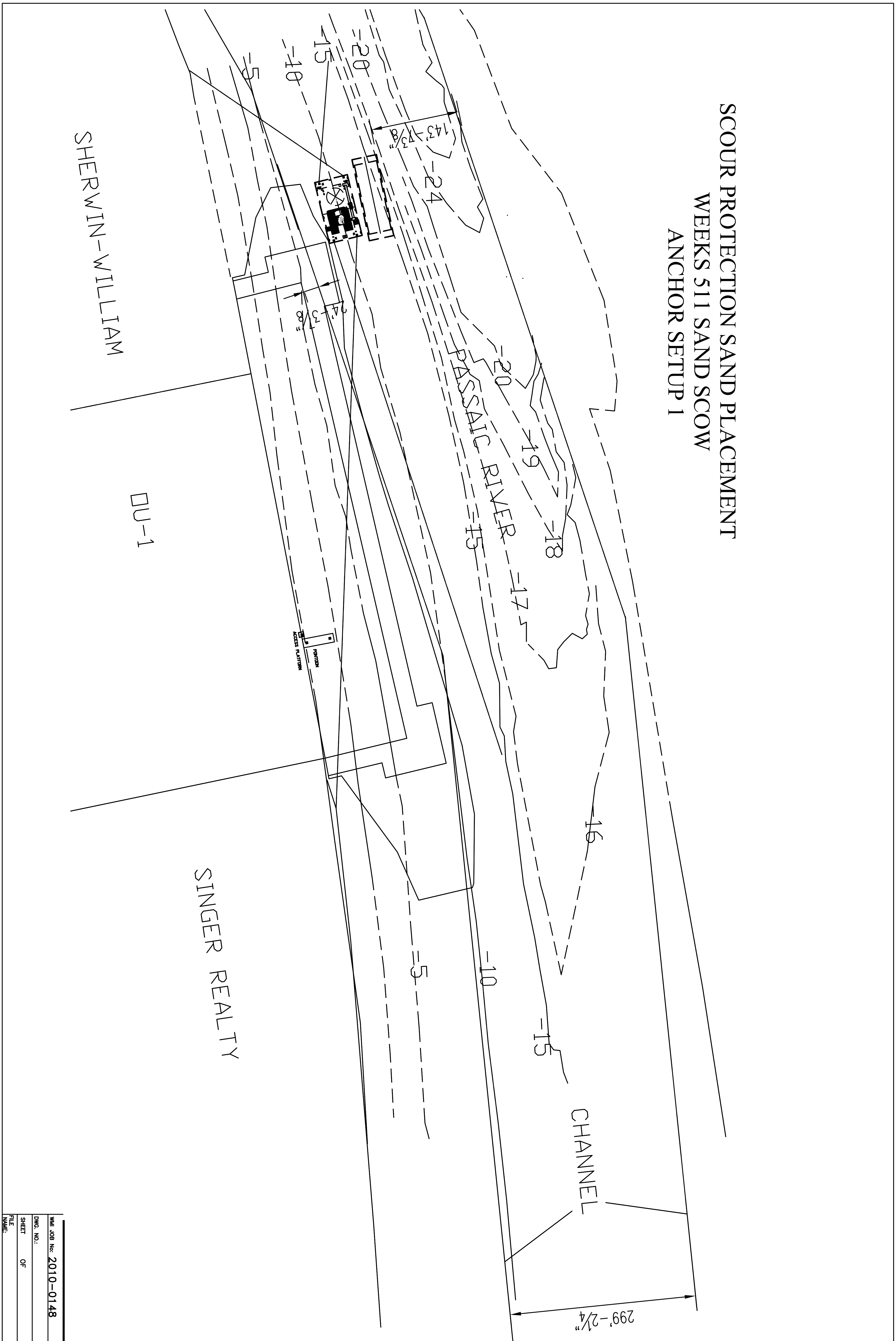
- Aids to navigation will be installed around the perimeter of the enclosure and long the pipeline (See attachment E).
- Equipment may change upon availability but location will remain.

Clarification:

- **Weeks would like to be informed 72 hours notice to move any equipment that may interfere with the navigation traffic.**

ATTACHMENT A

SCOUR PROTECTION SAND PLACEMENT
WEEKS 511 SAND SCOW
ANCHOR SETUP 1



WEEKS MARINE, INC.
4 COMMERCE DRIVE
CRANFORD, NJ 07016-3598
(908) 272-4010

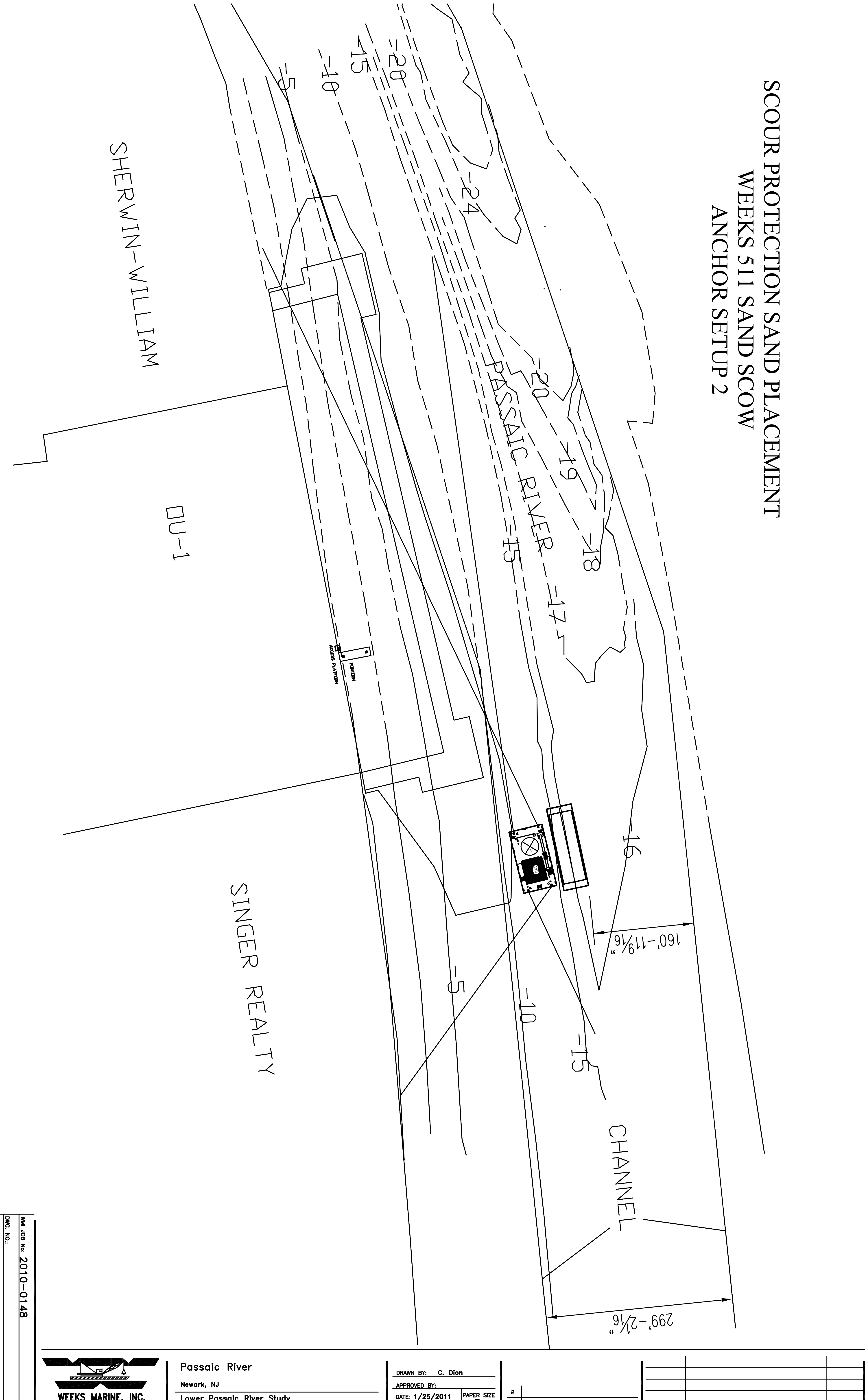
Passaic River
Newark, NJ
Lower Passaic River Study

DRAWN BY: C. Dion
APPROVED BY:
DATE: 1/25/2011
PAPER SIZE B
SCALE: N/A

NO.	REFERENCE DWG NUMBER
2	
1	

DATE	DESCRIPTION	BY

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:



SCOUR PROTECTION SAND PLACEMENT
WEEKS 511 SAND SCOW
ANCHOR SETUP 2

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:

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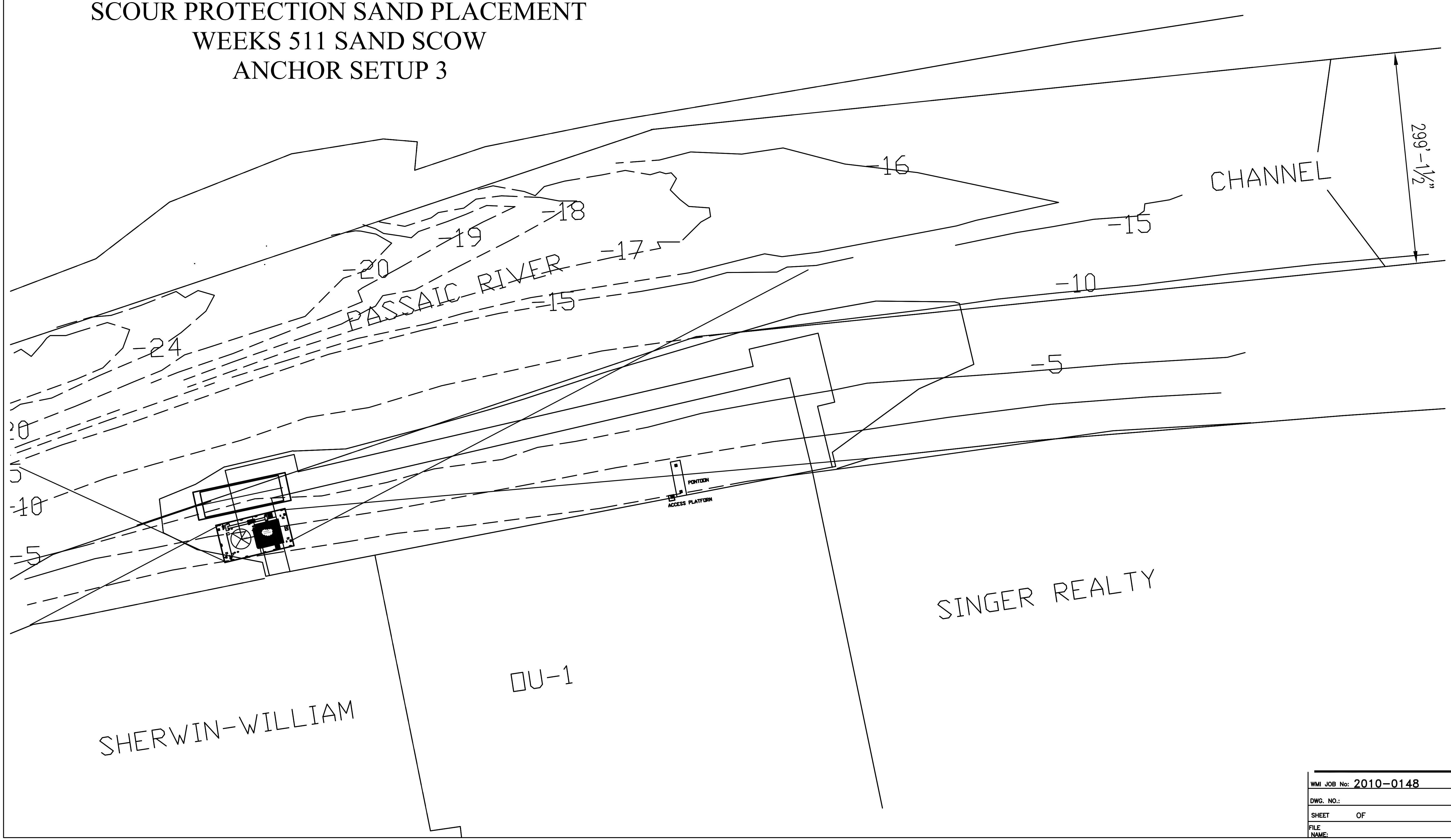
2	
1	

DATE	DESCRIPTION	BY

SCOUR PROTECTION SAND PLACEMENT
WEEKS 511 SAND SCOW
ANCHOR SETUP 3



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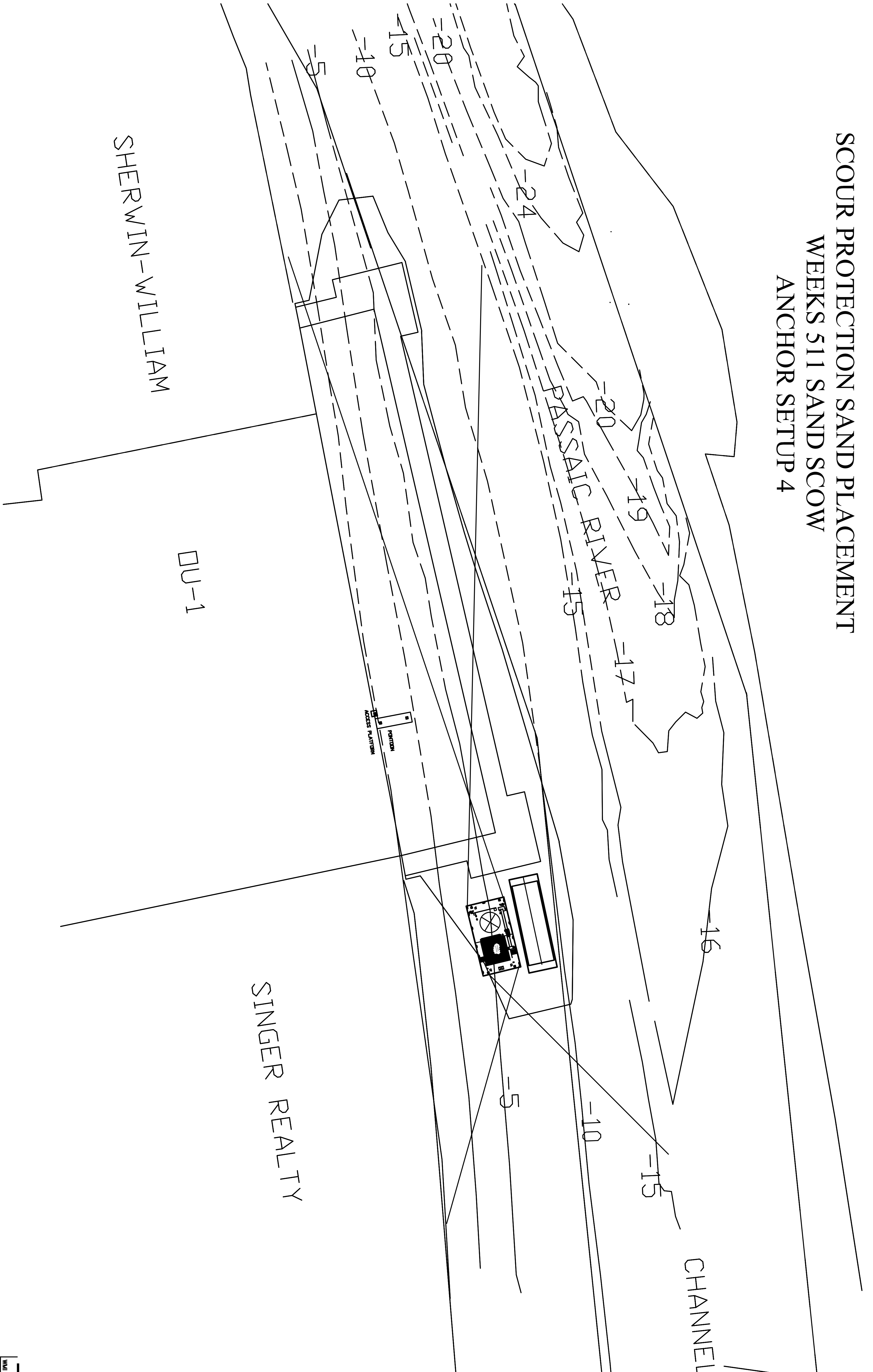
DATE	DESCRIPTION	BY

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:

SCOUR PROTECTION SAND PLACEMENT
WEEKS 511 SAND SCOW
ANCHOR SETUP 4



WMI JOB No: 2010-0148
DWG. NO.:
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FILE NAME:

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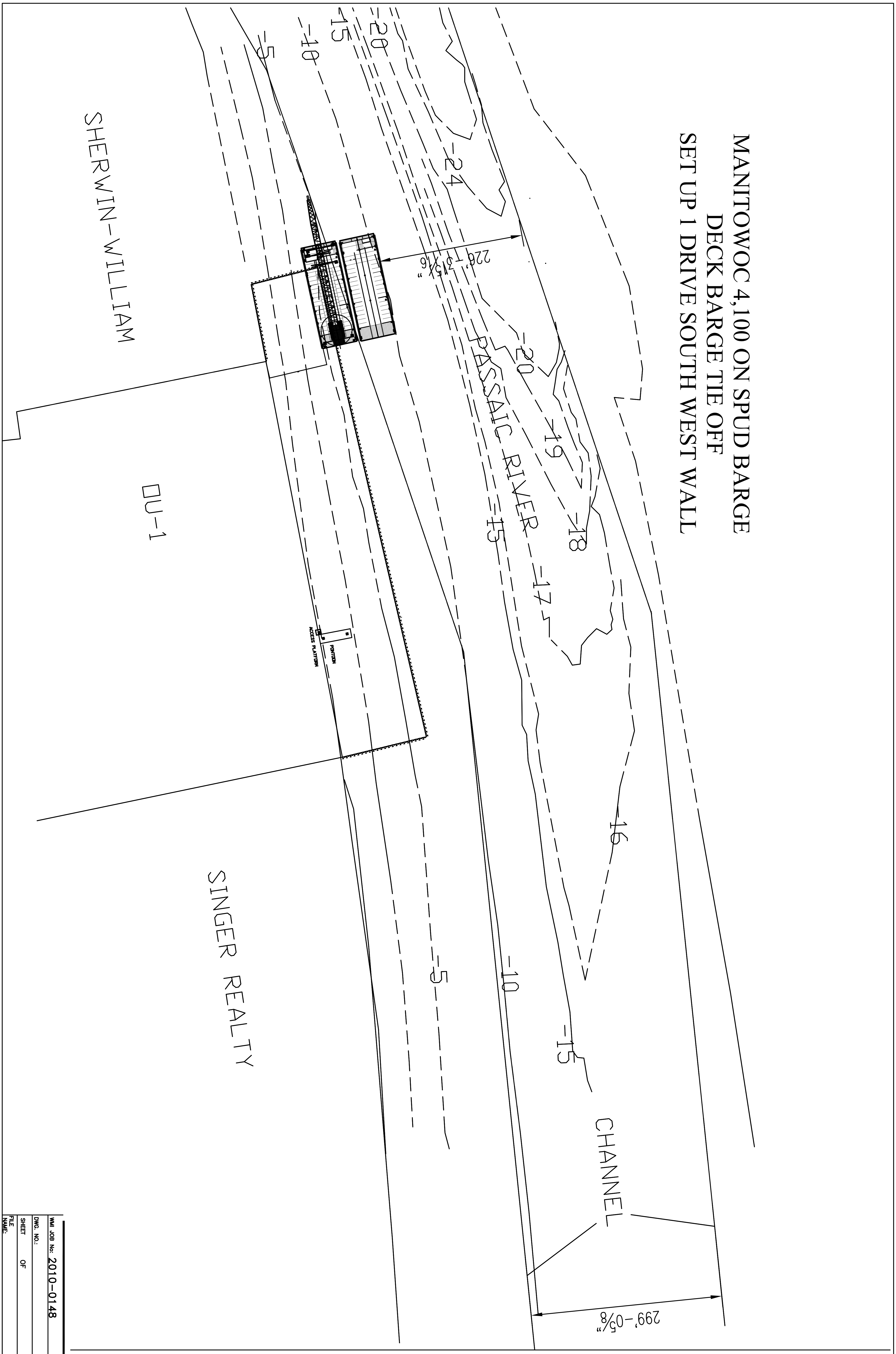
DATE	DESCRIPTION	BY

ATTACHMENT B

MANITOWOC 4,100 ON SPUD BARGE
DECK BARGE TIE OFF
SET UP 1 DRIVE SOUTH WEST WALL



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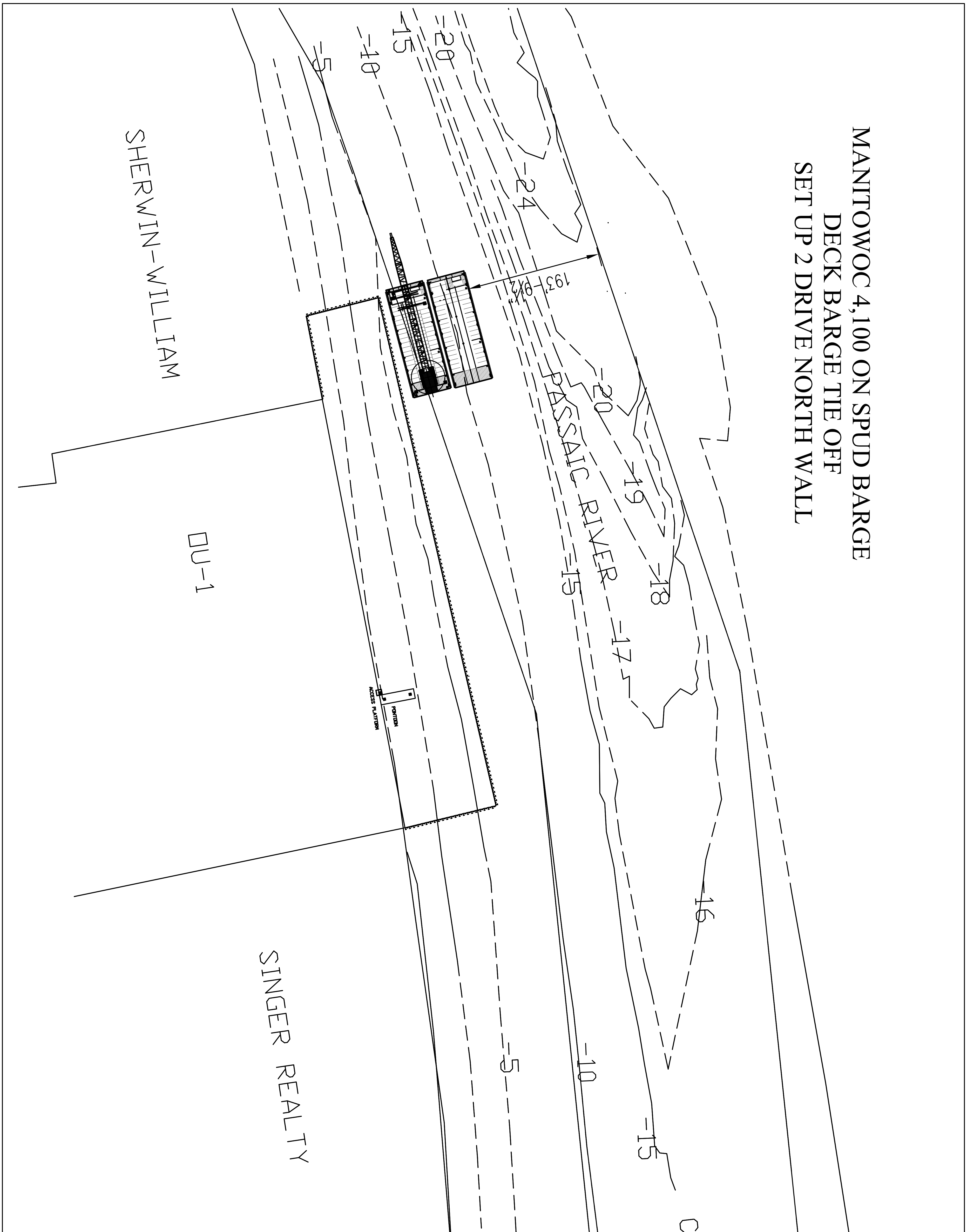

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Newark, NJ
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DATE: 1/25/2011
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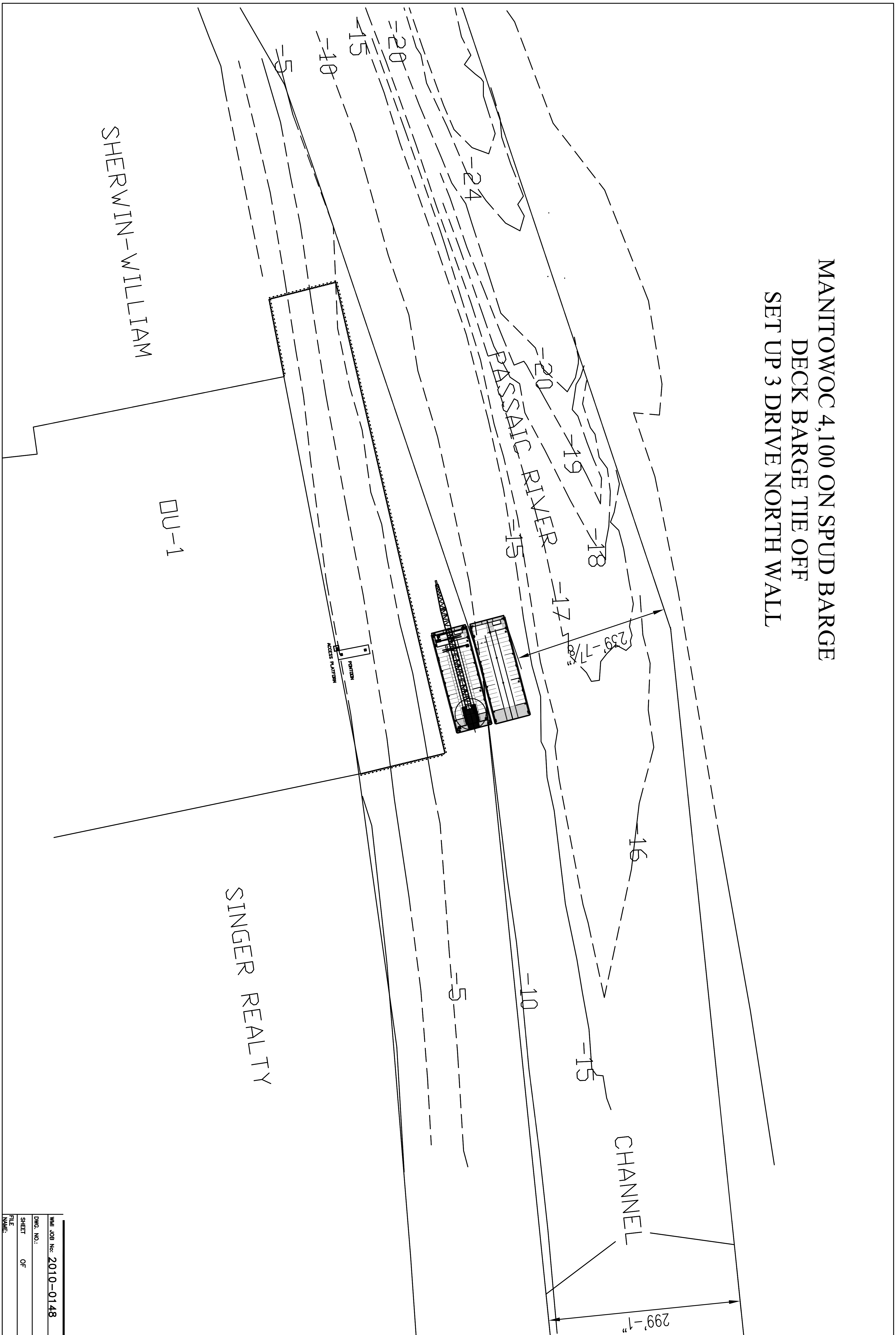
SCALE: N/A

NO.	REFERENCE DWG NUMBER
2	
1	

DATE	DESCRIPTION	BY

MANITOWOC 4,100 ON SPUD BARGE
DECK BARGE TIE OFF
SET UP 3 DRIVE NORTH WALL



WMI JOB No: 2010-0148
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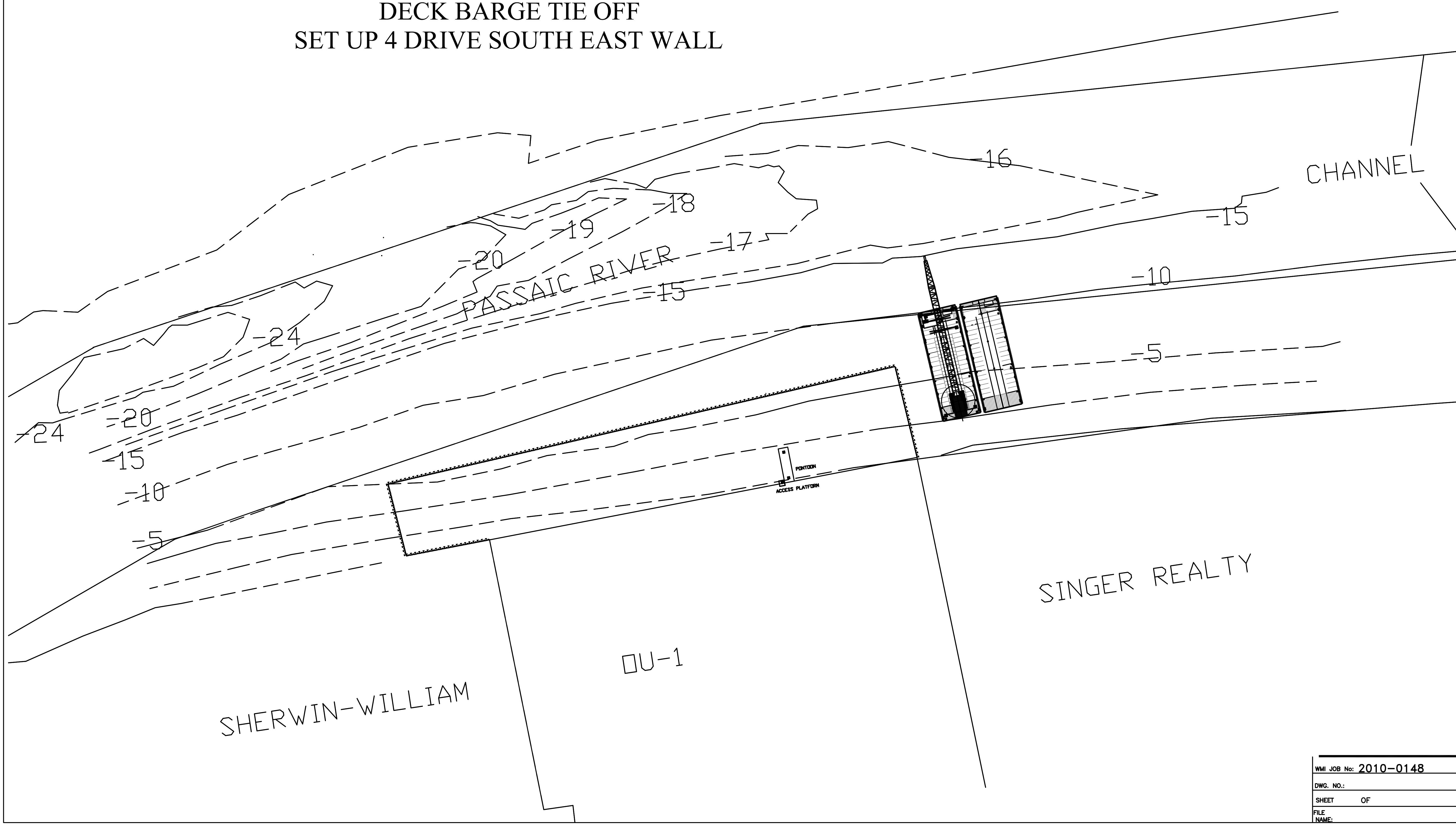
SCALE: N/A

NO.	REFERENCE DWG NUMBER
2	
1	

DATE	DESCRIPTION	BY

MANITOWOC 4,100 ON SPUD BARGE
DECK BARGE TIE OFF
SET UP 4 DRIVE SOUTH EAST WALL



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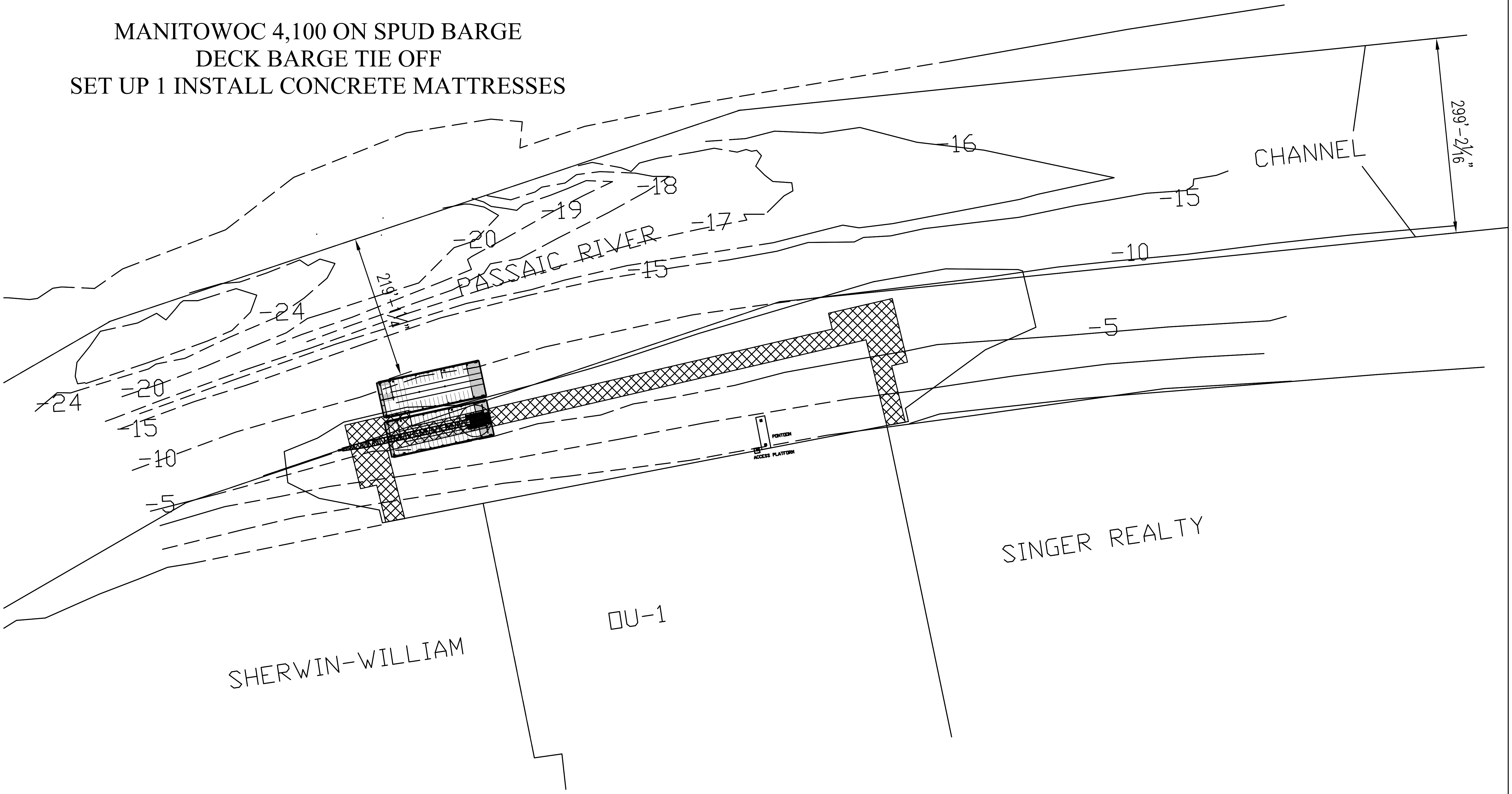
2	
1	

DATE	DESCRIPTION	BY

WMI JOB No: 2010-0148
DWG. NO.:
SHEET OF
FILE NAME:

ATTACHMENT C

MANITOWOC 4,100 ON SPUD BARGE
DECK BARGE TIE OFF
SET UP 1 INSTALL CONCRETE MATTRESSES



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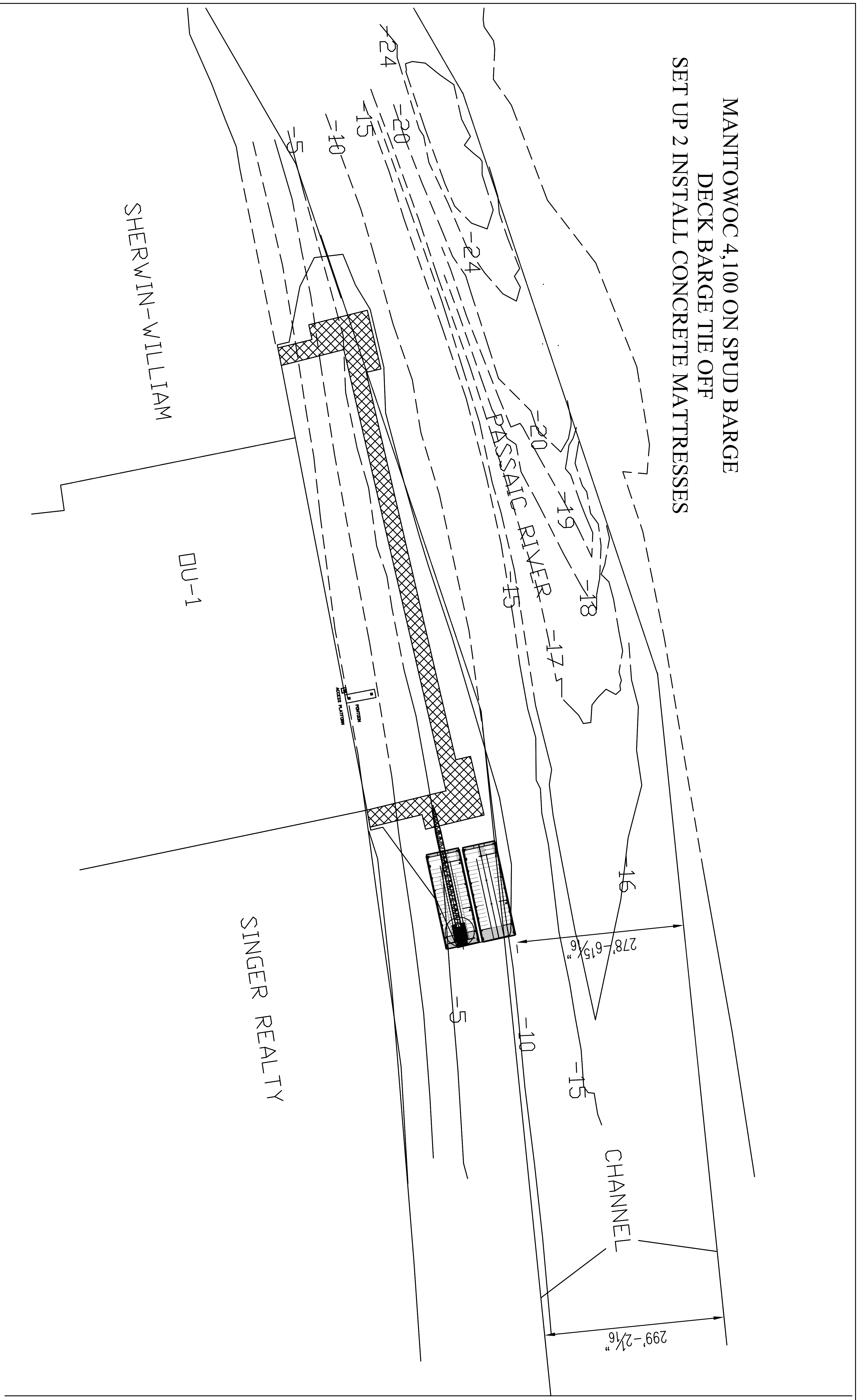

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1	

DATE	DESCRIPTION	BY

ATTACHMENT D

CITY:(Reqd) DIV/GROUP:(Reqd) DB:(Reqd) LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0009964\0001\29105\DWG\HYDRAULIC PIPELINE\09964G01.dwg LAYOUT: 2-1 SAVED: 2/7/2011 11:33 AM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 2/7/2011 11:39 AM BY: DECLERCQ, BRIAN

XREFS:	IMAGES:	PROJECTNAME: ----
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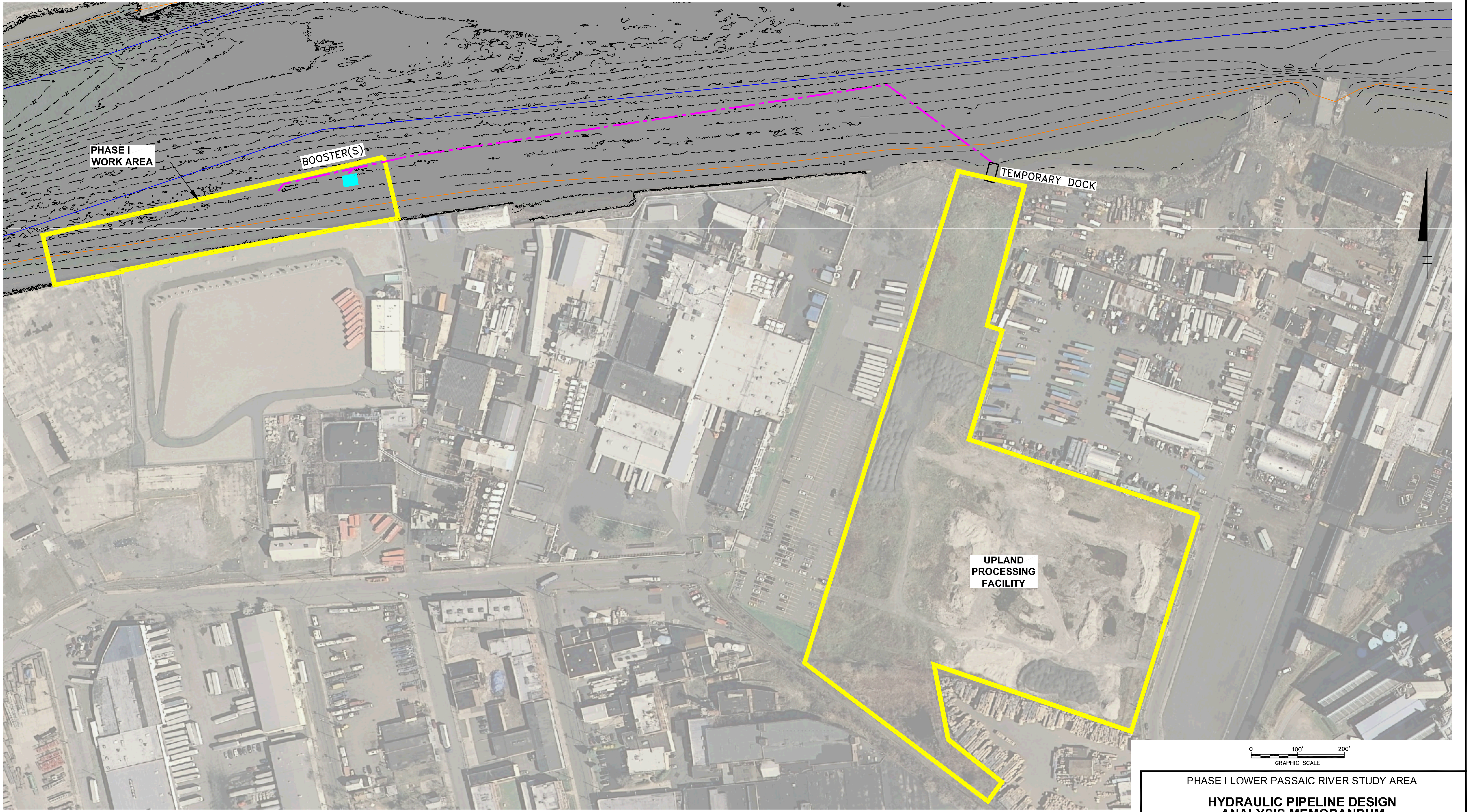

LEGEND:

━ (blue)	NAVIGATION CHANNEL
🟦	APPROXIMATE BOOSTER PUMP LOCATION
━ · ━ · (magenta)	CONCEPTUAL PIPELINE ALIGNMENT; APPROXIMATELY 5750 FEET
━ (orange)	MEAN LOW WATER ELEVATION (−2.4 FT. NGVD29)

NOTE:

1. BATHYMETRIC CONTOURS ARE BASED ON BATHYMETRIC DATA COLLECTED BY GAHAGAN & BRYANT ASSOCIATES, INC. FOR ENSR FROM 05/04/2009 TO 05/07/2009, AND 2009 BATHYMETRIC SURVEY PERFORMED BY OCEAN SURVEYS, INC. ON 4–7 MAY, 2009.

DRAFT

PRIVILEGED AND CONFIDENTIAL WORK PRODUCT
PREPARED AT THE REQUEST OF LEGAL COUNSEL
FOR OR IN ANTICIPATION OF LITIGATION
AND IN CONNECTION WITH RENDERING LEGAL ADVICE

PHASE I LOWER PASSAIC RIVER STUDY AREA

HYDRAULIC PIPELINE DESIGN ANALYSIS MEMORANDUM

PIPELINE LAYOUT AND BATHYMETRY FROM PHASE I WORK AREA TO UPF

FEBRUARY 2011, REVISION 0

FIGURE
2-1

WMI RECEIVED 2011-03-14

ATTACHMENT E

CITY: SYRACUSE DIV/GROUP: 141 DB: GMS LD:(Opt) PIC:R. ROMAGNOLI PM:R. ROMAGNOLI TM:R. ROMAGNOLI LYR: ON=*;OFF=*REF
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XREFS: IMAGES: PROJECTNAME: ----
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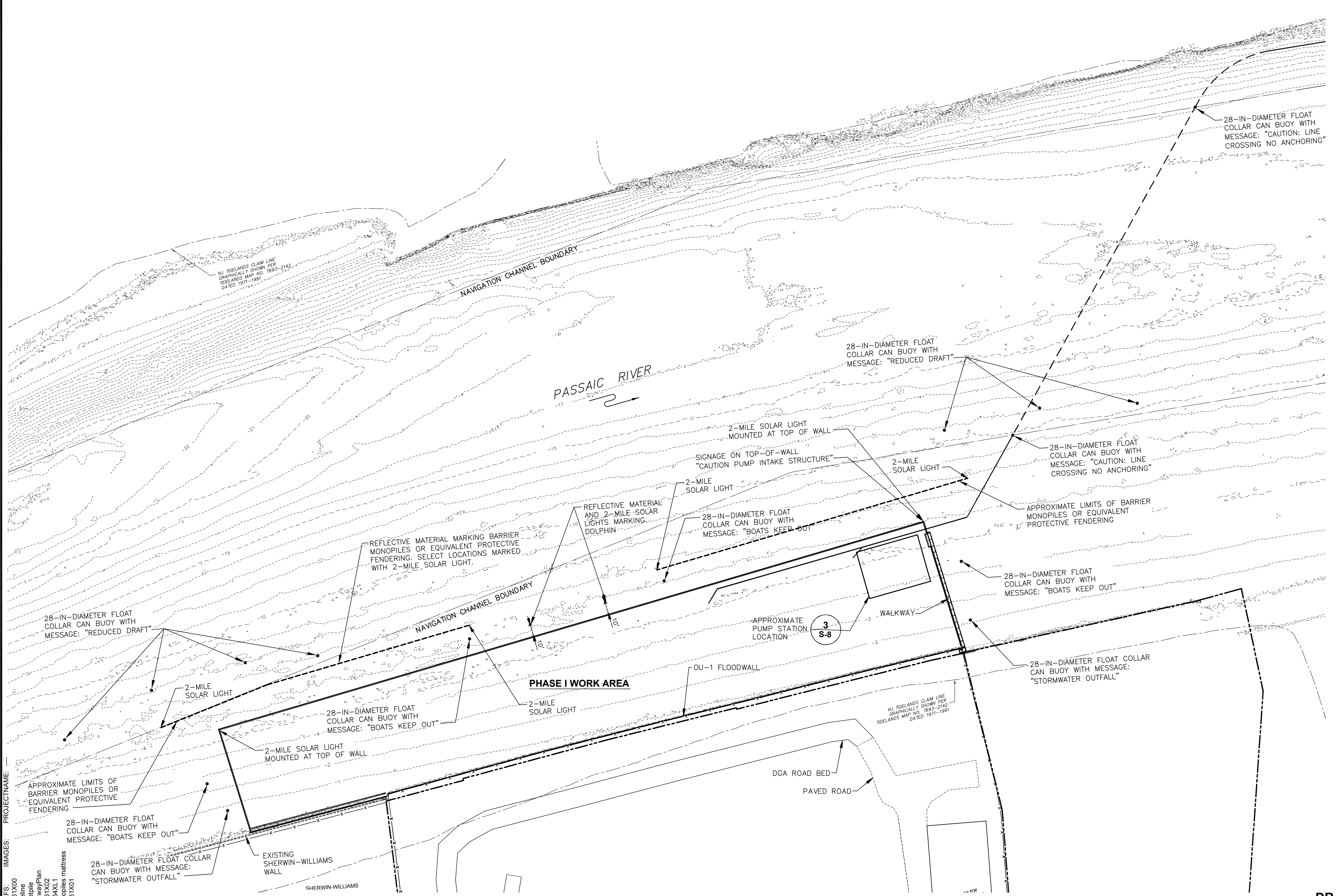
baseline
sheetpile
walkwayPlan
09961X02
09964XL1
monopiles mattress
09961X01



LEGEND:

PIPELINE ALIGNMENT
PIPELINE ALIGNMENT: SUBMERGED SECTION OF PIPELINE
PHASE I WORK AREA (REVISED 07/01/2010)
NAVIGATION CHANNEL BOUNDARY
BATHYMETRY
FENCE
PROPERTY BOUNDARY
DRAINAGE SWALE
PIERHEAD AND BULKHEAD LINE
TIDELANDS CLAIM LINE
EXISTING STRUCTURE
LIMITS OF PROTECTIVE FENDERING

+4.5 FT (SPRING MHHW)
+3.6 FT (MHW)
+1.0 FT (MSL)
+0 FT NGVD29
-1.7 FT (MLW)

NOTES:

1. BATHYMETRY DATA ARE FROM OCEAN SURVEYS, INC. DATED 06/30/2009; REVISED 09/15/2009.
2. UPLAND TOPOGRAPHY AND EXISTING FEATURES WERE TAKEN FROM SHEET NO. 9 OF THE FINAL SITE CONDITIONS PLAN SUBMITTED BY FRENCH AND PARRELLO ASSOCIATES ON 06/17/2004.
3. SURVEY SPOT ELEVATIONS WERE PROVIDED BY DPK CONSULTING, L.L.C. DATED 2009.
4. ALL LIGHTS, SIGNAGE, AND OTHER NAVIGATIONAL AIDS WILL BE APPROVED BY THE USCG PRIOR TO INSTALLATION.

DRAFT - NOT FOR CONSTRUCTION

50' 0 50' 100'
1"=50'

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No.	Date	Revisions	By	Ckd

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G-12

COLD STRESS GUIDELINES

COLD STRESS GUIDELINES

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COLD STRESS GUIDELINES

1. PURPOSE

As temperatures drop, the hazards of outdoor work can pose a threat of frostbite and hypothermia. Cold stress injuries can be prevented by using appropriate recognition and control techniques.

2. SCOPE

Clean Harbors Cold Stress Guidelines should be implemented when air temperatures are less than 50ºF=10°C or when working on water and combined air/water temperatures are less than 120ºF=49°C.

3. RESPONSIBILITIES

3.1. Employees

3.1.1. Use cold stress prevention techniques.

A. Observe co-workers for signs and symptoms of cold stress.

3.2. Foreman

3.2.1. Encourages cold stress prevention.

3.2.2. Implements work/rest cycles according to work intensity and ambient air temperature.

3.2.3. Observes employees for signs of cold stress. Takes rapid action to control cold exposure.

3.3. Health & Safety

3.3.1. Provides cold stress training.

3.3.2. Encourages cold stress prevention.

3.3.3. Monitors application of these guidelines.

4. SYMPTOMS & EFFECTS

4.1. Introduction

4.1.1. The body compensates for cold temperatures by conserving heat (restricting blood flow to skin surface) and producing heat (shivering, goose bumps) in order to maintain a constant body core temperature of 98.6º F=37°C. When body temperature drops below this level, blood flow to arms and legs will gradually be restricted in an effort to keep the heart and brain warm, which may cause localized freezing of skin tissue (frostbite) or a more severe drop in core temperature (hypothermia).

4.1.2. Pain in fingers, toes, and ears may be the first early warning of cold stress danger. Maximum shivering usually occurs at a body temperature of 95º F=35°C. Body temperatures below 95ºF can cause reduced mental alertness, reduction in decision-making, and reduced blood pressure. Loss of consciousness can occur at a core temperature of 90ºF=32°C, when the body usually stops shivering. Work in cold environments should stop immediately whenever severe shivering becomes evident.

4.1.3. First aid includes warming the body and changing wet clothing. Do not rub frostbite since this can cause infection and gangrene.

4.2. Factors That Increase the Effects of Cold Stress

4.2.1. Wind Chill Effect: wind and drafts can reduce temperatures below the actual thermometer reading. Wind chill effects significant below thermometer readings of 20ºF=-7°C.

4.2.2. Sweat: moisture trapped against the skin will decrease the body's defenses against frostbite and hypothermia.

4.2.3. Dehydration: dehydration may worsen the restriction of blood flow to the body's extremities.

4.2.4. Previous Frostbite: areas of previous frostbite injury are more susceptible to cold stress in the future.

4.2.5. Cigarette Smoking, Caffeine: these agents may worsen the restriction of blood flow to the body's extremities.

4.3. Prevention and First Aid

Efforts should be made to maintain a constant inner body temperature of 98.6º F=37°C. Appendix 1 "Cold Stress Primer" outlines the symptoms, first aid, and prevention measures for common cold stress injuries.

5. COLD WEATHER ANTI-EXPOSURE SUIT/PFD

5.1. Introduction

5.1.1. Clean Harbors requires the wearing of Personal Flotation Devices (PFD's) when working on or near water. Anti-exposure PFD's (e.g., "Mustang Suits") can be worn to prevent hypothermia during cold weather boating and boom handling operations. The following guidelines should be used to select a PFD during cold-weather work on/near water.

5.1.2. Anti-exposure coveralls are United States Coast Guard (USCG) and CSA approved as a Special Use Class V Personal Flotation Device. These suits are a one-piece coverall primarily worn to protect against the effects of cold weather during marine operations. They offer the advantage of being both an approved personal flotation device and an insulated coverall. These suits are commonly referred to by many CHES locations as "mustang suits" which is the name of one brand of anti-exposure PFD.

5.2. Selection Criteria for Anti-Exposure/Pfd Use

5.2.1. Required

A. When working/traveling in vessels on ANY body of water when the water temperature is 50°F =10°C or less; or

B. When working/traveling in vessels on any body of water when the combined water/air temperature is less than 120°F = 49°C

5.2.2. Additional Evaluation Required

A. If the heat stress hazard exceeds the water hazard, it may be unnecessary to use an anti-exposure/PFD. The following criteria should be considered and discussed with Health & Safety to determine the proper style of PFD.

B. When air temperature is greater than 50°F = 10°C, BUT combined water/air is less than 120°F = 49°C.

5.2.3. Evaluation Criteria

A. Scope of Work (Consider: Boat stability; work being performed.)

B. Location of Work (Consider: Rescuer's line of sight.)

C. Distance to Shore (Consider: Within ring buoy line.)

D. Rescue Time

E. Weather Conditions/Wind Chill Index (Consider: Water--calm, choppy, etc.; wind chill index.)

5.2.4. Not Required

A. Personnel are performing dock or shoreline operations ONLY.

B. If travel in a boat is necessary to reach the work location, review the complete selection criteria to determine situations requiring anti-exposure/PFD use.

6. CARBON MONOXIDE IDENTIFICATION & CONTROL

Carbon Monoxide poisoning causes several injuries and deaths each winter across the country. This poisoning can be prevented at home and at work by using appropriate prevention and control techniques.

6.1. Sources of Carbon Monoxide (CO)

6.1.1. Carbon monoxide is a colorless, odorless gas generated whenever fuel is burned (i.e. wood, propane, gasoline, and diesel). Space heaters, forklifts, and other fuel-operated equipment are significant emitters of carbon monoxide.

6.1.2. Cigarette smoke is also a source.

6.2. Symptoms and Effects

6.2.1. Carbon monoxide binds with hemoglobin in the blood, decreasing the body's capacity to carry oxygen. Short-term exposure can cause flu-like symptoms like headache, nausea, dizziness, and mental dullness. Concentrations above 500 ppm may cause unconsciousness and death. Long-term exposure to levels above 35 ppm can aggravate pre-existing heart conditions and induce heart attacks. The normal level of carbon monoxide in air is less than 1 ppm. The ACGIH TLV is 25 ppm over an 8-hour day.

6.3. Detection

6.3.1. Carbon monoxide sensors and other monitoring devices are available from your branch. For your home, carbon monoxide detectors are available at hardware stores.

6.4. Control

Several measures can be taken to control carbon monoxide exposure:

6.4.1. Assure that each forklift or heating device used indoors is properly tuned and adjusted;

6.4.2. Use kerosene in space heaters - diesel generates higher levels of carbon monoxide (adjust primary air adjuster for a clean burn);

6.4.3. Assure proper ventilation and monitoring is conducted whenever fuel-powered equipment is used (pressure washer, compressor, sawzall, etc.);

6.4.4. Inspect ventilation systems for proper operation, eliminate back drafts on furnaces and hot water heaters, and do not re-circulate garage or warehouse air;

6.4.5. Air purifying respirators can NOT be worn in elevated carbon monoxide environments; and

6.4.6. Stop operations and get to fresh air immediately if symptoms of carbon monoxide poisoning are experienced.

6.4.7. Consult your Health & Safety Representative and MSDS if you have any questions or need additional information or assistance.

7. TRUCK SAFETY/AEROSOL CANS

With the cold weather upon us, it's not unusual to keep ether-based starting fluid, brake cleaner, WD 40 or other spray-can products on hand to assure trucks, compressors, Bobcats and other equipment keep rolling.

These cans can easily be punctured under the air cushion seats of the larger rigs or the spray valve could be triggered in the cabs of pick-up trucks. This obviously poses a fire and health hazard should that occur.

All drivers and operators of CHES rolling stock and other motorized equipment should exercise common sense and make sure that all spray cans, flammables or other products containing hazardous materials are in appropriate locations outside the passenger compartments on vehicles.

WIND CHILL GUIDELINES

Wind Chill Hazards

Check the wind chill before you go outdoors in the winter, and make sure you are well prepared for the weather. Even moderate wind chill values can be dangerous if you are outside for long periods.

Note: The guidelines on frostbite in the table below apply to healthy adults.

Wind Chill Hazards and Risk of Frostbite

Wind Chill	**Risk of frostbite**	**Health Concern**	**What to do**
0 to -9	Low	- Slight increase in discomfort	- Dress warmly, with the outside temperature in mind.
-10 to -27	Low	- Uncomfortable - Risk of hypothermia if outside for long periods without adequate protection	- Dress in layers of warm clothing, with an outer layer that is wind-resistant. - Wear a hat, mittens and scarf. - Keep active.
-28 to -39	Increasing risk: exposed skin can freeze in 10 to 30 minutes	- Check face and extremities (fingers, toes, ears and nose) for numbness or whiteness - Risk of hypothermia if outside for long periods without adequate protection	- Dress in layers of warm clothing, with an outer layer that is wind-resistant. - Cover exposed skin: wear a hat, mittens and a scarf, neck tube or face mask. - Keep active.
-40 to -47	High risk: exposed skin can freeze in 5 to 10 minutes*	- Check face and extremities (fingers, toes, ears and nose) for numbness or whiteness (frostbite) - Risk of hypothermia if outside for long periods without adequate protection	- Dress in layers of warm clothing, with an outer layer that is wind-resistant. - Cover all exposed skin: wear a hat, mittens and a scarf, neck tube or face mask. - Keep active.
WARNING LEVEL** -48 to -54	High risk: exposed skin can freeze in 2 to 5 minutes*	- Check face and extremities frequently for numbness or whiteness (frostbite) - Serious risk of hypothermia if outside for long periods	- Be careful. Dress very warmly in layers of clothing, with an outer layer that is wind-resistant. - Cover all exposed skin: wear a hat, mittens and a scarf, neck tube or face mask. - Be ready to cut short or cancel outdoor activities. - Keep active.
-55 and colder	High risk: exposed skin can freeze in less than 2 minutes	DANGER! - Outdoor conditions are hazardous	- Stay indoors.

* In sustained winds over 50 km/h, frostbite can occur faster than indicated.

Wind chill - Minutes to Frostbite

The following are approximate values

Temperature (°C)	-15	-20	-25	-30	-35	-40	-45	-50
Wind (km/h)								
10	*	*	22	15	10	8	7	2
20	*	30	14	10	5	4	3	2
30	*	18	11	8	5	2	2	1
40	42	14	9	5	5	2	2	1
50	27	12	8	5	2	2	2	1
60	22	10	7	5	2	2	2	1
70	18	9	5	4	2	2	2	1
80	16	8	5	4	2	2	2	1

• = Frostbite unlikely

The wind speed, in km/h, is at the standard anemometer height of 10 metres (as reported in weather observations).

Frostbite possible in 2 minutes or less	▓
Frostbite possible in 3 to 5 minutes	░
Frostbite possible in 6 to 10 minutes	

Wind Chill Calculation Chart,

where T air = Air temperature in °C and V_{10} = Observed wind speed at 10m elevation, in km/h.

T air	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
V_{10}												
5	4	-2	-7	-13	-19	-24	-30	-36	-41	-47	-53	-58
10	3	-3	-9	-15	-21	-27	-33	-39	-45	-51	-57	-63
15	2	-4	-11	-17	-23	-29	-35	-41	-48	-54	-60	-66
20	1	-5	-12	-18	-24	-30	-37	-43	-49	-56	-62	-68
25	1	-6	-12	-19	-25	-32	-38	-44	-51	-57	-64	-70
30	0	-6	-13	-20	-26	-33	-39	-46	-52	-59	-65	-72
35	0	-7	-14	-20	-27	-33	-40	-47	-53	-60	-66	-73
40	-1	-7	-14	-21	-27	-34	-41	-48	-54	-61	-68	-74
45	-1	-8	-15	-21	-28	-35	-42	-48	-55	-62	-69	-75
50	-1	-8	-15	-22	-29	-35	-42	-49	-56	-63	-69	-76
55	-2	-8	-15	-22	-29	-36	-43	-50	-57	-63	-70	-77
60	-2	-9	-16	-23	-30	-36	-43	-50	-57	-64	-71	-78
65	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79
70	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-80
75	-3	-10	-17	-24	-31	-38	-45	-52	-59	-66	-73	-80
80	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81

FROSTBITE GUIDE

Low risk of frostbite for most people

Increasing risk of frostbite for most people in 10 to 30 minutes of exposure

High risk for most people in 5 to 10 minutes of exposure

High risk for most people in 2 to 5 minutes of exposure

High risk for most people in 2 minutes of exposure or less

HS 1.20 CONFINED SPACE ENTRY GUIDELINES

Clean Harbors
ENVIRONMENTAL SERVICES®

HS 1.20 CONFINED SPACE ENTRY GUIDELINES

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HS 1.20 CONFINED SPACE ENTRY GUIDELINES

1. PURPOSE

These guidelines specify the steps that shall be followed prior to and during entry into confined spaces in order to assist operating personnel in the reduction of the risk associated with entry into confined spaces. These specific guidelines include procedures for identifying and controlling hazards, procedures for emergency response and planning and training, and procedures for monitoring hazards and hazard controls.

2. SCOPE

2.1. Definition

Confined Spaces are locations that, by design, satisfy the following definition:

2.1.1. Are large enough and so configured that an employee can bodily enter and perform work;

2.1.2. Limited or restricted means for entry or exit; (limited entry by means of configuration, location, size, number, etc.);

2.1.3. Are not designed for continuous worker occupancy.

2.2. Confined Space that Requires a Permit Program

A confined space that requires a permit program to be implemented satisfies one or more of the following:

2.2.1. Contains or has a potential to contain a hazardous atmosphere;

2.2.2. Contains a material that has the potential for engulfing an entrant;

2.2.3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section;

2.2.4. Contains any other recognized serious safety or health hazard.

2.2.5. Confined spaces present the risk of oxygen deficiency, flammable atmosphere and/or toxic environments as well as physical hazards such as electrocution, mechanical activation, inadequate lighting, etc. Confined space entry risks can be minimized by understanding the hazards and taking appropriate action covered by these guidelines.

3. RESPONSIBILITIES

3.1. General/Project Management

3.1.1. Responsible for ensuring that all personnel understand the potential hazards in confined spaces.

3.1.2. Shall implement a comprehensive written facility-specific confined space entry program for protecting all persons from potential hazards, developing written procedures for entry into permit-required confined spaces, training personnel, evaluating rescue services, informing all personnel (including contractors) of relevant dangers, posting danger signs and ensuring compliance with all regulatory "Permit-required confined space" requirements.

3.1.3. Shall identify the type, number, locations, characteristics, and hazards of all non-permit and permit-required confined spaces. This information will be maintained at the facility. Management shall consult with affected employees and their authorized representatives on the development and implementation of all aspects of the permit space program. Management shall make available to affected employees or their representatives all information required by this program.

3.2. Entry Supervisor

3.2.1. General

The Entry Supervisor is responsible for both the thorough completion and safety of all aspects of confined space entry operations to which he/she is assigned. He/she has the authority to assign additional responsibilities in addition to those specified by this program (termed "program" responsibilities); however, additional responsibilities may not interfere with the primary responsibilities outlined below; the authority to hold crew members accountable for their responsibilities; and the authority and responsibility to discontinue operations if any situation poses a threat to the safety of the operation or crew members.

3.2.2. Responsibilities

A. Reviews, understands and knows the hazards faced during entry--including the chemical (i.e. MSDS, mode, signs or symptoms and consequence of exposure to chemical substances, etc.) and physical hazards of the space.

B. Reviews the Entry Permit to verify the following:

1. All appropriate entries are properly recorded on the permit;
2. All appropriate tests have been conducted;
3. All appropriate equipment and procedures specified by the permit are in place before endorsing the permit and allowing entry to begin.

C. Verifies that all information is accurate and appropriate before signing the permit.

D. Terminates the entry and cancels the entry permit under the following conditions: operation is complete, Entrants have left the space, and the space is secured; a condition not specified or allowed by the permit arises in or near the permit space.

E. Verifies that written rescue procedures, as specified by Section 10 and Appendix 5 of the CSE Guidelines, are available and that the means for summoning or enacting them are operable.

F. Restricts, blocks or prevents (without creating a physical risk to him/her self) unauthorized individuals from entering or attempting to enter the permit space during CHES entry operations.

G. Assures that the entry operation remains consistent with the terms of the permit and that acceptable entry conditions are maintained when entry responsibilities are transferred.

H. Assigns additional responsibilities (tasks).

I. Conducts and documents on the permit items discussed during the safety meeting.

J. Assures that the communication system is established.

K. Assures all participants are familiar with emergency procedures and their assigned responsibilities.

L. Assures that all entrants have had the opportunity to view the initial air monitoring being conducted on the space; discusses these results with the entrants.

M. Notifies Health and Safety of any unusual events, i.e., site problems, accidents, injuries, exposures, near misses, changes in tasks, unauthorized entries or attempts, etc. that occur during the entry operation.

N. A minimum of three employees is present and properly trained. Two of the three employees must be CHES employees who remain outside the space during the entire entry.

3.2.3. Entry-by-Entry Supervisor

The Entry Supervisor may enter the confined space to carry out responsibilities specified in 3.2.2 or otherwise supervise the work being performed. However, he/she is not permitted to perform other duties in the space such as those assigned to the Entrants. Additionally, if entry by the Entry Supervisor would compromise the capability of the rescue team, the Entry Supervisor may not enter the space.

3.2.4. Conditions for Entry-by-Entry Supervisor

The Confined Space Entry (CSE) Supervisor may enter a permit-required confined space to perform supervisory responsibilities under the following conditions. If these conditions are met, the CSE Supervisor can enter without relinquishing the CSE Supervisor role.

A. Verifies that adequate rescue services are available and that the means for summoning them are operable.

B. The Attendant is instructed to summon rescue if the need arises.

C. Entry is conducted for supervisory duties only.

   1. A new permit need not be completed if A-C above are ensured. However, time in and out should be recorded on the permit.

   2. If the Entry Supervisor is entering the space to perform work other than that of a supervisory nature, the Entry Supervisor must assure that another qualified Entry Supervisor is available to supervise the entry. In this case, a new permit is not required if the replacement supervisor is a qualified Entry Supervisor and his/her name and supervisory times are noted on the established permit. The original Entry Supervisor must be listed as an Entrant on the permit for the times in the space.

3.2.5. Assumption of Attendant Duties

The Entry Supervisor may also assume the Attendant's responsibility in addition to the Entry Supervisor responsibility. This is permitted so long as the following is considered, ensured and can be accomplished.

A. Only one Entrant is permitted in the space at any one point in time. Any deviation from this requirement must first be discussed and approved with Health & Safety.

B. Rescue or other emergency services (as specified in 3.3.1 (F)) can be summoned without relinquishing the Entry Supervisor or Attendant's duties--i.e. leaving the space. This may be accomplished through an established and effective communication system (i.e., two-way radios, others).

C. The Entry Supervisor will be able to remove the Entrant using non-entry rescue unless an adequate rescue team or outside rescue service is available, assigned and will be utilized.

D. The Entry Supervisor/Attendant will not enter the space to perform supervisory responsibilities unless relieved by an authorized Attendant.

3.3. Attendant

3.3.1. Primary Responsibilities

A. Reviews, understands and knows the hazards faced during entry, including the chemical (i.e., MSDS, mode, signs or symptoms and consequence of exposure to chemical substances, etc.) and physical hazards of the space.

B. Is aware of possible behavioral effects of hazards exposure of entrants (see permit, MSDS, etc.).

C. Continuously maintains an accurate count of Entrants in the permit space and ensures that the names listed on the Entry Permit accurately identify who is in the permit space.

D. Communicates with authorized Entrants as necessary to monitor Entrant status and to alert Entrants of the need to evacuate the space under Item (e) of this section. (Next item.)

E. Monitors activities inside and outside the space to determine if it is safe for Entrants to remain in the space and orders the authorized Entrants to evacuate the permit space immediately under any of the following conditions:

1. If the Attendant detects a prohibited condition;

2. If the Attendant detects the behavioral effects of hazard exposure in an authorized Entrant;

3. If the Attendant detects a situation outside the space that could endanger the authorized Entrants; or

4. If the Attendant cannot effectively and safely perform all his/her duties.

F. Summons rescue and other emergency services as soon as he/she determines that authorized entrants may need assistance to escape from permit space hazards.

G. Takes the following actions when unauthorized persons approach or enter a permit space while entry is under way:

   1. Warns the unauthorized persons that they must stay away from the permit space;

   2. Advises the unauthorized persons that they must exit immediately if they have entered the permit space; and

   3. Informs the authorized Entrants and the Entry Supervisor without leaving the standby position, nor entering the permit space, if unauthorized persons have entered the permit space.

H. Performs non-entry rescues as specified by the written rescue plan and guidelines.

I. Performs no other duties than monitoring and protecting the authorized Entrants.

J. Conducts (as appropriate without entry) and documents atmospheric monitoring as specified by the permit or additional monitoring as deemed necessary. Communicates these results to the entrants.

K. Documents monitoring results and operational conditions on permits.

L. Remains outside the space during entry operations until relieved by another qualified Attendant (Attendant). ("Qualified" means the relief Attendant is as knowledgeable in the responsibilities, hazards, conditions, etc. as the original Attendant.)

3.3.2. Other Attendant Duties

OSHA recognizes that some tasks, particularly those that enhance the Attendant's knowledge of conditions in the space, can be performed safely by the Attendant. Accordingly, in order to protect authorized Entrants from unnecessary hazards, OSHA has decided to allow Attendants to perform only such duties as will not hinder their primary function of monitoring and protecting authorized Entrants.

The following are examples of permitted and prohibited duties; others should be evaluated on a case-by-case basis. (Contact Health and Safety.)

A. Permitted Duties

   1. Passing tools and buckets to Entrants.

   2. Pulling buckets while maintaining constant visual or verbal communication with the Entrant.

B. Prohibited Duties

   1. Directs traffic.

   2. Walks to a vehicle to obtain a tool.

3. Loads or unloads a drum if that action will affect the attendants primary duty of monitoring the status of the entrant(s).

C. Regardless of the Attendant's regular or additional responsibilities, the following conditions must be maintained.

1. The Attendant maintains constant communication with the Entrant (s).

2. The use of an automated LEL/Oxygen/Toxic meter is used to continuously monitor the confined space and immediately alerts the Attendant and Entrant that a problem exists.

3. The frequency of monitoring as noted above shall be based on the conditions of the space being monitored and any limitations of the air-monitoring instrument being utilized.

4. The Attendant does not break the plane of an opening into the confined space.

3.4. Entrants - Responsibilities

3.4.1. Adhere to all instructions provided by the Entry Supervisor and Attendant.

3.4.2. Know the hazards that may be faced during entry including information on the mode, signs or symptoms, and consequences of the exposure to a physical or atmospheric hazard.

3.4.3. Properly use equipment:

A. Testing and monitoring equipment specified by the permit, as appropriate for Entrant's use;

B. Ventilating equipment needed to obtain acceptable entry conditions;

C. Communications equipment, methods, systems, signals, etc.;

D. Required personal protective equipment;

E. Lighting equipment needed to enable employees to see well enough to work safely and to exit the space quickly in an emergency;

F. Barriers and shields as specified by Section 9.l.3;

G. Equipment, such as ladders, needed for safe entry and egress by authorized Entrants;

H. Rescue and emergency equipment needed to comply with the rescue plan and guideline, except to the extent that the equipment is provided by Rescue Services;

I. Any other equipment necessary for safe entry into and rescue from permit spaces.

3.4.4. Visually observe initial air monitoring that is conducted on the space.

3.4.5. Alert the Attendant whenever:

A. The Entrant recognizes any warning sign or symptom of exposure to a dangerous situation; or,

B. The Entrant detects a prohibited condition.

3.4.6. Exit from the permit space as quickly as possible whenever:

A. An order to evacuate is given by the Attendant or the Entry Supervisor;

B. The Entrant recognizes any warning sign or symptom of exposure to a dangerous situation;

C. The Entrant detects a prohibited condition; or

D. An evacuation alarm is activated; or

E. The Entrant suspects a problem has developed or is likely to develop with their respiratory protection or other personal protective equipment.

3.5. Health and Safety

3.5.1. Provides technical assistance to aid crews in identifying space characteristics and conduct site audits to ensure compliance with these guidelines.

3.5.2. Conducts an annual review of these Entry Guidelines to assure that the guidelines continue to provide adequate protection for Entrants.

3.5.3. Provides consultation on unusual, difficult or unique operations.

4. DEFINITIONS

NOTE: This section is provided by OSHA and may not accurately reflect CHES' Confined Space Entry Guidelines. CHES program requirements take precedent over information provided by the definitions. This information is made available for illustrative purposes only.

Acceptable entry conditions: The conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.

Attendant: An individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program.

Authorized entrant: An employee who is authorized by the employer to enter a permit space.

Blanking or blinding: The absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Confined space: A space that: (l) Is large enough and so configured that an employee can bodily enter and perform assigned work; and (2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and (3) Is not designed for continuous employee occupancy.

Double block and bleed: Closure of a line, duct, or pipe by closing and locking or tagging two inline valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

Emergency: Any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

Engulfment: The surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entry: The action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry permit (permit): The written or printed document that is provided by the employer to allow and control entry into a permit space and contains the information specified in Appendix 9 (CSE Permit.)
Entry supervisor: The person (such as the employer, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section.

NOTE: An Entry Supervisor also may serve as an Attendant as long as that person is trained and equipped as required by this section for each role he or she fills. Also, the duties of Entry Supervisor may be passed from one individual to another during the course of an entry operation.

Hazardous atmosphere: An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes: (l) Flammable gas, vapor, or mist in excess of l0 percent of its lower flammable limit (LFL); (2) Airborne combustible dust at a concentration that meets or exceeds its LFL;

NOTE: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (l.52 m) or less.

(3) Atmospheric oxygen concentration below l9.5 per cent or above 23.5 percent; (4) Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of this part and which could result in employee exposure in excess of its dose or permissible exposure limit;

NOTE: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.

(5) Any other atmospheric condition that is immediately dangerous to life or health.

NOTE: For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communication Standard, §l9l0.l200 of this part, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

Hot work permit: The employer's written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

Immediately dangerous to life or health (IDLH): Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health affects or that would interfere with an individual's ability to escape unaided from a permit space.

NOTE: Some materials--hydrogen fluoride gas and cadmium vapor, for example--may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse l2-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

Inerting: The displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

NOTE: This procedure produces an IDLH oxygen-deficient atmosphere.

Isolation: The process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

Line breaking: The intentional opening of a pipe, line, or duct that is or has been carrying flammable corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

Non-permit confined space: A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Oxygen deficient atmosphere: An atmosphere containing less than l9.5 percent oxygen by volume.

Oxygen enriched atmosphere: An atmosphere containing more than 23.5 percent oxygen by volume.

Permit-required confined space (permit space): A confined space that has one or more of the following characteristics: (l) Contains or has a potential to contain a hazardous atmosphere; (2) Contains a material that has the potential for engulfing an entrant; (3) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or (4) Contains any other recognized serious safety or health hazard.

Permit-required confined space program (permit space program): The employer's overall program for controlling, and, where appropriate, for protecting employees from, permit space hazards and for regulating employee entry into permit spaces.

Permit system: The employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

Prohibited condition: Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

Rescue service: The personnel designated to rescue employees from permit spaces.

Retrieval system: The equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.

Testing: The process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

NOTE: Testing enables employers both to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to and during entry.

5. SAFETY MEETING

5.1. Frequency

5.1.1. A Safety meeting shall be conducted once the space has been characterized and:

A. Prior to the start of any activity;

B. Whenever new tasks are initiated i.e., entering the next boiler in a series;

C. For newly assigned Entrants, Attendant, etc.; and,

D. A minimum of once per shift, prior to the start of each operation.

5.2. Content

The following information must be discussed: Atmospheric, chemical and physical hazards of the space and surrounding area; rescue procedures; the task to be completed; Material Safety Data Sheets; work assignments; and responsibility of each function, i.e., Entrant, Attendant and Supervisor.

5.3. Documentation

5.3.1. The Entry Supervisor (or his/her designee) must document the following information on the Confined Space Permit: Information discussed; those in attendance; any questions posed by the crew; and, scope of work assignments.

5.3.2. Signature: Each crewmember must sign the permit once they are satisfied they understand all operational and safety aspects of the assigned work.

5.3.3. Withholding Signature: Any crew member who has not had his/her questions answered to their satisfaction, does not thoroughly understand their responsibilities, or is unsure of methods to safely perform the operation may withhold their signature until their questions are answered and the information is provided. No entrant will be compelled to enter a confined space until they understand and agree to information indicated in 3.3 above.

5.3.4. Agreement: An Entrant's signature is his/her indication that they understand the hazards, agree to their responsibilities and have had all questions answered to their satisfaction. No entrant shall be compelled to sign his/her name but should do so only after receiving adequate explanation of applicable information.

6. OPERATION PLANNING

6.1. Client Provided Information

Prior to site work involving entry to client's confined space (preferably during the bid stage), Clean Harbors must solicit hazard information on the space to be entered. Section I & II of the CSE Permit should be utilized to obtain the required information. The following information must be requested from the client:

6.1.1. If the space is considered a permit space.

6.1.2. Requirements of the client's confined space entry program; (these may result in additional requirements to CHES, but should not compromise the guidelines specified here).

6.1.3. Client's experience with the space that makes the space in question a "permit-required" space.

6.1.4. Known hazards of the space.

6.1.5. Any precautions or procedures that the client has implemented for protection of employees in or near the space where CHES will be working.

6.1.6. If any client's personnel will be working in or near the space. (Operations must be coordinated between CHES and the client to ensure neither endangers the others employees.) See Section 9.9 for additional guidance.

6.2. CHES Information

See Section 8 Hazard Assessment for additional information needed during the planning of a confined space entry.

6.3. Other Procedures

Other procedure that might apply to Confined Space Entry operations include, however are not limited to: PPE, Respiratory Protection, Exposure Monitoring, Decontamination, Hazard Communication, Excavation Safety, Hot Work, Lock Out/Tag Out and Underground Storage Tank Removal.

7. PERMIT SYSTEM

7.1. Completion

A CHES entry permit must be thoroughly prepared by the Entry Supervisor prior to the entry. (See Appendix 9 for a sample of the permit form.) All items must be reviewed, evaluated, performed, etc. before the Entry Supervisor signs the permit, indicating all information is complete and accurate.

7.2. Availability/Posting

The completed permit and space conditions must be discussed with the Entrants and Attendant during the safety meeting. At that time, the Entrants and Attendant will be given an opportunity to review and confirm that pre-entry preparations have been completed. Each participant will be asked to sign the permit. The permit shall also be posted.

7.3. Permit Duration

The permit is valid for one shift or the time period required to complete the assignment or job identified on the permit (entry purpose) if that is less that one shift. If the job exceeds the expiration date and time, a new permit must be issued.

7.4. Canceling the Permit

The Entry Supervisor must terminate the entry and cancel the permit under the following conditions:

7.4.1. Entry operations covered by the permit have been completed and all entrants have exited the space;

7.4.2. A condition not allowed by the permit arises in or near the space.

7.5. Information Recording

The Attendant is responsible for ensuring that the following information is recorded on the permit: monitoring results, Entrant's time in and out, and other pertinent information contained on the permit.

7.6. Retention

7.6.1. Retention Period

Canceled permit must be retained for one (l) year to facilitate review of the confined space entry program.

7.6.2. Copies

Copies of all permits should be kept in one central file that is accessible for review. The files shall be maintained at each field service location and facility.

7.6.3. Site Problems

Any problems encountered during an entry shall be noted on the permit and must be communicated to Health and Safety by the Entry Supervisor as soon as possible, but no later than at the conclusion of the entry.

8. HAZARD ASSESSMENT

The hazards of confined spaces are varied and potentially extensive. Before an operation is performed in a confined space, the hazards must be assessed and a control strategy developed to minimize the hazards. To assist the Entry Supervisor in this process, CHES has developed the following tools:

8.1. Confined Space Entry Permit Section I

This section of the permit is utilized to gather information on space hazards from the customer. This information should be gathered by the Quality Supervisor, Field Specialist or whoever is scoping the job and provided to the Entry Supervisor during operation planning.

8.2. Confined Space Entry Permit Section II

This section is used during the scoping of confined space operations to identify and categorize confined space hazards. It is completed by the person scoping the job and provided to the Entry Supervisor during job planning.

8.3. Substance Analysis

To aid the Entry Supervisor in determining the chemical hazards, the following sources should be referenced:

8.3.1. Job folder from previous operations performed in this space;

8.3.2. Chemical (sample) analysis of product stored in the space (total analysis must be available);

8.3.3. Chemical assessment provided by the customer through a process analysis or Material Safety Data Sheets.

8.4. Client Provided Information

See Section 6 Operation Planning, for additional information needed to assess the hazards of a planned entry.

9. ENTRY GUIDELINES

The following guidelines are provided to help identify, evaluate and control the hazards typically encountered in confined spaces. Because each space is unique and presents obvious and less than obvious hazards, it is vital that each action be taken to identify and minimize the risk during entry.

9.1. Limiting Unauthorized Entry

9.1.1. Signs

A. All warning signs shall be printed both in English and in the predominant language of non-English reading employees. Employees unable to read labels and posted signs shall be informed of the instructions printed on the signs.

B. A sign warning of the confined space must be posted at the entrance to each confined space while CHES is on site performing an entry. An example of acceptable wording includes the following. Other wording may be used. Contact Health and Safety.

DANGER
PERMIT REQUIRED CONFINED SPACE
DO NOT ENTER

9.1.2. Posting

The sign should be posted in a conspicuous location such that it can be readily seen by any individual who happens upon a space's access. It should not be placed on the cover (access way) to a space.

9.1.3. Access Protection

To further limit access of unauthorized Entrants to a confined space where CHES is working but the access location is not being used for entry, the following methods should be used. Other methods may also achieve this objective.

A. Station a worker at each entry/access point to inform unauthorized Entrants of the space and the prohibition against entering.

B. Close off each entry point by reattaching the access cover if unattended.

C. Attach (bolt) a secure barrier (expanded metal wire, etc.) to each access point that is unattended.

NOTE: Ensure the material is sufficiently strong to prevent easy break-through--i.e., chicken wire is inappropriate for floor level openings. However, expanded metal wire may provide adequate stability and strength. Also, be sure this action does not create additional hazards--i.e., trip hazard, puncture wound, etc.

D. Place or ensure that a manhole gate is placed around any manhole entrance.

E. Position a vehicle to block another vehicle from entering the space. (**NOTE**: Exhaust gases may enter the confined space creating a potentially toxic environment. Therefore, either vent exhaust gases away from the space or keep the engine off. Also, when using this barrier during entries involving flammable materials, the ignition must be left in the OFF position at all times. The Entry Supervisor should install a tag on the steering wheel indicating the vehicle must remain off or lockout the vehicle. Log on the permit that the keys have been removed.

The atmosphere around the entire vehicle must be evaluated to assure flammable vapors [greater than l0% of the LEL] do not accumulate before starting the vehicle.)

9.1.4. Host Employer/Another Employer

If employees other than CHES personnel are performing work on or near the space being entered and that work will affect the CHES entry team, then the entry supervisor needs to ensure the following is followed: meet with and apprise the client contact of the host employer or other contractors working on the site, etc. that CHES will be working in the space (identify the space) and ask that they inform their employees to not enter the space, nor perform any work around the space that may jeopardize the safety of the Entrants or permit, under the section "Supervisor's Comments."

9.1.5. Reporting Unauthorized Entry or Attempts to Enter

Any unauthorized entry or attempted entry must be reported to the Entry Supervisor immediately. The Entry Supervisor is responsible for removing unauthorized individuals who enter or who attempt to enter the space during entry operations. However, attempts should be made to deter the unauthorized person from entering the space. This should be done verbally. Bodily force should not be used.

9.2. No Entry

When planning a confined space entry, one option to consider is NO ENTRY. This option may be viable with a little adaptation to the operation and should be considered before a decision to enter is made. Contact Health and Safety for assistance when considering this option.

9.3. Isolation

Prior to entry, the space must be removed from service and protected against the release of energy sources or introduction of material into the space. Sources include: product lines, mechanical, electrical, hydraulic, pneumatic, etc. Contact Health and Safety before entering if the space cannot be isolated i.e., sewers, manholes, etc. Additional precautions will be required.

9.3.1. Energy Isolation and Lockout/Tagout Procedures: Confined Space Entry

A. Energy isolation and lockout/tagout procedures shall be specific for each type of permit-required confined space.

B. The confined space shall be completely isolated from all other systems by physical disconnection or blanking off all lines or double block and bleed as a minimum.

C. Lockout/tagout or any closure of lines, ducts or pipes shall be confirmed by the entry supervisor.

D. All blanks to be used on feed lines, drain lines, etc. shall be recorded on the entry permit.

E. Any energy isolation procedures or line blanking/blinding or bleeding shall be noted on the Confined Space Entry Permit and confirmed by the entry supervisor. The specific LOTO checklist used by the CSE Supervisor, to ensure all sources of energy have been isolated, is part of the CSE permit and must be completed.

F. If electrical isolation is required, circuit breakers and/or disconnects will be locked in the "off" position with a key-type padlock. The only key is to remain with the person working inside the confined space. If more than one person is inside the confined space, each person shall place his/her own lock on the circuit breaker. In addition to the lockout system, there must be an accompanying tag that identifies the operation and prohibits use.

G. Lockout and tagout will be completed before entry when moving parts, drive belts or chains present a hazard.

H. Any forms of stored energy (e.g., hydraulic, pneumatic) must be isolated or released procedures and processes used to clean the inside of a confined space shall be reviewed and authorized by the **Entry Supervisor**.

9.4. Hazard Mitigation

Methods to mitigate confined space hazards must be instituted prior to entry. Available methods include, but are not limited to:

9.4.1. Purging

Introducing a gas (inert or air) to flush the atmosphere of oxygen deficient or toxic gases, vapor, dust, mists, fumes, etc.

9.4.2. Inerting

Displacing the atmosphere with a non-combustible gas (such as nitrogen, carbon dioxide, argon, etc.) to such an extent that the resulting atmosphere is non-combustible. (**NOTE**: This procedure produces an IDLH, oxygen-deficient atmosphere. Notify Health and Safety prior to inerting any confined space.)

9.4.3. Flushing

Introducing a liquid to the tank with the objective of mobilizing and removing product contained in the space.

9.4.4. Mechanical Venting

The process of reducing the hazardous atmosphere from the space by introducing or removing air from the space utilizing a unit solely designed for the purpose of moving air.

A. Exhaust Venting

1. Exhausting air from the space removes the hazardous atmosphere and dilutes the remaining atmosphere with clean air.

2. If properly arranged, exhaust venting has several advantages over Forced Air Ventilation. These include: removing hazardous atmospheres close to the source; introducing uncontaminated (outside) air or diluted air in the breathing zone of the workers; and greater ability to control vapor exhausts.

B. Forced Air Ventilation

1. Air should not be blown into a space that contains flammable or toxic atmospheres. Blowing air into a space will agitate and evaporate the contaminants and disperse them throughout the space. Blowing air into a space will also result in an uncontrolled expulsion of the hazardous atmospheres from the space through any openings in the space. This may result in contamination of adjacent spaces and areas.

2. Clean air may be blown into a space only when no flammable or toxic materials are present or being generated by the work process and only when ventilation is required merely to provide clean, respirable air for breathing and general comfort.

3. In the event that special circumstances require air to be blown into a tank containing flammable materials, this option must first be discussed and approved with Health & Safety prior to being implemented.

C. Natural Ventilation

This is not acceptable as an effective method to control atmospheric hazards.

D. Ventilating Techniques - See Appendix 2.

9.4.5. Lockout/Tagout - Refer to CHES' Program.

9.4.6. Isolation - Refer to Section 9.3 of this program.

9.4.7. Hot Work - Refer to CHES' Program

9.4.8. Physical Hazard Control Program

The Physical Hazard Control Program was established by CHES to identify, inform and control physical hazards encountered during CHES operations. The program consists of Physical Hazard Evaluation Sheets that specify and reference action that should be taken to mitigate a hazardous condition. Appendix 3 contains Physical Hazard Evaluation Sheets that are currently available. If a hazard is observed on the site, the appropriate hazard control procedures should be followed and the action specified by the referenced documents taken to mitigate the hazard.

A. Heat Exchangers

Prior to entry into heat exchangers or other confined spaces that contain coils or are equipped with jackets, the coils or jackets must be depressurized. If work is to be done on the coil or jacket, it must be drained, gas free, and isolated.

B. Tank Trailers and Tank Trucks

Tank trailers must be detached from tractors, brakes set, wheels chocked, and trailer jack stands put in place. Tank trucks must have brakes set, wheels chocked, and engines shut down. A sign indicating confined space work in progress must be placed on the trailer. Consider using more than one sign to ensure appropriate notice is provided. Barricades shall be provided on all sides, including front and rear, to properly designate the CSE work in progress activity.

C. Hydrogen Sulfide

Iron sulfide deposits may form in vessels that have contained Hydrogen Sulfide. Iron sulfide deposits may burst into flames when they dry out. Therefore, if vessel surfaces are suspected of containing iron sulfide deposits, the vessel surfaces must be kept wet with water or steam until the deposits are completely removed.

D. Oxygen Depletion

Oxygen may be depleted from the atmosphere within confined spaces due to the action of bacteria, algae, rust, burning, etc. Continuous oxygen and flammability monitoring are required.

9.4.9. Additional Control Programs

CHES has developed many programs to assist the Entry Supervisor in mitigating hazards. Clean Harbors Health & Safety Manual contains all safety programs developed by CHES. Applicable programs should be selected and applied when site hazards dictate.

9.4.10 Other Methods <RESERVED>

9.5. Acceptable Entry Conditions (AEC)

Prior to entering the confined space, the Entry Supervisor must determine and assure that acceptable entry conditions exists. The following are the conditions that must be met.

9.5.1. Hazard Assessment

The hazards of the space have been assessed using information provided by the client and information developed using Section II of the CSE Permit. Additional hazards should be noted at this time. The Entry Supervisor must verify the accuracy of the hazard assessment by conducting a survey of the area (entry should not be performed to verify hazards). If additional hazards are identified, note these in the Hazard Assessment section of the permit, identify appropriate control measures and discuss all pertinent information with the crew.

9.5.2. Permit

Acceptable Entry Conditions as specified by the permit must be complete, accurate, discussed with the crew, signed by all appropriate personnel, and the permit shall be posted.

9.5.3. Hazard Control

Hazards identified prior to entry must be controlled, discussed, explained, etc. before initiating entry. This includes methods to control atmospheric, physical, etc. hazards identified in the Hazard Assessment Guide.

9.5.4. Atmospheric Evaluation - Refer to Appendix 4 for guidelines and Section 9.7 for methods.

A. Atmospheric Concentrations

Material	Acceptable Concentrations
Oxygen (A)	l9.5 - 22.0%
Flammable (A)	<l0% LEL; and
Toxic (B)	<l/2 the "Permissible Exposure Limit"/TLV

1. Ventilation must be used to maintain acceptable concentrations. Other methods listed under Section 9.4, Hazard Mitigation, may be used to produce acceptable atmospheric conditions. However, it may not maintain the atmosphere at an acceptable level.

2. If ventilation is not sufficient for producing and maintaining acceptable concentrations of toxic materials, ventilation shall none-the-less be used and must be supplemented with respiratory protection. (See Section 9.5.4(D)).

B. "Prohibited" Conditions

1. If a prohibited condition is identified, hazard mitigation techniques must be used to reduce the hazards before entry may be considered.

2. Prohibited conditions include concentrations beyond the range listed in 9.5.4(A).

3. Prohibited conditions also include when all toxic materials cannot be measured; the entire space cannot be characterized from outside; "unknown" conditions exist; and permit conditions are not met.

C. Restricted Entry Conditions

A confined space **SHALL NOT** be entered where any of the following conditions exist:

1. LEL is greater than l0%;

2. Oxygen concentration is less than 19.5% or exceeds 22.0%; or,

3. The IDLH is exceeded.

Contact Health and Safety for on-site support. Contact Health and Safety if an oxygen deficient environment less than l6% oxygen is encountered.

D. Alternative Control Method - Personal Protective Equipment

Operations performed in the confined space may not enable CHES to thoroughly control toxic or oxygen-deficient atmospheres. In those instances where hazard mitigation have been used and (IDLH may not be exceeded), they must none-the-less be used and respiratory protection must be used to supplement the hazard control strategy. This strategy is not applicable when RESTRICTED ENTRY CONDITIONS exist. Other forms of PPE must also be used as appropriate.

9.5.5. Physical Hazards

Physical hazards of the space have been identified (see Section 8) and controlled (see Section 9.4.8) as required to prevent employee exposure.

9.5.6. Isolation

The space has been isolated from hazardous sources as identified in Section 9.3 above.

9.6. Verifying Acceptable Entry Conditions

Prior to and throughout the entry, the crew must be vigilant in assuring that Acceptable Entry Conditions (AEC) exist. **If, at any time during the entry, AEC is not maintained in the space, the entry must be terminated, immediately.** Verification that acceptable conditions continue may be accomplished through the following means:

9.6.1. Atmospheric Exposure Monitoring

Atmospheric monitoring conducted by the Attendant (Standby) and/or Entrants is maintained within Acceptable Concentrations as indicated in 9.5.4. (A) and recorded on the permit.

9.6.2. Communication

Changes that occur during the entry that might create unacceptable (not meeting conditions specified by the permit), prohibited or restricted entry conditions or may invalidate the permit, must be communicated IMMEDIATELY to the Attendant (Standby), other Entrants and Entry Supervisor.

9.6.3. Continuing Hazard Observations

As work progresses, additional hazards may develop. The CSE Supervisor needs to be notified of any changing conditions that might affect entry conditions. The Entrants and Attendant must be constantly aware of developing or changing conditions, how these may affect existing entry conditions, and their ability to produce new or unforeseen hazards. If observations of the Entrants, Attendant or Entry Supervisor indicate changes to existing hazards or exposure to a new hazard, the Entry Supervisor must evacuate the space, update the permit, notify all crew members of the changes, and reinitiate entry. The new hazard must also be controlled utilizing hazard mitigation methods or another effective means to control the hazard.

9.7. Atmospheric Exposure Monitoring

Atmospheric monitoring of the space must be conducted to determine if acceptable Entry Conditions exist before entry begins.

9.7.1. Materials

The following must be evaluated in the order listed:

1st	Oxygen
2nd	Combustible gases and vapors
3rd	Toxic gases and vapors

9.7.2. Guidelines - Refer to Appendix 4.

9.7.3. Monitoring Frequency

A. Monitoring must be conducted prior to, throughout the entry, and/or re-entry, and whenever monitoring is interrupted as would happen during breaks. Continuous monitoring should be conducted for each material outlined in Section 9.7.l.

B. The frequency of monitoring as noted above shall be based on the conditions of the space being monitored and any limitations of the air-monitoring instrument being utilized. However, it is required in the following situations:

   1. Space Isolation Not Feasible - Examples include very large spaces or continuous systems such as sewers.

   2. Hazard Increasing Activities - These include, but are not limited to: Introducing organic solvents (hydrocarbon) to the space; hot work; movement of sludge ("mucking"); use of exhaust-producing equipment in the space; others. (Contact Health and Safety.)

C. Continuous monitoring is defined as the minimum response time of the test instrument as specified by the manufacturer.

D. Testing must continue throughout the entry to assure Acceptable Entry Conditions are maintained during the course of entry operations.

9.7.4. Recording

All monitoring results (including oxygen, combustible gases and vapor, and toxic gases and vapors) must be documented. Space is provided on the permit for this purpose. However, additional forms such as the Atmospheric Monitoring Log or other form can be used. Recording of results is important both to document that testing is being performed and even more so to enable the Attendant to spot trends in entry conditions. Results must be recorded at least every 30 minutes when periodic testing is appropriate and at least every 15 minutes if continuous testing is warranted. (Additional monitoring and documentation may be necessary if tasks or conditions change.

9.7.5. Monitoring Location During Venting

Appendix 4 provides guidance to ensure representative atmospheric monitoring is obtained. However, it is critical to avoid monitoring outside air while venting is being used. Outside air monitoring occurs when samples are obtained from access ways that are under negative air flow due to the presence of Exhaust Venting. To avoid this, samples should be obtained from areas outside the stream of air flowing into the access way or where outside air has commingled with the confined space atmosphere and dilution has occurred. This will occur at locations removed from the immediate vicinity of the access way. Additional, remote areas of the space will provide representative monitoring of the confined space atmosphere (i.e., toxic and outside air combined).

9.8. Attendant Duties

The Attendant must remain outside the space performing the duties specified in Section 3.3 for the duration of the entry. This person may have no other duties that would interfere with his/her primary responsibilities as specified in 3.3. The Attendant may attend to multiple spaces at once provided that the attendant is able to effectively monitor the status of the entrants in those spaces. If the attendant is going to monitor multiple spaces simultaneously Health & Safety must approve this first.

9.9. Multiple Employer Entries

See Section 9.13 for additional requirements regarding multiple employer entries.

9.9.1. To avoid endangering either CHES or other employers' employees (client, trades, other contractor, etc.) from exposure to hazards created by the space, operation, etc., entry operations must be coordinated.

9.9.2. So far as possible, simultaneous entries must be avoided. If this is unavoidable, procedures must be developed to assure that CHES employees do not endanger the employees of another employer and vice versa.

9.9.3. If this is anticipated or occurs on site, contact Health and Safety to develop and specify procedures to coordinate activities and minimize hazards. Also, see Section 9.l regarding unauthorized entry.

9.10. Additional Requirements

9.10.1. Personal Protective Equipment - See Health and Safety Guidance Manual for use and selection.

9.10.2. Lighting

A. All work areas shall be adequately lighted for the work being performed.

B. Portable lighting fed by ll0 volt supply must be equipped with either: A low voltage isolation transformer; or, protected with a ground fault circuit interrupter (GFCI).

C. All lighting equipment shall be approved for use in Class I, Division I Hazardous location where flammable or combustible materials are handled or encountered or a flammable or combustible atmosphere may exist.

9.10.3. CPR/Basic First Aid

A minimum of two people working on each Confined Space Entry must maintain current (within one year) valid CPR/Basic First Aid Training. One of the CPR/Basic First Aid trained individuals must remain outside the space at all times.

9.10.4. Fire Extinguisher

A minimum of two (2) fire extinguishers is required for each space where flammable or combustible materials are encountered. A minimum of the following is necessary: 10A: 40B:C.

9.10.5. Flushing Equipment

Whenever acid or caustic material are handled, a means for flushing the eyes, face, or body must be available. The device must be capable of delivering sufficient flushing capabilities to continue flushing until first aid services can be obtained. Typically, a minimum of l5 minutes is needed. Flushing equipment can include: eye wash; safety shower; or water hose (low pressure "garden" type hose.) The flushing equipment need not be owned by Clean Harbors so long as it is: functional (provides adequate flushing capabilities); readily accessible (within 10 feet of the portal); pH is neutral and available for use.

9.10.6. Electronic Communication Devices

A. Various electronic communication devices are available and may be needed for a particular entry. Each device should be evaluated in the specific work environment to ensure it will provide effective communication.

B. Communication equipment used in a flammable or combustible environment must possess the following classification: Class 1, Division 1.

9.11. Contracted Workers Confined Space Entry (CSE) Entrant Approval Process

In order for contracted workers (e.g. On-Site, Northstar, J.W. Transport) to perform confined space entries on Clean Harbors' projects, the following criteria must be met. Note that contract labor should only be used on confined space entries when other options have been considered unacceptable or unfeasible.

9.11.1. Local Health and Safety Representative and General Manager must agree that use of contract workers is appropriate for a particular project. Each project where contract labor is considered must be reviewed.

9.11.2. Verify with the appropriate State authority that use of contracted employees is permissible on CSEs. Obtain necessary approval. Health and Safety must be involved in this process. In Maryland, for example, this written approval must come from the Commissioner of Labor and Employment.

9.11.3. Assure that each contracted worker has received adequate CSE training in compliance with the applicable regulations. Prior to project start-up, the SCE Supervisor shall contact the appropriate H&S Manger to confirm that the contracted workers' CSE training has been verified or completed. Prior to commencing the entry, the CSE supervisor shall ensure that each contract employee has been apprised of specific hazards of the permitted space to be entered and is made aware of Clean Harbors procedures in place to protect each entrant. Documentation of this review will be maintained with the applicable CSE permit.

9.11.4. Contracted workers normally only serve as CSE Entrants. However, in some cases these contract employees normally only serve as CSE entrants. However, in some cases the contract employees may also perform the duties of an attendant, but only by mutual agreement between the CSE Supervisor and H&S. They cannot serve as CSE Supervisors or Rescue Personnel.

9.11.5. CHES also may not rely on those workers for such services as rescue team staffing and CPR/First Aid-qualified personnel. Emergency rescue arrangements and plans must be established without relying on the contracted workers to participate in the emergency rescue. For example, there must be a sufficient number of trained CHES personnel on site to perform emergency rescue if that is needed.

9.11.6. Contract workers can serve as CSE Entrants on confined space entries in Level C personal protection. Approvals for Level B entries are granted on a case-by-case basis after review by the EH&S, Law Departments, and Senior Management personnel (shown below). Allow a 9-10 day review and approval period following the request by the responsible Operations Manager.

9.11.7. General Manager must then send request to use contract labor on a particular project to the Health and Safety Manager and to appropriate field service or plant Senior Operations Management personnel:

Field Service:	DOSS
Facilities:	Appropriate General Manager
EH&S:	Health and Safety Manager

Written authorization must be received from each party in order for contract workers to be used.

9.11.8. Prior to any CSE, the contracted workers must be thoroughly briefed by the responsible Clean Harbors CSE supervisor in all aspects of the CSE. All entrants must receive the same information. The following information must be discussed:

A. The hazards identified prior to and during entry: Include information on the exposure pathway, signs or symptoms, and consequences of the exposure to a physical or atmospheric hazard;

B. Required personal protective equipment;

C. Air monitoring instruments being utilized to monitor the atmosphere in the space;

D. Action levels being utilized to determine appropriate levels of protection;

E. Energy isolation (e.g., lockout/tagout, others) methods that have been implemented on the space;

F. Ventilation equipment being utilized to obtain and maintain acceptable entry conditions;

G. Communications equipment, methods, systems, signals, etc. being utilized during the entry;

H. Lighting utilized to enable employees to work safely and to exit the space quickly in an emergency;

I. Other equipment needed for safe entry, egress and rescue from the permit space;

J. Rescue and emergency equipment needed to comply with the rescue plan and guideline, except to the extent that the equipment is provided by Rescue Services.

K. Rescue and Emergency Plan for the entry.

A notation by the CSE supervisor that this review and communication was completed must be documented on the CSE Permit in the Entry Supervisor's Comments section. Each employee (including contract labor) involved in the entry must, of course, sign the Permit, attesting that they have reviewed the Permit, which includes all of the above.

9.12. Confined Space Entry Coordination Guidelines for Same Entry/Same Time CSEs involving Clean Harbors and Other Companies or Contractors

9.12.1. Scope

A. This section applies to work to be performed at the same time and in the same confined space by both Clean Harbors Environmental Services (CHES) personnel and non-CHES personnel (not under the supervision of CHES). IN ALL CASES, CHES PROJECT PERSONNEL MUST INITIALLY ATTEMPT TO ARRANGE SEPARATE CONFINED SPACE ENTRIES SO THAT CHES PERSONNEL ARE NOT IN THE SAME SPACE AT THE SAME TIME AS THE NON-CHES PERSONNEL. IF THIS IS NOT POSSIBLE, THE PROCEDURES OUTLINED IN THIS SECTION MUST BE FOLLOWED.

B. Note that specific written approval from the Vice President of Health and Safety and Senior Operations personnel must be obtained prior to any coordinated activity.

C. This section does not apply to contracted labor workers used by CHES. See Section 9.11 for guidelines regarding contracted labor workers (e.g., On-Site or Northstar) and their use as Entrants on confined space projects.

9.12.2. Purpose

The purpose of this section is to ensure that entries into confined spaces performed by CHES in conjunction with non-CHES workers (not supervised by CHES) are conducted in accordance with 29 CFR 1910.146(c)(8) & (c)(9).

9.12.3. Process

A. Notify local H&S representative of request. Specify why separate entries cannot be arranged. Approvals for this work are granted on a case-by-case basis by the EH&S Department and Senior Operations Management personnel after a minimum 5-day review and approval process.

B. Project Manager, Supervisor, or General Manager must submit a written work plan detailing the coordinated entry; (see specific list below of items (item C) to include in the work plan) to:

Field Service:	Regional VP Operations and Senior VP, Sales and Operations
Facilities:	Senior VP Plants
EH&S:	Health & Safety Manager

Written authorization must be received from each party in order for the coordinated entry to occur.

C. Once written approval is given, the CHES project manager must coordinate all aspects of the confined space entry (CSE) with the non-CHES project supervisory personnel. This coordination will include at a minimum the following:

1. Scope of work for each company;

2. Impact each company's work will have on the other, and procedures to prevent safety hazards from developing from each company's work;

3. Responsibility for air monitoring, and plans and types of air monitoring. CHES must monitor for all airborne contaminants that will affect CHES personnel in accordance with CHES confined space guidelines;

4. Responsibility for hazard control, and plans and types of hazard control, including any lockout/tagout requirements;

5. Responsibilities and plans for emergency rescue.

CHES must only be responsible for the confined space entry of its employees. The non-CHES company must follow its own CSE procedures and provide its own personnel and equipment for its portion of the confined space entry, including emergency rescue. This information must be communicated to the non-CHES CSE supervisor. The CHES CSE supervisor must document on the CHES permit that this communication has taken place.

The written work plan detailing the coordinated entry must be attached to the CHES CSE permit.

9.12.4. Permit

A. The CHES CSE Supervisor must make a notation on the Clean Harbors' Confined Space Entry Permit that the entry procedures and coordinated work plan have been reviewed with the non-CHES CSE supervisor. This notation should be in the Entry Supervisor's Comments portion of the permit.

B. The CHES CSE supervisor must describe on the permit the emergency procedures to follow in the event an emergency is initiated by any personnel (both CHES and non-CHES) involved in the CSE. This must be detailed information.

9.13. Contractor Work

9.13.1. When CSE Contractors are working on CHES projects, they will be reviewed and approved by the H&S Director. This approval process verifies that these contractors have been evaluated with regard to training qualifications; their confined space policy has been reviewed and approved; and medical clearance has been verified by CHES prior to conducting CSE work on-site. (See Appendix 8 for the checklist to be completed.) The General Manager or Project Manager, and the Health and Safety manager should verify that contractor employees being used for the job have all of the training, medical clearances, and appropriate equipment to conduct the work safely. A contractor log listing each contractor employee approved for conducting entries will be maintained.

9.13.2. The facility will then conduct a job safety briefing to inform the contractor of the permit required confined spaces to be entered on site, the hazards associated with them, and the permit system.

9.13.3. When contractor personnel will be working in or near permit-required confined spaces, entry operations will be coordinated with CHES and contractor supervisors in accordance with Sections 9.9, 9.11 and 9.12 of this policy. However, the contractor shall ultimately be responsible for completion of the permit and activities conducted inside the confined space.

NOTE: All dual permits shall be reviewed and approved by the H&S Manager. Also, the H&S Manager shall notify the VP-Health and Safety of any dual permit situations.

9.13.4. Location management will debrief contractors at the conclusion of entry.

9.13.5. The Health and Safety Manager will periodically evaluate confined space entry contractor performance. If the contractor is not meeting appropriate standards, the Health and Safety Manager shall have the authority to stop work.

9.13.6. Contractors removed from confined space entry work for cause will then have to re-apply for approval prior to project re-start.

10. EMERGENCY PLANNING AND RESPONSE

NOTE: See Appendix 5 for detailed guidance on Emergency Planning and Response.

10.1. Introduction

Two rescue services are available for retrieval of Entrants from a confined space in an emergency. They are:

10.1.1. Outside Rescue Services

10.1.2. CHES Rescue Service

10.2. Outside Rescue Service

10.2.1. Introduction

Outside rescue services may be a Fire Department or a client (customer) provided service. If the site Entry Supervisor wishes to utilize the client's Rescue Service or outside service, he/she must consult with the service to determine their capability, availability and applicability to perform the service. This must be done in preparation (bid stage) of a confined space entry.

10.2.2. Required Action

Outside Rescue Services must be contacted and notified during the preparation phase (bid stage) of a confined space entry (see below). Health & Safety must also be involved in the evaluation and determination of the proficiency of any outside rescue service. If outside services will be used for emergency rescue services, they must be contacted and the following information must be determined. If an outside rescue service is used, the following must be done:

A. Inform the outside service of the hazards.

B. Provide the outside service with access to each space where rescue may be necessary, so they may develop appropriate rescue plans and practice rescue operations.

C. Provide MSDSs and other toxic hazard information.

D. Contact the outside services to determine if they can respond to a confined space entry emergency, and if the service is proficient with CSE Rescue Techniques and the utilization of CSE Rescue Equipment.

E. If they are available and are willing to render assistance if the need develops, determine the response time.

F. It is preferable to have the outside Rescue Service available throughout the entry. Services may be available and willing to do this for a fee.

10.2.3. Outside Service Planning

During entry planning, where outside emergency services will be utilized, they must be contacted and provided with hazard information and other information to enable proper planning of their response. The following information must be provided:

A. Space Hazards

1. Description of Space (CSE Permit Section I)

2. Hazard Assessment Guide (CSE Permit Sec. II)

3. Other Hazard Information as Available.

B. Access to the Space

So that the service can develop appropriate plans and practice rescue operations.

C. MSDS/Toxic Hazard Information

10.3. CHES Rescue Service - Introduction

If the Entry Supervisor elects to utilize CHES' rescue service, he/she must ensure the following:

10.3.1. A sufficient number of trained rescue personnel are available to effect rescue;

10.3.2. The rescue team is provided with and trained to properly use the personal protective equipment (PPE) and rescue equipment necessary for making rescues;

10.3.3. The rescue team is trained to perform their assigned duties and to the Entrant level;

10.3.4. The rescue team receives practical training once every twelve (l2) months by means of simulated rescue operations;

10.3.5. The rescue team possesses current basis first-aid and cardiopulmonary resuscitation (CPR).

10.4. Non-Entry Rescue - Introduction

This option should be used whenever possible.

10.4.1. Non-entry rescue involves removal of an Entrant from outside the space, without entry, using the retrieval system outlined below (see 10.4.3 – 10.4.7.) This method prevents exposure of rescues from the hazards, which created the emergency. However, under certain circumstances, non-entry rescue may be inappropriate, i.e., physical injury such as a broken bone. Here, movement may exacerbate the injury; immediate removal may not be required to minimize the impact, etc. A review of Appendix 5 and the Addendum will guide the decision-making process.

10.4.2. To facilitate non-entry rescue, retrieval systems or methods shall be used unless, in the concurrent opinion of Health and Safety and the Entry Supervisor, the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the Entrant. Examples where the mechanical retrieval may increase the overall risk of entry include:

A. Obstructions or turns that prevent pull on the retrieval line from being transmitted to the Entrant may not contribute to a rescue;

B. A permit space from which an employee being rescued with the retrieval system would be injured because of forceful contact with projections in the space may not contribute to a rescue.

10.4.3. Retrieval System Equipment

A. Full body harness

B. Lifeline

C. Wristlets (optional - contact Health and Safety) - See Below.

D. Mechanical Retrieval Device

10.4.4. Harness/Lifeline

Each Entrant must use a harness (chest or full-body) with a retrieval line attached. The other end of the retrieval line must be attached to a mechanical retrieval device (availability required for vertical entries 5 feet or greater) or fixed point in such a manner that rescue can begin as soon as the rescuer (Attendant) becomes aware that rescue is necessary.

10.4.5. Wristlet

Wristlets may be used in lieu of the chest or full-body harness if use of the harness is not feasible or creates a greater hazard and the use of wristlets is the safest and most effective alternative. Involve Health and Safety in this decision-making process.

10.4.6. Mechanical Retrieval Device

A mechanical retrieval must be available on all vertical spaces more than five (5) feet deep.

10.4.7. Non-Entry Rescue Consideration

Please refer to and review information described in Appendix 5, Section 3.l for direction on the techniques for performing non-entry rescue.

10.5. Entry Rescue

10.5.1. Introduction

In the event that the Entry Supervisor has determined that entry rescue will be utilized, items mentioned in Section 8.3 must be assured.

10.5.2. Stretcher Rescue

Certain types of horizontal entries present unique circumstances, which may inhibit the effective utilization of a full body harness to facilitate rescue. In these circumstances the use of a stretcher for entry rescue in lieu of, or in addition to, a harness may be used provided the following conditions are met.

A. All items mentioned in Section 8.3 are assured.

B. The space access and egress is sufficient to accommodate the stretcher.

C. There is a minimum of (5) five employees dedicated to the entry. These employees must satisfy the training requirements specified in Appendix 6.

D. The stretcher's construction is compatible with the materials in the space.

E. A towline equal to, or greater than, 1.5 times the diameter of the space is available outside the space. This line may be used to assist rescuers with removal of personnel. The line material(s) must be compatible with the material(s) in the space.

F. This option has been reviewed and approved by H&S during the bid stage of the project.

10.5.3. Contingency Planning

Consideration must be given, and contingencies developed, to provide a secondary means of rescue should the effectiveness of a stretcher be compromised. These contingencies must be developed, documented on the permit, and discussed with all members of the crew prior to beginning the entry.

10.5.4. Rescue Consideration

Please refer to and review information described in Appendix 5 for direction on the techniques for performing entry rescue.

11. COMMUNICATION

11.1. Effective Communication

An effective means of communication is essential for limiting hazards, initiating methods to mitigate emergencies and assuring information is communicated promptly. Communications must be maintained at all times between Entrants and Attendant. This may be accomplished by one or a combination of the following methods:

11.1.1. Visual contact between Entrants and Attendants;

11.1.2. Vocal contact between Entrants and Attendants;

11.1.3. Electronically assisted vocal contact between Entrants and Attendants;

11.1.4. Signal system, i.e., periodic taps, line jerks, etc.

11.2. Signaling or Vocal Contact

If signaling or vocal contact is used, the system established must assure that the Entrants and Attendant can see and understand the voice commands or signals.

11.3. Signaling System

A clearly understandable signal system should be established before entry into the confined space. In the event of failure of the above means of communication, an alternative signal system such as using line-jerk signals in the following manner:

11.3.1. One pull--allow more slack in the line.

11.3.2. Two pulls--lead line is inadequate.

11.3.3. Three pulls--emergency, pull man from confined space.

11.3.4. No response--emergency, initiate rescue.

A. For this method to be used, there can be no obstruction that would prevent clear signaling. Examples that may prevent signaling include: baffles; remote locations; corners; bends; etc.; others.

B. Entrants must be instructed to have direct contact with signal line. The line attached to either the air-line or retrieval line may not be adequate for this method.

11.4. Other Forms of Communication

Other forms of communication may be used as well. For example, a loud horn may be used in large confined spaces where the workers may be some distance from the access openings. (Air horns may be a source of ignition and, therefore, should not be used in flammable or combustible atmospheres.)

11.5. Emergency Notification - Outside Services

A method to communicate to outside services (Ambulance, EMS, Fire, Rescue, etc.) must be arranged. Telephone, two-way radio, cellular phone, etc. must be arranged to assure that outside service can be notified in the event they are needed.

11.6. Inability to Establish Effective Communication System

If none of these means of communications is available or effective, no entry should be made into the confined space. Contact Health and Safety.

11.7. Entry Supervisor's Responsibility

Prior to entry, the Entry Supervisor must establish an effective system of communication and assure, in practice, it is effective. To accomplish this, perform the following for each confined space:

11.7.1. Prior to entry, evaluate the space to determine an adequate system of communication.

11.7.2. Acceptable communication systems include, but are not limited to, visual contact; verbal, either unassisted or electronically assisted (contact H&S if electronically assisted method is proposed for a space containing flammable or combustible materials); or, sounds--i.e., periodic taps.

11.7.3. Whenever the Attendant Standby cannot see the Entrant (s), adequate communication means Attendant Standby and entrant (s) can hear and understand each other's voices or signals.

11.7.4. Initially, and periodically, verify that the established communication system is and continues to be effective.

12. RECLASSIFYING CONFINED SPACE

12.1. Conditions

Under certain conditions, a confined space may be reclassified as a non-permit confined space. Once reclassified, several provisions of CHES' Confined Space Program may be relaxed.

12.1.1. A permit-required confined space may be reclassified to a non-permit confined space provided the following conditions are met:

A. The space poses no actual or potential atmospheric hazard (as verified with atmospheric monitoring).

B. All previously identified hazards within the space have been eliminated.

C. Continuous forced air ventilation is maintained on that space, and the ventilation is sufficient to maintain airborne levels below established action levels.

D. Periodic air quality monitoring is performed to verify that atmospheric hazards have been eliminated and there has been no change in air quality since reclassification has taken place.

12.1.2. If the above conditions are met, then it may be possible to reclassify the space. Prior to reclassifying any space, Health & Safety must be consulted and authorize reclassification of the space.

12.1.3. A reclassification certificate (see Appendix 7) must be completed by a qualified CSE Entry Supervisor in order for a space to be reclassified. All personnel entering a space that has been reclassified must review and sign the reclassification certificate.

12.1.4. Once a space is reclassified, all conditions which have been met in order to reclassify that space must remain the same. If there is any change in conditions within the space, then all entrants must exit the space and Health and Safety must be consulted.

12.1.5. A reclassification certificate shall be valid for only one shift or until the completion of the task requiring the entry, whichever is less.

13. GUIDELINES REVIEW

To assure the continued effectiveness of the CSE Guidelines, CHES will perform a periodic review of two components of the program: Entry Operations and Entry Guidelines. The following is a description of how and when these reviews will be conducted.

13.1. Entry Operation Review

13.1.1. Entry operations must be reviewed and revised to correct noted deficiencies before subsequent entries are authorized. This review is required wherever the Entry Supervisor (Site Specific Entry), CHES (all Entries), have reason to believe that measures taken under the program may not effectively protect employees. Examples may include, but are not limited to:

A. Unauthorized entry to a permit space;

B. Detection of a hazard not covered by the permit;

C. Detection of a condition prohibited by the permit;

D. Occurrence of an injury or near-miss during entry;

E. A change in the use or configuration of a space;

F. Complaints about the effectiveness of the program;

G. Other circumstances.

13.1.2. It is the Entry Supervisor's responsibility to notify the crew and Health and Safety if these or other conditions that affect the protection of employees in confined spaces are detected. The Corporate or Regional Health and Safety Manager must be notified.

13.2. Entry Guidelines Review

Within one (l) year from the date this program is implemented and annually thereafter, CHES will review the Confined Space Entry Guidelines to ensure that employees are protected from hazards of confined spaces. The following tools will be used: canceled permits; issues identified under Section l3.l, Entry Operation Review; audits and observations conducted by the Health and Safety and Compliance Staff; other sources will also be utilized as available.

APPENDIX 1: Confined Space Entry Compliance Guide

INTRODUCTION

The following is a guide to assist the Entry Supervisor during preparation and performance of a Confined Space Entry (CSE). It is not a substitute for confined space training, thorough knowledge of CHES' CSE Guidelines, or experience performing confined space entries. It is provided to assist the Entry Supervisor in assuring all appropriate action is considered to facilitate an uneventful entry.

PROJECT ACTION ITEM RESOURCES (CSE GUIDELINES)

A. Bid Stage - (Conducted by Quality Supervisor, Field Service Specialist, Health and Safety)

1. Assess Confined Space Hazards
    a. Sections I & II on CSE Permit
    b. Substance Analysis
    c. Previous Experience with Space
    d. Other Sources

2. Provide Hazard Assessment Information (A.l above) to the Entry Supervisor.

B. Pre-Planning - (Conducted by the Entry Supervisor prior to departing for the site.)

1. Review the Hazard Assessment Information (A.l above).
2. Determine and obtain appropriate equipment needed to mitigate all identified and anticipated hazards, e.g., chemical, physical, atmospheric, emergency, communication, etc. - (Section 9.4)
3. Identify trained and qualified crew members.
4. Review the Permit with Health and Safety.

C. Site Evaluation and Entry Preparation - (Performed at the site by the Entry Supervisor)

1. Conduct site evaluation to assure Hazard Assessment is accurate and additional hazards are not present.
2. Implement Hazard Mitigation methods for all recognized and anticipated hazards. (Section 9.4)
3. Prepare Permit. (Section 7.l)
4. Discuss Permit information with all crewmembers. (Section 7.2)
5. Implement methods to limit unauthorized entry. (Section 9.l)
6. Determine and verify if Acceptable Entry Conditions (AEC) exist. (Section 9.5)

    a. Hazard assessment accurate. (Section 9.5.l)
    b. Permit completed, accurate, discussed with crew, signed.) (Section 9.5.2
    c. Hazards controlled. (Section 9.5.3, 9.5.5 & 9.5.6)
    d. Atmospheric concentrations acceptable. (Section 9.5.4.A & 9.7)
    e. "Prohibited" Conditions do not exist. (Section 9.5.4.B)
    f. Restricted entry conditions do not exist. (Section 9.5.4.C)
    g. Effective communications system is established, and effectiveness verified, - initially and periodically. (Section 9.6.2 & 11)
    h. Emergency Plan and Response established, communicated, understood, effectiveness- verified. (Appendix 5)

D. Perform Entry - (Performed by the Attendant, Entry Supervisor and Entrants.)

Appendix 1 Cont'd.

1. Ensure Communication is maintained throughout the entry.

2. Solicit feedback on entry conditions and continued effectiveness of hazard controls as work progresses.
3. Continue atmospheric and hazard monitoring, record results (Attendant).
4. Cease operations IMMEDIATELY if Permit conditions or acceptable entry conditions change
5. Notify Health and Safety immediately if D.4 occurs.

E. Job Completion - (Performed by Entry Supervisor)

1. Debrief the client on hazards encountered, identified or created during the entry.
2. Record the debriefing on the Permit.
3. Provide canceled Permits to Health and Safety. Version 2 (8/99)

APPENDIX 2: Confined Space Ventilation Guidelines

1. PURPOSE

To provide guidance to field personnel for the proper performance of confined space ventilation. Ventilation is conducted to eliminate hazardous atmospheres and maintain Acceptable Entry Conditions (AEC). Air monitoring is conducted concurrently to confirm proper operation of the ventilation system.

2. TYPES OF VENTILATION

2.1. Natural Ventilation: Natural ventilation created by opening entrance covers, vents or open top space is normally not sufficient to consistently maintain AEC within a confined space. Therefore, natural ventilation is not recognized by CHES as an acceptable hazard mitigation technique permitted; mechanical ventilation is required.

2.2. Mechanical Ventilation: Mechanical ventilation is achieved by using a pneumatic air driven fan, or intrinsically safe electrical fan to force air through the space. Flexible ductwork is utilized to control and direct air flow.

2.2.1. General Dilution Ventilation: Dilution ventilation is achieved by exhausting (pulling, drawing) a large volume of air out of the space. Fresh make-up air is drawn into the space through open entranceways, vent pipes and other openings by the negative pressure created by the exhaust blower.

2.2.2. Local Ventilation: Local ventilation is designed to exhaust (pull, draw) air near a source of contaminant generation so that it is not released into the work area atmosphere. Fresh make-up air is supplied by the general work area. Local exhaust ventilation is effective for "point source" activities such as welding and cutting, or solvent cleaning.

3. GENERAL DILUTION VENTILATION DESIGN

Ventilation systems should be arranged to provide the best possible distribution of air throughout the space and to provide clean, respirable make-up air to replace the contaminated air removed from the space.

3.1. Technique

3.1.1. Pulling Air From Space:

A. Pulling air from the space produces a controlled capture and removal process.

B. Air can be pulled from the point of maximum concentration, or from an area closest to worker.

C. Fresh make-up air will be drawn in through openings in the space.

3.1.2. Pushing Air Into Space:

A. Air should not be blown into a space, which contains flammable or toxic atmospheres.

B. Blowing air into a space will agitate contaminants and disperse them throughout the space.

Appendix 2 Cont'd.

C. Blowing air into a space will also result in an uncontrolled leak of the hazardous atmospheres though any openings in the space, which may result in contamination of adjacent work areas.

D. Air may be pushed into a space only if no flammable or toxic materials are present, toxic dusts do not exist in the space and ventilation is required merely to provide clean, respirable air for breathing and general comfort. Contact Health and Safety for guidance.

3.2. Design Criteria

The location of exhaust fans, ductwork and make-up air inlets is extremely important for proper air distribution. The following criteria will assist in the design of an effective ventilation system.

3.2.1. Fan Location:

Ventilation is most efficient when the fan is closest to the source of contamination. To provide effective air circulation, however, duct hose is often added to either end of the fan. Duct additions decrease fan capacity and, therefore, should be minimized. The following offers guidance to maximize the effectiveness of ventilation used in confined spaces.

3.2.2. Minimize Number of Elbows

A. One elbow is equivalent to adding more than 15-30 feet of duct hose to a fan (depends on duct diameter).

B. When elbows are necessary, sharp bends should be avoided. The length of the curve of the elbow should be at least three (3) times longer than the duct diameter.

i.e. 8 inch duct = 2 feet curve
6 inch duct = 1.5 feet curve
4 inch duct = 1 foot curve

3.2.3. Minimize Duct Length:

A. Keep hose lengths as short as possible. Long lengths of duct hose can significantly decrease fan capacity.

B. Use duct diameter specified by fan manufacturer. Using a smaller duct diameter than recommended causes reductions in fan capacity.

C. Do not splice different diameter duct hoses together. Adding smaller diameter hose will create turbulence and loss of air flow inside the duct.

D. Use the chart below to determine the actual capacity of your system:

1. Use total length of duct in front and back of blower;

2. Add 15 feet of hose for each elbow in 6-inch or 8-inch duct line;

3. Add 30 feet of hose for each elbow in 30-inch duct line.

   i.e. For the Model 8 fan, using 20 feet of hose with 2 elbows, the effective duct length is 50 feet. This yields an "actual" ventilation rate of 5480 cfm.

ACTUAL AIR FLOW VS. DUCT LENGTH

VENTILATION RATE*

EFFECTIVE HOSE LENGTH**	MODEL 3-HP (8-in duct)	MODEL 8 (8-in duct)	MODEL RF-20 (14-in duct)
0 feet	1700 cfm	6250 cfm	11,000 cfm
10	1640	6100	10,850
20	1600	5955	10,700
30	1550	5800	10,570
40	1515	5650	10,400
50	1470	5480	10,250
60	1425	5320	10,100
70	1375	5150	9,955
80	1325	4975	9,785
90	1275	4785	9,585
100	1225	4600	9,500
200	430	1835	7,600

* - Coppus blower operated at 80 psig
** - For each elbow in duct line, add 15 feet of hose for 6-8 inch duct, add 30 feet of hose for 14-inch duct.

3.2.4. Make-Up Air

Make-up air drawn into a space must be free of toxins and provide 19.5-22% oxygen. Make-up air should consist of 100% outside air, and not re-circulated exhaust air.

A. Air supply inlets should not be located near exhaust outlets. Exhaust outlets should be positioned so that air is carried downwind away from space.

B. When make-up air and exhaust air move through the same opening, ducting should be provided to create sufficient air circulation.

C. Pure oxygen must never be used to ventilate a confined space, since elevated oxygen levels will significantly increase the combustibility of all substances in the space.

D. Fuel driven motors, compressors and other equipment operated outside the space should be located downwind, so that combustion by-products are not pulled into the space.

E. Open as many entranceways as possible to allow maximum make-up air. (Assure each opening is barricaded, per Section 9.l.)

3.2.5. Air Circulation

An efficient air circulation pattern is necessary to supply fresh air to workers and remove hazardous atmospheres efficiently and effectively.

Appendix 2 Cont'd.

A. Air circulation is most efficient when make-up air and exhaust air move through separate openings.

B. The most effective means of ventilating a confined space is by discharging contaminated air through a top entranceway and introducing fresh air through a bottom entranceway.

C. Short-circuiting can occur when make-up air enters at the same opening where the fan is located.

D. To avoid air recirculation:

1. Position fan so that it exhausts downwind from opening;

2. When pulling air, extend duct into space so that air is drawn from bottom of space and not from the entranceway; and

3. When pushing air, extend duct outside of space to draw from a sufficient distance away from entranceway where contaminated air will be exiting.

E. For large spaces, or spaces with separate compartments, more than one fan and duct hose may be necessary to allow even air distribution.

3.2.6. Calculate Air Changes

A. Calculate the volume of the space in cubic feet.

B. Determine the fan rating as measured in CFM.

C. Divide the volume by the fan rating. For example, if a space is 900 cubic feet and you are using a fan rated at 450 CFM, it will take 2 minutes to complete one air change. Therefore, it would take 6 minutes to complete three air changes.

D. If achievable, based on the space, attempt to achieve a minimum of 10 air exchanges per hour in the space.

E. **PRIOR TO PERSONNEL ENTERING THE SPACE, VENTILATE THE SPACE WITH A MINIMUM OF THREE AIR CHANGES.** Repeat air monitoring. If acceptable conditions are achieved, entry can be initiated.

F. **DURING THE ENTRY, CSE PERSONNEL MUST:**
a. **MONITOR THE SPACE FOR THE ENTIRE ENTRY.**
b. MAINTAIN VENTILATION IN ACCORDANCE WITH THE JOB SET-UP.

4. LOCAL VENTILATION

Local exhaust ventilation should be used during welding and cutting, and other operations, which generate contaminants from a specific source.

A. Position blower so that it pulls welding fume directly from the cutting area, away from the worker's breathing zone.

Appendix 2 Cont'd.

B. Pull air from as close to the cutting area as possible, since ventilation efficiency decreases as distance from the cut increases.

C. Use duct hose to exhaust contaminants outside of the space.

CONFINED SPACE VENTILATION CHECKLIST

I. MAXIMUM BLOWER EFFICIENCY:

________ Position blower as close to space as possible.

________ Use as short a length of flex hose as possible.

________ Keep flex hose as straight as possible.

________ Use flex hose diameter recommended by manufacturer. (Do not use smaller diameter duct hose, or splice together ducts with different diameters.)

________ Do not use duct elbows unless absolutely necessary.

________ Do not make duct elbows with sharp angles.

________ Curve elbows: Length of curve should be at least 3 times as long as hose diameter. e.g. 8" duct: curve = 2 feet, 4" duct: curve = 1 foot

________ Increase compressed air inlet pressure to compensate for long flex hose lengths or numerous elbows.

II. MAXIMUM AIR CIRCULATION:

________ Position blower exhaust downwind from space openings.

________ Open as many entranceways as possible to allow maximum make-up air.

________ Separate entranceways available: Discharge air and introduce fresh air separate openings.

________ Single entranceway: Extend duct from fan to bottom of space for complete air circulation.

________ Local ventilation provided for hot work.

III. VENTILATION SAFETY

________ Firmly secure unit before admitting compressed air.

________ Bond/ground unit to clean, unpainted surface.

________ Do not allow solid objects or debris to enter inlet housing.

________ Do not operate fan models without blade guards.

________ Do not exceed l50 psi.

CleanHarbors
ENVIRONMENTAL SERVICES®

APPENDIX 3: Physical Hazard Evaluation Sheet

PHYSICAL HAZARD DATA SHEET CHECKLIST

TASK

_____ Abrasive Blasting (1)
_____ Abrasive Wheels & Tools (1)
_____ Aerial Lifts (1, 3, 5)
_____ Air Compressor (1)
_____ Back Safety Manual (5)
_____ Bonding & Grounding (3)
_____ Chainsaw (1)
_____ Cold Stress (3)
_____ Compressed Gas Cylinder Handling (1)
_____ Confined Space Entry (3)
_____ Control of Hazardous Energy (3) (Lockout/Tagout)
_____ Cranes (1)
_____ Drum Handler (4)
_____ Excavating & Trenching (3)
_____ Excavator/Backhoe Equipment (1) Rev.
_____ Elevated Work Platforms (1, 2, 3, 5)
_____ Explosive Actuated Fastening Tools
_____ Falling Objects (1)
_____ Floor Holes (1)
_____ Hand Tools (1) rev.
_____ Heat Stress (3)

TASK

_____ Hotsy (1)
_____ Housekeeping (1)
_____ Inerting Spaces (1)
_____ Ladders (1)
_____ Lighting (1)
_____ Manual Lifting (5)
_____ Marine Safety (2)
_____ Noise (1, 3)
_____ Overhead Wires (1)
_____ Personal Lifts (1)
_____ Pneumatic Hammer
_____ Power Tools (Including Electric; Hydraulic; Pneumatic; etc.) (1)
_____ Rigging (1)
_____ Sharp Objects (1)
_____ Slips, Trips & Falls (1)
_____ Skid Steer Loader
_____ Track Cleaning Procedures (3)
_____ Vactor/Cusco Controls (3)
_____ Vacuum Truck Operation (1)
_____ Welding Cutting Burning (1)
_____ Work at Elevation (1)
_____ Work Zone Traffic Control (1)

Footnotes:

(1) - Attach Physical Hazard Data Sheet
(2) - Attach/Complete Checklists
(3) - Attach/Refer to Program
(4) - Attach/Refer to Guidance Manual (Chapter 1)
(5) - Attach/Refer to Training Program

APPENDIX 4: Confined Space Monitoring Guidelines

1. PURPOSE

To provide guidance to field personnel for the proper performance of confined space air monitoring. Air monitoring is conducted to evaluate space hazards and verify safe entry conditions.

2. TYPES OF MONITORING NEEDED

Air monitoring is required for oxygen, flammable and toxic levels, in this order. Acceptable concentration levels and equipment are listed below. All monitoring equipment must be calibrated and field-checked prior to use.

Order	Acceptable Levels	Instrument
O2	19.5-22%	Combustible Gas Meter (CGM)
LEL	< 10%	CGM
Toxic	< Action Level*	CGM (CO, H2S); HNU; Drager; Sample Pump

* - Consult Health & Safety for appropriate Action Level.
Action Levels are determined according to the OSHA PEL, ACGIH TLV, IDLH or toxicity information, and level of protective equipment utilized.

3. SAMPLING TECHNIQUES

3.1. Pre-Entry Testing: Pre-entry testing must be conducted prior to initial entry, whenever a new permit is issued, a new task or substance is introduced, and prior to re-entry after a work break or departure from the space.

3.1.1. Entrance Cover

A. Monitor outside all entrance covers, pipe vents, valves, etc. prior to handling or opening.

B. Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed.

3.1.2. Characterize Space Atmosphere From Outside Space

From outside of the space, conduct monitoring to characterize the space atmosphere. This testing may be done from entrance ways, vent pipes or any other openings which allow remote access to the interior of the space.

A. Sample with ventilation system on. Avoid sampling "clean air" from ventilation system intake.

B. Use extension probe or tubing to reach inside the space for monitoring of Oxygen, LEL and toxics.

C. Sample every four (4) feet vertically to detect stratified layers or areas with higher vapor concentration.

D. Sample every ten (10) feet horizontally to identify areas with higher vapor concentration.

Appendix 4 Cont'd.

E. Collect the minimum number of samples according to space size given in the following chart for pre-entry testing. Document readings on the entry permit.

NUMBER OF SAMPLE LOCATIONS REQUIRED TO CHARACTERIZE SPACE FROM OUTSIDE

SPACE VOLUME (IN GALLONS)	or	HEIGHT/ WIDTH	MINIMUM SAMPLE LOCATIONS*
20,000		Any	1
20,000-50,000		20 feet	5
50,000-100,000		30 feet	8
>100,000		50 feet	12

* - Minimum number of samples is based on one sample for every 4 foot vertical drop.

3.2. Complete Characterization of Space Atmosphere

If the space is configured such that a comprehensive initial characterization of the space atmosphere cannot be conducted remotely from outside the space, complete the characterization during initial entry as follows:

3.2.1. Requirements:

A. All Pre-Entry, remote testing conducted from outside the space show concentrations of oxygen, LEL and toxics within Acceptable Levels.

B. Entrant uses the following protective equipment:

1. SCBA or SAR with escape bottle;

2. Chemical protective clothing;

3. Full body harness; and

4. Tethered to emergency extraction device (or lifeline anchored to a fixed point for horizontal entry, if permitted by H&S).

C. Attendant must use the following equipment:

1. SCBA or separate SAR with escape bottle;

2. Chemical protective clothing; and

3. Full body harness.

3.2.2. Characterization Procedure:

A. Sample every four (4) feet vertically to detect possible stratified layers or areas with higher vapor concentration.

B. Sample every ten (10) feet horizontally to detect areas with higher vapor concentration.

C. Monitor sumps, depressions or any other areas where vapors may accumulate.

Appendix 4 Cont'd.

D. Avoid monitoring fresh make-up air from ventilation intake.

E. Report monitoring results to Attendant and Entry Supervisor.

F. Exit immediately if levels exceed Action Levels listed in entry permit.

G. Entry may proceed according to permit if space characterization is within acceptable limits. Discuss characterization findings with crew.

3.3. Monitoring During Entry

Monitoring must be conducted during the entire entry period. After initial space characterization, monitoring is designed for the early detection of any change in site conditions.

3.3.1. Monitoring Locations

The selection of appropriate sample locations is critical for obtaining representative air monitoring.

A. General:

1. Sample with ventilation system on.

2. Pay particular attention to sumps, depressions or any other area where gases may accumulate.

3. Avoid sampling of "clean air" from ventilation system intake, which can cause lower than actual readings:

    a. Do not sample in front of access ways or other openings which are a source of fresh air;

    b. Collect samples outside the stream of intake air; and

    c. Collect samples where make-up air has mixed with the space atmosphere and dilution has occurred.

B. Ventilation Exhaust

Monitor ventilation exhaust periodically to ensure that flammable or toxic vapors do not accumulate outside the space. Document readings on the entry permit or air monitoring log.

C. Ventilation Intake

Fuel driven motors, compressors and other equipment can generate combustion by-products, which can be drawn into the space with make-up air. If this equipment is used, monitor ventilation make-up air for oxygen, LEL and toxic levels periodically to ensure that supply air is uncontaminated.

Appendix 4 Cont'd.

3.3.2. Frequency:

A. General:

1. Continuously monitor oxygen and LEL levels using a combustible gas meter with alarms set at 19.5% and 22% oxygen, and 10% LEL. Report readings to Attendant.

2. Continuously monitor toxic levels, as permitted by air monitoring equipment. Report readings to Attendant.

   The frequency of monitoring as noted above shall be based on the conditions of the space being monitored and any limitations of the air monitoring instrument being utilized.

3. Increase monitoring reporting frequency whenever a new task is begun, a new substance is introduced into the space, site conditions change, or other hazard increasing activities are conducted.

B. Hazard Increasing:

Continuous monitoring is required when any hazard increasing activity is conducted. These activities may increase the generation of flammable or toxic vapors, and increase or decrease oxygen levels above acceptable levels. Typical hazard increasing activities include, but are not limited to the following:

1. Sludge removal (mucking, bucketing);
2. Pressure washing or hotsy;
3. Inerting and flushing space;
4. Solvent cleaning;
5. Painting;
6. Welding or cutting;
7. Operation of fuel/oil driven equipment; and
8. Work in a sewer or other large, continuous system, which cannot be isolated.

4. RECORD KEEPING

Monitoring information must be documented on the entry permit, and air monitoring log. The following information must be recorded and maintained in the appropriate CSE permit folder at the completion of the project:

4.1. Recording of results is important both to document that testing is being performed and even more so to enable the Attendant to spot trends in entry conditions. Results must be recorded at least every 30 minutes when periodic testing is appropriate and at least every 15 minutes if continuous testing is warranted.

4.2. Name or initials of tester documented on permit.

5. USE & CARE OF MONITORING EQUIPMENT

5.1. General

5.1.1. All instruments must have current calibration.

5.1.2. All equipment should be checked for battery level, instrument response, and leak checked before use.

5.1.3. All equipment should be tested for damage prior to use.

5.1.4. Begin measurements using the highest (least sensitive) scale first, and proceed towards the lowest (most sensitive) scale.

5.1.5. Excessive moisture, other chemicals, radio signals and electromagnetic fields can cause instrument interference.

5.2. Instrument Response Time

5.2.1. Temperature Effects:

Instruments will react slower in colder temperatures. For example, the MSA Miniguard oxygen sensor needs three (3) minutes to respond when temperatures are below 32°F.

5.2.2. Delay Due to Probe Length:

Allow for appropriate response time when using remote probes for interior testing. The following charts provide instruction on instrument delay due to probe length.

MSA MINIGUARD WITH ASPIRATOR BULB

SAMPLE LINE (Feet)	MINIMUM # OF ASPIRATIONS
5	5
10	7
15	8
25	9
35	11
50	15

* - Allow aspirator bulb to fully inflate before conducting next compression.

MSA PASSPORT WITH PUMP ATTACHED	
Sample Line:	50 feet standard
Pump Rate:	0.25 lpm
Response Time for Air to Reach Sensors:	30 seconds

Appendix 4 Cont’d.

INDUSTRIAL SCIENTIFIC WITH PUMP

SAMPLE LINE (Feet)	RESPONSE TIME (Seconds)
5	1
10	3
15	4
25	7
35	10
50	14

NOTE: OBTAIN APPENDIX E MONITORING GUIDELINES FROM HEALTH AND SAFETY.

APPENDIX 5: Emergency Planning and Response Guidelines

1. INTRODUCTION

Planning and training for a confined space emergency is an important part of Confined Space Entry. Rescue of personnel in a Confined Space may only be performed by trained personnel.

Untrained Clean Harbors' employees will not be permitted to respond to a Confined Space Entry (CSE) emergency, nor participate in an entry, until they have completed the Clean Harbors' CSE Training Program.

2. HAZARD RECOGNITION

2.1. Toxic Hazards

Toxic Hazards - Toxicity is the ability of a substance to cause damage to living tissue, impairment of the central nervous system, severe illness or, in extreme cases, death through inhalation, ingestion or skin contact. The source of toxic hazards is typically the chemicals, compounds or atmosphere found in the confined space. They can exist as liquids, sludges, gases, vapors, mists or solids. Toxins affect the body, not only at the point of contact (local reaction), but also in remote areas of the body, such as target organs (systemic reaction).

2.1.1. A toxic hazard requiring the canceling of the CSE Permit and cessation of the entry include, but are not limited to:

A. Air sample concentrations that exceed PPE Action Levels.

B. Malfunctioning sampling equipment.

C. Ventilation equipment breaks down.

D. Oxygen content drops below l9.5% and the Entrants are wearing level "C" PPE (see section 2.l.2 of this appendix.)

E. The combustible gas concentration in the space exceeds l0% LEL.

F. The confined space lighting system fails.

G. Others

2.1.2. Circumstances requiring implementation of emergency response may include, but are not limited to:

A. Employees in the space show signs of exposure to the substance (s), yet still respond to verbal commands.

NOTE: Review MSDS's prior to initiating entry. Consult Health and Safety for signs of overexposure and for additional assistance or clarification.

B. Employees in the space do not respond to the attendant's communication.

C. Catastrophic equipment failure resulting in a rapid rise in the toxic concentration or rapid decrease in the oxygen concentration of the space.

Appendix 5 Cont'd.

D. Others

NOTE: Some conditions and materials can pose a simultaneous physical and toxic hazard to employees.

2.2. Physical Hazards

Physical hazards are those that result from space configuration, operations performed, equipment used and structures, devices or conditions that can cause physical trauma to those in the space. Examples of physical hazards typically encountered in a confined space include: Mixer blades or agitators, hoppers, electrical sensors, fill pipes, steam coils, baffles, explosive atmospheres, slips, trips and falls and the unexpected filling of the space with material which could engulf an employee.

2.2.1. A Physical Hazard Requiring Emergency Response Exists When:

The event incapacitates an Entrant, such as: a fall; unexpected activation of equipment in the space; being struck by an object; engulfment; limb caught in coils or sumps; etc.

2.3. Accident Prevention

The purpose of CHES' Confined Space Guidelines is to prevent the likelihood of encountering an unanticipated or uncontrolled chemical, atmospheric or physical hazard.

However, in the unlikely event that a CHES employee encounters an uncontrolled hazard, contingency plans must be in place to minimize the potential outcome of the event. The following guidelines are provided for that purpose:

3. CHES EMERGENCY SERVICE – RESCUE TECHNIQUES

3.1. Non-Entry Rescue

The Attendant should always be capable of making an entry rescue if necessary, and as such, should be wearing the appropriate PPE. If the Attendant has evaluated the nature of the emergency (through a logical review of decision making questions posed in the Addendum) and suspects or identifies that the Entrants are incapacitated, suffer from symptoms of overexposure and/or are unable to self-rescue or are not responding to calls for space evacuation, then a non-entry rescue should be attempted immediately.

3.1.1. Action

A. Evaluate the nature of the emergency through a logical review of decision making questions identified in the Addendum.

B. If the nature of the emergency is such that the Entrant (victim) is conversant and appears to be capable of performing a self-rescue without further injury, the Attendant should encourage the Entrant to do so and provide necessary advice as appropriate.

C. Summon prearranged emergency assistance as indicated on the Entry Permit.

D. The Attendant should attempt a Non-Entry Rescue if the nature of the emergency is such that it can be done without injury to the Attendant or further injury to the Entrant (victim).

Appendix 5 Cont'd.

E. Reconfirm that PPE is still appropriate for making an entry rescue, and then don SCBA in case an entry is necessary. **NEVER ATTEMPT AN ENTRY RESCUE UNTIL A QUALIFIED AND PREPARED REPLACEMENT IS READY TO ASSUME THE ATTENDANT DUTIES AND IS AUTHORIZED TO DO SO BY THE CSE SUPERVISOR.**

F. Determine the following:

1. Physical Injury - Movement Appropriate - Not Appropriate

2. Chemical/Atmospheric Exposure – Movement Appropriate – Not Appropriate

3. Hazard Causing the Injury - Known - Unknown

4. Other Issues Covered in the Addendum

G. Following the instructions for the extraction device being used, begin extracting the employee from the space.

H. If there is resistance to the removal, stop and determine the difficulty.

I. If non-entry extraction is unable to continue, assess the need for entry rescue (refer to Section 3.2 of this appendix and Section 10.5 of the guideline.)

J. If non-entry extraction can continue, continue removing the Entrant.

K. Once the Entrant clears the confined space, immediately decontaminate the Entrant and perform a preliminary CPR/First Aid assessment.

L. Provide CPR/First Aid as needed.

M. Initiate additional appropriate action.

N. Stabilize the Entrant for transport or advanced life-support.

3.2. Entry Required Rescue

If the Attendant has evaluated the nature of the emergency (through mentally reviewing decision-making questions posed in the Addendum) and suspects or identifies that the Entrants are incapacitated, suffering from symptoms of overexposure and/or are unable to self-rescue or are not responding to calls for space evacuation, AND it is apparent that the Entrant (s) cannot evacuate the space without assistance, then an entry must be made to rescue the Entrant (s). **NEVER ATTEMPT AN ENTRY RESCUE UNTIL A QUALIFIED AND PREPARED REPLACEMENT IS READY TO ASSUME THE ATTENDANT DUTIES AND IS AUTHORIZED TO DO SO BY THE CSE SUPERVISOR.**

Appendix 5 Cont'd.

3.2.1. Action

A. Evaluate the nature of the emergency through a logical review of decision-making identified in the Addendum.

B. Summon, prearranged assistance as indicated on the Entry Permit.

C. Determine the following:

1.	Physical Injury	Movement Appropriate	Not Appropriate
2.	Chemical/Atmospheric Exposure	Movement Appropriate	Not Appropriate
3.	Hazard Causing the Injury	Known	Unknown
4.	Other Issues Covered in the Addendum.		

D. While notification is being made to EMS, increase ventilation to the space if the emergency is not a fire and re-evaluate conditions in this order:

First	Oxygen Content
Second	Combustible Gas Level
Third	Toxic Concentrations

E. Don any additional necessary PPE. (**NOTE**: Although the Attendant should always be capable of making an entry rescue, if necessary, and as such, should be wearing the appropriate PPE. The appropriateness of the PPE should be reconfirmed before an entry is made including emergency use respirator, not a respirator designed solely for entry.)

F. Once notification to EMS is made, reassess the appropriateness of entry to assist the Entrants.

G. The CSE Supervisor should assign a qualified and appropriately attired replacement Attendant before authorizing the original Attendant to enter the space as a Rescuer.

H. After confirming that a replacement Attendant is in position and that the original Attendant is correctly attired to enter the confined space as a Rescuer, authorize his/her entry into the confined space to conduct the rescue.

I. Enter the confined space.

J. If the Entrant is wearing an emergency egress unit, check to assure it is turned on.

K. Determine if the Entrant is still breathing.

L. If the Entrant has ceased breathing, immediately begin extraction from the space.

M. If the Entrant is still breathing, try to determine if there is a physical injury and if movement will cause additional injury.

N. If there is no physical injury, move the Entrant into a position that permits the extraction device to lift the Entrant from the space.

Appendix 5 Cont'd.

O. If there is apparent physical injury and an atmospheric hazard is not imminent, call for additional in-space assistance and equipment to immobilize the Entrant prior to moving.

P. Extract the Entrant from the confined space.

Q. Once the Entrant clears the confined space, immediately decontaminate the entrant and perform preliminary CPR/First Aid assessment.

R. Provide CPR/First Aid as needed.

S. Initiate additional appropriate action.

T. Stabilize the Entrant for transport or advanced life-support.

ADDENDUM TO APPENDIX 5: Emergency Planning & Response Guidelines/Emergency Action Decision Making

INTRODUCTION

Prior to implementing emergency action, it is necessary to access the nature of the emergency. Without a clear understanding of the hazard control system failure (i.e., what went wrong), it is dangerous to re-enter the space to take emergency action. Non-entry rescue poses less danger because exposure to the same conditions does not occur.

Sixty (60%) per cent of those killed in confined spaces are would-be rescuers: Many of these unnecessary deaths can be attributed to rescuers entering before identifying and controlling the hazards that produced the initial accident.

To prevent rescuers from becoming victims and extricate the injured as efficiently, appropriately and quickly as necessary, the emergency must be quickly and thoroughly evaluated and appropriate action initiated rapidly. Many decisions must be made. Some necessary information is presented below. Consideration of this information will assist the emergency responder in evaluating the hazard control system failure, thereby permitting a rapid, yet appropriate, response to each emergency.

The following questions refer to Entry Required rescue. However, difficulties experienced during a non-entry rescue could result in the need to enter to assist or affect rescue. Therefore, these questions should be reviewed for each.

1. WHAT IS THE EMERGENCY?

   Does the injury/exposure require immediate action?

Example:	Back Injury (Immediate action NOT necessarily required).	vs.	Heart Attack (Immediate action REQUIRED)
Example:	Respirator Failure (Immediate action REQUIRED).	vs.	Disoriented yet responds to verbal communication (Immediate action NOT necessarily required.)

2. IS THE ENTRANT CONVERSANT?

   If the Entrant can communicate and appears rational, can he/she describe the injury? If the situation is not urgent and conditions won't deteriorate resulting in an imminent situation, the emergency action plan should be implemented and first aid provided before initiating removal.

3. WILL CONDITIONS CHANGE AND/OR DETERIORATE SUCH THAT THE ENTRANT COULD BE INCAPACITATED OR RENDERED UNCONSCIOUS?

   If the answer is, yes, immediate action may be appropriate.

4. IS IMMEDIATE ACTION NECESSARY TO PREVENT FURTHER INJURY OR DETERIORATING CONDITIONS?

5. IS THE CAUSE OF THE INJURY/EXPOSURE KNOWN? (Is the safety system failure identified?)

   The reason the injury/exposure occurred must be known before entry rescue can be initiated. Without this knowledge, rescuers could become victims. (See next question.)

Addendum to Appendix 5 Cont'd.

6. IS THE EMERGENCY A CHEMICAL EXPOSURE, ATMOSPHERIC OR PHYSICAL EMERGENCY?

Each emergency requires different action and constitutes a different level of urgency. For example:

Chemical Exposure - A chemical burn to the skin may be urgent, but may not be life-threatening. Immediate extrication from the space is warranted, but the employee may be able to self-rescue.

Skin contact is not the only potential exposure source. Chemicals can affect the body through inhalation (see below) or through ingestion as well.

Atmospheric - These situations represent potential inhalation exposure such as the case where air purifying cartridge respirators are worn and an unanticipated/uncontrolled gas such as hydrogen sulfide develops in the space. (What unique odor characteristics does hydrogen sulfide possess?)

Hydrogen sulfide affects the respiratory center of the brain and, elevated concentrations, can cause cessation of breathing. In this example, the exposure could be life threatening and, therefore, removal should be initiated immediately.

Physical Injury: Appropriate action depends on:

a. Injury Site
b. Severity

If the Entrant is conversant, an assessment of the severity and injury site can be identified from outside the space. However, if the Entrant is not conversant or the injury is severe, removal must be rapid.

7. IS IT NECESSARY TO ENTER THE SPACE TO PERFORM RESCUE?

Obviously, if removal of employees is possible without entering the space (i.e., employee is on a lifeline harness and tethered to extraction device or other acceptable means) and removal is appropriate (i.e., injury/exposure is life threatening, Entrant can be moved, etc.), this is the preferable method. This must be determined (known) during initial planning. Non-entry rescue can only be determined during initial operation planning. The Entry Supervisor must assure that the physical space configuration will not present any impediments to the non-entry rescue.

8. WILL NON-ENTRY RESCUE INCREASE THE INJURY?

Movement of a non-life-threatened, injured individual may be urgent but could increase the injury.

Example: Non-entry rescue will increase the injury:
Broken Bones - Spinal Injury

Example: Non-entry rescue will not increase injury:
Foot Sprain

Here again, a conversant Entrant and a knowledgeable Attendant is the key factor in determining the urgency of the situation. If the Entrant is non-conversant and if the injury is or may be life threatening, rapid removal is likely appropriate.

9. WILL ADDITIONAL CONTROL MEASURES MITIGATE THE HAZARD CAUSING THE EMERGENCY?

Example: Mechanical equipment, electrical service, etc. not identified during hazard assessment and controlled, is activated, resulting in an injury. Will implementation of the controls (lockout/tagout) at this point mitigate the hazard and permit safe re-entry?

Example: A previously unanticipated gas is introduced to the space resulting in health effects. Will increased or localized ventilation mitigate the hazard and permit safe re-entry?

10. IS THE SPACE SAFE FOR RE-ENTRY?

Unless all appropriate information has been gathered and evaluated (therefore the hazard is known), re-entry could result in additional victims.

11. ARE ALL ENTRANTS SIMILARLY AFFECTED BY THE EMERGENCY?

For physical injuries, the answer to this question may be obvious. However, for atmospheric or chemical exposure, this is a critical decision point.

Example: If one employee of two in the space begins to experience health effects of exposure to the chemical being handled, it may be the result of a malfunctioning respirator, skin absorption of the chemical through an undetected breach of the PPE, or other cause.

If both individuals are affected similarly, unless the hazard is identified and controlled, emergency entry may result in a similar exposure.

Example: Two Entrants on Level B (same air cylinder) enter a toluene tank. One Entrant begins experiencing lightheadedness; the other is unaffected. What could be the cause?

APPENDIX 6: Confined Space Training Requirements

CONFINED SPACE ENTRY SUPERVISOR

1. Completion of the CSE Supervisor Training Course.
2. Free of any written H&S violations.
3. Eligible candidates must be at the level of Environmental Technician II or equivalent.
4. Current CPR/First-Aid and CSE Rescue Training.
5. Successfully passes CHES Supervisor written exam.
6. Has sufficient* CSE experience and completes CHES Supervisor Mentoring Qualification procedure.
7. Receives approval of the General/Project Manager and H&S Manager upon completion of items 1-6.

CONFINED SPACE ENTRANT

1. Completes CHES' Confined Space Training course, or other confined space training course approved by CHES' Training Department.

CONFINED SPACE ATTENDANT

1. Completes CHES' Confined Space Training course, or other confined space training course approved by CHES' Training Department.
2. Current CPR/First-Aid and CSE Rescue Training.

* **Note –** "sufficient" means that the employee can demonstrate to the satisfaction of the H&S Manager and the GM that they have worked in and around CSEs and that this experience has provided them a good understanding of the CSE requirements and process.

*** Note -** Each affected employee will be trained prior to initial assignment, prior to a change in assigned duties, if a new hazard has been created or special deviations have occurred.

ENVIRONMENTAL SERVICES®

APPENDIX 7: Reclassification Certificate

CLEAN HARBORS ENVIRONMENTAL SERVICES
RECLASSIFICATION CERTIFICATE
Non-Permit Confined Space Entry

Location: ______________________ Date: ______________________
Purpose of Entry: ______________________ Time: ______________ (am/pm)
Entry Supervisor (print name): ______________________________________
Entrants' Names (print names): ______________________________________
Space Type: Roll-off ________ Tank ________ Pit ________ Other ______________

SECTION I: SITE ASSESSMENT

YES **NO**

1. Were space hazards eliminated? Indicate method: _______ _______
   _______ Contents Removed _______ Space Isolated (LO/TO)
   Describe other hazard elimination methods: ______________________________________
   ____

Note: Hazard control through ventilation does not constitute elimination. Consult Health and Safety.

2. Is the surrounding area free of hazards in the area that could present a risk to entrants, such as drifting vapors from piping, tanks, sewers or other atmospheric hazards? _______ _______

3. Is the area likely to remain free of atmospheric hazards during entry--i.e., no hazardous operations performed in the space: No chemical added to the space; others? _______ _______

4. Do current monitoring results indicate that all atmospheric hazards have been eliminated _______ _______

5. Have all other hazards within the space been eliminated? If no, treat as a Permit-Required Confined Space _______ _______

SECTION II: MONITORING

1. Are oxygen levels between 19.5% and 22.0%? _______ _______

2. Are combustible gas meter readings below detectable limits (Zero LEL _______ _______

3. Are toxic contaminants below one-half respective TLV/PEL? _______ _______

MONITORING RESULTS

Monitoring Location	TIME	OXYGEN	LEL %	TOXICS

Appendix 7 cont'd.

ACTION ITEMS

1. ANY "NO" ANSWER REQUIRES IMPLEMENTATION OF ALL PERMIT-REQUIRED CONFINED SPACE GUIDELINES.

2. ENSURE ALL EMPLOYEES ENTERING THE SPACE REVIEW AND SIGN THE CERTIFICATE.

3. IF HAZARDS ARISE DURING ENTRY, EACH EMPLOYEE MUST EXIT THE SPACE IMMEDIATELY! A RE-EVALUATION MUST BE PERFORMED BEFORE THE SPACE CAN BE FURTHER RECLASSIFIED. A NEW RECLASSIFICATION CERTIFICATE AND MONITORING MUST BE COMPLETED.

Entrants' Signatures ______________________ ______________________ ______________________

______________________ ______________________ ______________________ ______________________

APPENDIX 8: Confined Space Contractor Approval Checklist

Contractor/Vendor: ________________________________ Approved: ___________
Location: ____ Denied: ___________
Date: ____
Reviewed by: ______________________________________

- ☐ Has drug and alcohol use policy.
- ☐ Contractor has an appropriate medical monitoring program, including ability to wear a respirator.
- ☐ TRIR rates for the past 3 years are lower than the latest industry average.
- ☐ EMR is <1.0. If not, reasonable explanation as to why it is not (e.g., new company, etc.)
- ☐ Written confined policy contains key elements of 29 CFR 1910.146
  - ☐ Definitions
  - ☐ Roles and responsibilities of Entry Supervisor, Entrant, Attendant
  - ☐ Confined space permits
  - ☐ Training
  - ☐ Testing and monitoring
  - ☐ Required safe work practices
  - ☐ Safety equipment and clothing requirements
  - ☐ Rescue requirements
- ☐ Confined space permit which requires the following key information:
  - ☐ Required PPE
  - ☐ Emergency and rescue provisions
  - ☐ Site-specific rescue plan
  - ☐ Entry log
  - ☐ Monitoring data recordings
  - ☐ Calibration data
- ☐ Confined space training agenda(s) with training time indicated for courses. Ensure adequate amount of time is allowed in CSE courses to ensure course material is presented and is not a “general awareness” of CSE courses (e.g., 1 hour)
- ☐ 24 or 40 HazWoper training agenda addresses the OSHA required topics.
- ☐ The following certificates for each contractor employee to conduct CSE work:
  - ☐ HazWoper training
  - ☐ Confined space training
  - ☐ First Aid & CPR training, if contractor provides own rescue service
  - ☐ Lockout/Tagout training
  - ☐ Physician’s Written Opinion

APPENDIX 9: Confined Space Entry Permit

CONFINED SPACE ENTRY PERMIT

CLIENT: ______________________ CHES LOCATION: ___________________________ JOB NUMBER: ______________
CLIENT ADDRESS: ____
PURPOSE OF ENTRY: ____
PERMIT IS VALID FROM: ____________________AM/PM__________ TO: ___________________AM/PM_______________
Time Date Time Date

SECTION I DESCRIPTION OF SPACE

CLIENT PROVIDED INFORMATION:
SPACE INDENTIFICATION (NUMBER/NAME): ______________________________ PERMIT REQUIRED ☐ YES ☐ NO PRECAUTIONS BY CLIENT ☐ YES ☐ NO
CLIENT/CONTRACTOR WORK IN PROGRESS ☐ YES ☐ NO IF YES, CAN WORK BE RE-SCHEDULED? ☐ YES ☐ NO (if no, contact H&S)
SPACE DIMENSIONS: LENGTH __________________ WIDTH __________________ HEIGHT __________________ CAPACITY __________________ GALLONS
OPENING/ENTRYWAY: HOW MANY? ____________ SIZE ____________ LOCATION ____________ ☐ VERTICAL ☐ HORIZONTAL ☐ GREATER THAN 5 FEET
KNOWN HAZARDS: ____

SECTION II HAZARD ASSESSMENT – POTENTIAL HAZARDS THAT MAY BE ENCOUNTERED

ATMOSPHERIC HAZARDS:
☐ OXYGEN DEFICIENCY<19.5% ☐ OXYGEN ENRICHED>22.0% ☐ FLAMMABLE ABOVE 10%LEL ☐ TOXICS ABOVE ½ PEL ☐ TOXICS ABOVE ½ IDLH

PHYSICAL HAZARDS:
☐ ACTIVITIES NEAR AREA
☐ BAFFLES
☐ BURNS
☐ COLD STRESS
☐ CONVERGING WALL
☐ CONTAMINATED CAVITIES
☐ CULVERTS
☐ CUTS/ABRASIONS
☐ FLOOR HOLES
☐ ELEVATED WORK
☐ ELECTRICAL SHOCK
☐ ENGULFMENT
☐ FALLING OBJECTS
☐ FIRE/EXPLOSION
☐ FLOODING
☐ HEAT STRESS
☐ HOT WORK
☐ IONIZING RADIATION
☐ LADDERS
☐ LIMITED LIGHTING
☐ MECHANICAL EQUIP.
☐ MOVING PARTS
☐ NOISE
☐ OVERHEAD HAZARDS
☐ PATHWASTE SHARPS
☐ POWER TOOLS
☐ PRODUCT LINES
☐ SLIP/TRIP/FALLS
☐ SUMPS/LOW SPOTS
☐ VEHICLE TRAFFIC
☐ VENTILATION SHAFTS
☐ STORED ENERGY
  ☐ ELECTRICAL
  ☐ HYDRAULIC
  ☐ GRAVITY
  ☐ PNEUMATIC
  ☐ STEAM
  ☐ OTHER
____

CHEMICAL HAZARDS: (LIST ALL MATERIALS AND INCLUDE MSDS, PROFILE, ANALYTICAL, ETC.)
CHEMICAL /TRADE NAME(S): 1) ________________________ 2) ________________________ 3) ______________________ 4) ______________________
5) ________________________ 6) ________________________ 7) ________________________ 8) ______________________
☐ CORROSIVE ☐ IRRITANT ☐ TOXIC (SKIN) ☐ TOXIC (INHALATION) ☐ TOXIC (INGESTION) ☐ PATHWASTE ☐ OTHER: ________________

SECTION III PROJECT PLANNING

OPERATION TO BE PERFORMED
☐ ABRASIVE BLASTING
☐ BACKHOE/BOBCAT
☐ BUCKETING MATERIAL
☐ DRUM LOADERS
☐ EXCAVATIONS
☐ GRINDING
☐ HOTSY
☐ HOT WORK
☐ INERTING
☐ PAINTING
☐ PNEUMATIC TOOLS
☐ PRESSURE WASHING
☐ SAMPLING
☐ SCARIFYING
☐ SET TANK LEGS
☐ SOLVENT CLEANING
☐ ULTRASONIC TESTING
☐ VACTOR/CUSCO
☐ VACUUM TRUCK
☐ OTHER: __________

ENTRY COMMUNICATIONS
☐ VISUAL
☐ HAND SIGNALS
☐ VERBAL W/OUT RADIO
☐ ROPE TUGS
☐ OUTSIDE EMERG. COMM. ESTABLISHED ☐ ELECTRONIC EXPLOSION PROOF
☐ OTHER SIGNAL METHOD:____

FIRE SAFETY
☐ CO2 EXTINGUISHER (2-15 LB UNITS REQ'D)
☐ DRY CHEM. EXTINGUISHER (2-20 LB UNITS REQ'D)
☐ FIRE HOSE READY
☐ FIRE DEPT. STANDBY
☐ HOT WORK PERMIT
☐ FIRE WATCH
☐ BONDING/GROUNDING
☐ AMBIENT LEL TESTING

SECTION IV HAZARD CONTROL

ATMOSPHERIC HAZARD CONTROLS
☐ PURGING
☐ INERTING
☐ FLUSHING
☐ ISOLATION
☐ MECHANICAL VENTILATION
☐ EXHAUST ☐ FORCED (CONTACT H&S)
☐ PHYSICAL BARRIERS
☐ WET SWEEPING
☐ MINIMIZE VERTICAL DROP OF DRY MATERIALS

PHYSICAL HAZARD CONTROLS
☐ AIR POWERED TOOLS
☐ AREA TRAFFIC CONTROL
☐ BOND/GROUNDING
☐ COLD STRESS MONITORING
☐ DI-ELECTRIC BLANKETS
☐ EXPLOSION-PROOF LIGHTING
☐ FALL PROTECTION
☐ GFCI USED
☐ HEAT STRESS MONITORING
☐ HOT SURFACES COVERED
☐ HOT WORK PERMIT
☐ LADDERS SECURED
☐ LIGHTING AT ENRTYWAY
☐ LO/TO CONTROLS
☐ NON-CONDUCTIVE EQUIPMENT
☐ NON-SPARKING TOOLS
☐ PROTRUSIONS MARKED
☐ REMOTE HANDLING TOOLS
☐ SUMPS MARKED & BLOCKED
☐ WORK SURFACES IMPROVED

CHEMICAL HAZARD CONTROLS
☐ BARRIER CREAM
☐ DILUTION
☐ LOCAL VENTILATION
☐ PATHWASTE SHOTS
☐ PATHWASTE TRAINING
☐ REMOTE HANDLING
☐ HEPA UNITS
☐ PERS. PROT. EQUIP.
☐ SAFETY SHOWER
☐ EYEWASH

PERSONAL PROTECTIVE EQUIPMENT – IDENTIFY RESCUE GEAR IN SECTION IX
☐ SUPPIED AIR RESP.W/EGRESS BOTTLE
☐ AUDIBLE ALARM (MANDATORY WITH SAR)
☐ SCBA
☐ AIR PURIFYING RESPIRATOR ☐ FULL FACE
CARTRIDGE TYPE::______________________
☐ OUTER GLOVES: _____________
☐ INNER GLOVES: ______________
☐ BOOTS:______________________
☐ COVERALLS:_________________
☐ SEAM TYPE:__________________
☐ RAIN GEAR
☐ HARD HATS
☐ HEARING PROTECTION
☐ PFD
☐ BARRIER CREAM
☐ DI-ELECTRIC GLOVES AND BOOTS
☐ FACE SHIELD
☐ CUT RESISTANT PPE
☐ NOMEX COVERALLS
☐ OTHER: ____________________

SECTION V ATMOSPHERIC MONITORING

INSTRUMENT	CALIB. DATE	INSTRUMENT	CALIB. DATE	INSTRUMENT	CALIB. DATE
☐ DETECTOR TUBES	____________________	☐ 4 GAS METER	____________________	☐ PERSONAL PUMP	____________________
☐ PID	____________________	☐ 4 GAS/PID	____________________	☐ SAMPLING BADGE	____________________
☐ OTHER: ______________________________					

ACTION LEVELS (FOR ACCEPTABLE ENTRY CONDITIONS)
LEVEL C RANGE: OXYGEN 19.5 – 22.0% O2 LEL <10.0% CO 0 – 15 ppm H2S 0 – 5 PPM TOXICS: ____
LEVEL B RANGE: OXYGEN 19.5 – 22.0% O2 LEL<10.0% CO 15-1200PPM H2S 5-100PPM TOXICS: ____

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SECTION VI CONFINED SPACE ATMOSPHERIC MONITORING LOG

Environmental conditions:
(weather, temperature) ____
____

TIME	LOCATION OR ACTIVITY	PARAMETER INSTRU/MANUAL	OXYGEN	LEL	CO	H2S	TOXIC	COMMENTS

ADDITIONAL COMMENTS: (Use additional pages) ____
____
____
____

Sampling Performed By: ______________________ **Title:** __________________ **Facility:** __________

Signature: ____

SECTION VII LOCK OUT / TAG OUT PERMIT

LIST MACHINE, EQUIPMENT OR PROCESSES TO BE LOCKED/TAGGED AND THE METHOD OR EQUIPMENT USED TO LOCK OUT OR DEENERGIZE.

DEVICE BEING ISOLATED	ISOLATION METHOD	DEVICE LOCATION	DEVICE BEING ISOLATED	ISOLATION METHOD	DEVICE LOCATION

ENERGY ISOLATION VERIFIED BY:_______________________________ **TIME:**_______________ **DATE:**____________
WORK AUTHORIZED BY:_______________________________ **TIME:**_______________ **DATE:**____________
LOCKOUT PROCEDURE RESPONSIBILITY TRANSFERRED BY_______________ **TIME:**_______________ **DATE:**____________

SECTION VIII STATUS OF THE ENTRANTS

NAME OF ATTENDANT:_______________________ **DUTIES TRANSFERRED TO:**_______________________ **TIME:**_______________

NAME OF ENTRANTS	TIME IN	TIME OUT	TIME IN	TIME OUT	TIME IN	TIME OUT	TIME IN	TIME OUT

SECTION IX EMERGENCIES/CONTINGENCIES

EMERGENCY PLANNING

- ☐ CHES RESCUE TEAM
- ☐ IN-PLANT RESCUE TEAM
- ☐ OUTSIDE RESCUE TEAM
- ☐ TEAM DUTIES PLANNED
- ☐ NON-ENTRY RESCUE
  - ☐ MECH.DEV.APPLICABLE
  - ☐ HARNESS LIFELINE (IF NONE, CALL H&S)
  - ☐ SPECIALIZED EQUIP.
- ☐ ENTRY RESCUE
  - ☐ HARNESS WORN
  - ☐ CSE STRETCHER
  - ☐ COMMUNICATIONS ESTAB.
- ☐ SCBA SET UP/CHECKED
- ☐ SEPARTATE SAR W/EGRESS
- ☐ 30 MIN. SAR W/EGRESS

☐ ADDITIONAL PRECAUTIONS:____

EMERGENCY PROCEDURES

DESCRIBE ALL EMERGENCY PROCEDURES TO BE UTILIZED IN THE EVENT NEEDED

☐ FIRE OR EXPLOSION: ____
☐ TOXIC EXPOSURES: ____
☐ EQUIPMENT OR SYSTEM BREAKDOWNS: _______________________________________
☐ PERSONAL PHYSICAL INJURIES: _______________________________________
☐ OTHER: ____

EMERGENCY PHONE NUMBERS

FIRE DEPT: _____________________ **AMBULANCE:** _____________________ **PLANT EMERGENCIES:** _____________________

SECTION X RESCUE PLAN

In the event of an incident where an entrant is unable to exit the space on their own the following rescue plan is to be immediately initiated.

The acting attendant, CSE Supervisor and the following assisting personnel will participate in rescue activities.

___________________ ___________________ ___________________________ Duties Transferred at (Time) ___________ to

___________________ ___________________ ___________________________`

INITIAL ACTIONS

The acting attendant will make notification to assisting personnel or CSE supervisor and direct them to call emergency medical services. An assessment of the space hazards will be made. All equipment that would interfere with rescue activities will be immediately turned off to reduce noise and any obstructions removed.

NON-ENTRY RESCUE

Non-entry rescue must be attempted immediately as follows: All entrant positioning must be monitored to verify that non-entry rescue does not increase injury.

HORIZONTAL RESCUE

The acting attendant (and assistants) at the time of incident recognition will pull the entrant(s) by their lifeline to the opening of the space and out of the space and begin emergency decontamination procedures.

VERTICAL RESCUE

The acting attendant (and assistants) at the time of incident recognition will activate the mechanical extraction device, hoist the entrant(s) connected to the device(s) out of the space, and begin emergency decontamination procedures.

ENTRY RESCUE

In the event that entry rescue is necessary, it may only be performed as long as there are sufficient personnel to contact emergency services and assist with rescue activities. (***At a minimum two rescue trained personnel shall be available to initiate entry rescue procedures***)

The following person will act as the rescue attendant and will not enter the space. ☐ Acting attendant ☐ CSE Supervisor ☐ Assisting Personnel ____________________

Rescuer(s) making entry will don the personal protective clothing, gloves, full body harness, lifeline, etc. All entry rescue personnel must don designated supplied air respirators.

Upon entering rescuer(s) will assess the situation, determine the appropriate rescue method, and communicate with the rescue attendant. The entering rescuer(s) will assist in moving the entrant(s) to a position where they can be removed from the space. Emergency decontamination procedures will be completed on all personnel exiting the space.

The following are special procedures that must be implemented for this permit space:

____
____
____

SECTION XI PHYSICAL HAZARD DATA SHEET

TASK

______ ABRASIVE BLASTING (1)
______ ABRASIVE WHEELS AND TOOLS (1)
______ AERIAL LIFTS (1)
______ AIR COMPRESSOR (1)
______ BONDING & GROUNDING (2)
______ CHAINSAW (1)
______ COMPRESSED GAS CYLINDER HANDLING (1)
______ COMPRESSED GAS REGULATOR USE (1)

______ CRANES and HOISTS (1)
______ DOUBLE DIAPHRAM PUMPS (1)
______ ELECTRICAL SAFETY (1)
______ EXCAVATING & TRENCHING (2)
______ EXCAVATION/BACKHOE EQUIPMENT (1)
______ EXPLOSIVE ACTUATED FASTENING TOOLS (1)
______ FALLING OBJECTS (1)
______ FLOOR HOLES/FLOOR OPENINGS
______ HAND TOOLS (1)
______ HIGH PRESSURE WATER BLASTING (1)
______ (HOTSY) CLEANING WITH HOT WATER & STEAM (1)
______ HOUSEKEEPING (1)

TASK

______ INERTING SPACES (1)
______ LADDERS (1)
______ LIGHTING (1)
______ MOVEMENT LIMITING FALL PROTECTION (1)
______ NOISE (1)
______ OVERHEAD WIRES (1)
______ PNEUMATIC HAMMER (1)
______ POWER TOOLS (INCLUDING: Electric; Hydraulic; Pneumatic; Etc.) (1)
______ RIGGING (1)
______ SCAFFOLDS (1)
______ SHARP OBJECTS (1)
______ SKID STEER LOADER (1)
______ SLIPS, TRIPS AND FALLS (1)
______ STEAM COILS IN OIL TANKS (1)
______ TRACK CLEANING PROCESS (2)
______ UTILITY SAFETY KNIVES (1)
______ VACUUM TRUCK OPERATION (1)
______ WELDING, CUTTING, BURNING (1)
______ WORK ZONE TRAFFIC CONTROL (1)

FOOTNOTES:

(1) – Attach/Refer to Physical Hazard Data Sheet **(2) – Attach/ Refer to Program**

SECTION XII ENTRY SUPERVISOR'S PRE-ENTRY CHECKLIST

VENTILATION CHECKLIST

☐ CLEAN MAKE-UP AIR
☐ BLOWER SECURED
☐ BLOWER GROUNDED
☐ BLOWER AS CLOSE AS POSSIBLE TO SPACE
☐ FLEX HOSE DIA. MATCHES BLOWER DIA.
☐ LIMIT USE OF DUCT ELBOWS
☐ ELBOWS HAVE NO SHARP ELBOWS
☐ LENGTH OF CURVE AT 3X HOSE DIA.
☐ ALL SPACE OPENINGS CLEAR
☐ LOCAL HOT WORK VENT
☐ DISCHARGE & MAKEUP-AIR SEPARATED
☐ BLADE GUARDS ARE IN PLACE
☐ ELEC. EQUIP. IS EXP. PROOF
☐ HOSE CLOSE TO ENTRANT
☐ HOSE CLOSE TO BOTTOM
☐ INLET SHIELDED FROM DEBRIS

VERIFICATION OF ACCEPTABLE ENTRY CONDITIONS

☐ UNAUTH. ENTRY PROHB.
  ☐ SIGNS POSTED
  ☐ ACCESS PROTECTED
  ☐ HOST EMPL.INFORMED
  ☐ CONTRACTOR INFORMED
☐ NO ENTRY CONSIDERED
  ☐ APPLICABLE
  ☐ NOT APPLICABLE
  WHY: _______________
  ____
☐ HAZARDS CONTROLLED
  ☐ ATMOSPHERIC
  ☐ PHYSICAL
  ☐ CHEMICAL
  ☐ OTHER
☐ ATMOSPHERE CHECKED
  ☐ OXYGEN
  ☐ COMBUSTIBLE GAS
  ☐ TOXIC
☐ ISOLATION COMPLETED
  ☐ BLANKED/BLINDED
  ☐ MISALIGNED
  ☐ DBL BLOCK & BLEED
  ☐ LO/TO COMPLETE
☐ EMERGENCIES/CONTINGENCIES
  ☐ ESTABLISHED
  ☐ DISCUSSED
  ☐ VERIFIED
☐ COMMUNICATIONS
  ☐ ESTABLISHED
  ☐ DISCUSSED
  ☐ VERIFIED
☐ ACCEPTABLE ENTRY CONDITIONS
  ☐ ESTABLISHED
  ☐ DISCUSSED
  ☐ PERMIT SIGNED
  ☐ HAZARDS CONTROLLED
  ☐ ATMOSPHERE LEVELS OK
  ☐ PERMIT DISCUSSED
  ☐ PERMIT COMPLETE
  ☐ EXPOSURE SYMPTOMS DISCUSSED

☐ REVIEWED ENTRY WITH H&S MANAGER (Name) ________________________________ (Date) ______________________________ ___________________

ENTRY SUPERVISOR'S COMMENTS/SAFETY MEETING NOTES

____
____
____

I VERIFY THAT ALL ACCEPTABLE ENTRY CONDITIONS HAVE BEEN MET; THE SPACE IS ISOLATED AND READY FOR ENTRY.
NAME AND SIGNATURE OF ENTRY SUPERVISOR: ____
PRINT **SIGNATURE**

Supervisor Duties Transferred To: ____
PRINT **SIGNATURE** **TIME**

SIGNATURE OF ALL CREW MEMBERS
I HAVE READ AND UNDERSTAND THIS ENTRY PERMIT; I AGREE TO COMPLY WITH ALL PORTIONS OF IT.

____________________ ____________________ ____________________ ____________________

____________________ ____________________ ____________________ ____________________

____________________ ____________________ ____________________ ____________________

SECTION XIII PERMIT TERMINATION

CLIENT DEBRIEFING DONE? ☐ YES BY: ____________________________ **☐ NO (EXPLAIN):** ____
LOCKOUT/TAGOUT HARDWARE REMOVED BY: ________________________________ **TIME:** ______________________ **DATE:** _________________________
LOCKOUT/TAGOUT TERMINATED BY: ____ **TIME:** ______________________ **DATE:** _________________________
DATE AND TIME PERMIT CANCELLED OR EXPIRED: ____
CSE SUPERVISOR'S SIGNATURE: ____ **DATE:** _________________________

HS 1.95 ELECTRICAL SAFETY PRACTICES

HS 1.95 ELECTRICAL SAFETY PRACTICES

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HS 1.95 ELECTRICAL SAFETY PRACTICES

1. PURPOSE

This practice defines the safety precautions and responsibilities for performing electrical work at Clean Harbors Environmental Services, Inc. (CHES). This practice includes the safety requirements of Occupational Safety and Health Administration (OSHA) 29 CFR 1910 Subpart S, "Electrical". Installations of optical fiber cable, where such installations are made along with electrical conductors, are also covered by this practice.

2. SCOPE

2.1. Standards of Practice

2.1.1. The standards of this practice apply to all CHES employees, contractors and subcontractors. The standards of this practice apply to work on, or directly associated with, installations of utilization equipment used for purposes other than generating, transmitting or distributing electric energy or other utilization installations which are not an integral part of a generating installation, substation or control center.

2.1.2. The standards of this practice do not apply to work performed by qualified persons on, or directly associated with, the following listed equipment.

A. Generation, transmission and distribution installations. Requirements for this work are contained in 29 CFR 1926 Subpart V, "Power Transmission and Distribution".

B. Installations for the generation, control, transformation, transmission and distribution of electric energy, including communications and metering, located in buildings used for such purposes or located outdoors.

C. Communications installations not covered by 29 CFR 1910.268.

D. Installations in vehicles other than mobile homes and recreational vehicles.

E. Installations for railways for operation of rolling stock or signaling and communications purposes.

2.1.3. **NOTE**: No standard in this practice shall be construed:

A. To deny electrical workers the right to verify the de-energized condition of the circuitry to which they may be exposed;

B. To forbid electrical workers from taking any emergency lifesaving measures they consider necessary, provided such measures do not constitute a definite life threat to greater numbers of people;

C. To forbid any persons from taking any de-energization procedures deemed necessary in an emergency, provided such de-energization is reported immediately to supervision.

2.1.4. **NOTE**: All voltages in this practice refer to nominal voltages.

3. RESPONSIBILITIES

3.1. Supervisors

3.1.1. Ensure that only trained and qualified electrical workers are assigned to perform work on electrical equipment, components and systems. If an apprentice is used to perform electrical work, the work shall be performed under the direct supervision of trained and qualified electrical workers.

3.1.2. Ensure that detailed pre-job briefings are conducted prior to any work on or near energized electrical equipment.

NOTE: "Near", in this sense, is defined as conditions where contact with energized components is possible by slipping, tripping, falling, actions of others, or inadvertent action of reasonable probability.

3.2. Trained and Qualified Electrical Workers

3.2.1. Request from their supervisor any additional documentation or reference material they require to safely perform electrical work.

3.2.2. Correct and/or report to their immediate supervisor all electrical hazards, which come to their attention. Work involving unsafe practices or conditions shall be stopped until such hazards are removed.

3.2.3. Use insulated tools as required by this practice. Lanyards shall be attached to tools when working above electric equipment where a dropped tool may create an unsafe condition or hazard.

3.2.4. Use only ladders meeting the requirements of ANSI-A14.5 for electrical work.

3.2.5. Perform only those tasks for which they are trained, knowledgeable, equipped and authorized. Inexperienced workers (e.g., apprentices) shall work under the direction of a trained and qualified electrical worker.

3.3. Employees

3.3.1. Familiarize themselves with the electrical safety precautions for equipment and hazards in their work areas including hazards involved with stored energy.

3.3.2. Heed safety warning signs and signals and warn others who are in danger or in the vicinity of energized equipment or lines.

3.4 Vice President-Facility Engineering

3.4.1 The V.P. – Facility Engineering is responsible for implementing this program.

4. DEFINITIONS

Deadfront: Without live parts exposed to a person on the operating side of the equipment.

Exposed: (As applied to live parts) Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to parts not suitably guarded, isolated or insulated.

NOTE: The use of any temporary guard, isolation or insulation barrier such as shields, insulating blankets or tape that can be dislodged is not considered to be suitably guarded, isolated or insulated.

Ground Fault Circuit Interrupter (GFCI or GFI): A personnel protective device with a 4-6 milliamp ground fault current trip setting used to interrupt electrical power to a piece of equipment.

Hot Stick: A registered brand name in common usage to indicate a tool insulated for the rated voltage, and used with or without special fittings for a variety of electrical jobs. Normally used for overhead line work by qualified line personnel.

Insulated Tools: Tools tested and approved by the manufacturer for the rated voltage or tools that are covered, surrounded or separated with a nonconductive material in order to prevent or reduce the transfer of electricity. Before use, tools that are insulated by field modification must be approved by Health and Safety or by a registered professional engineer.

National Electrical Code (NEC): The NEC, also approved as ANSI/NFPA-70, referenced in 29 CFR 1910 Subpart S, "Electrical".

National Electrical Safety Code: Also known as ANSI/EEE, Standard C-2, referenced in ANSI/NFPA 70E.

Nationally Recognized Testing Laboratory: An independent testing laboratory. Underwriters' Laboratory (UL), Factory Mutual (FM) and Electrical Testing Laboratory (ETL) are the main approved testing laboratories that can approve electrical components in accordance with OSHA requirements.

Polychlorinated Biphenyl (PCB): An organic liquid used as a dielectric and/or coolant in transformers, capacitors, etc. Some common trade names (all registered) are "Askarel", "Chlorextol", "Chlorinol", "Dykanol", "Elemex", "Inerteen", "LMX", "No-Flamol", "Pyranol", "SAF-T-Kuhl", "Therminol" and "Aroclors".

Trained and Qualified Electrical Worker: A person with knowledge of the operation, installation and construction of electrical equipment, knowledge of the hazards involved, and who has received electrical safety training in accordance with 29 CFR 1910.331-335.

Two-Person Rule: The Two-Person Rule recommends as a safe work practice the presence of two trained and qualified electrical workers when working on or in close proximity to exposed, energized electrical circuits/equipment above 480V. This recommendation can be waived at the discretion of the electrical supervisor. Reducing the voltage level whereby two people should be utilized for the work is to be determined by the electrical worker and the job supervisor after consideration of other hazards and conditions that dictate an increased level of safety oversight for the task to be performed. The first person performs the work. The second person stands by to render assistance to the first person in the event he/she is inadvertently shocked while performing the work.

The second person shall know the location of the isolation device(s) for the equipment being worked on. Additionally, the second person shall be assigned no additional duties or tasks while the work is being performed. The second person safety watch requirement of the Two-Person Rule can be waived where it can be determined that (1) the circuits or equipment involved present no significant hazard to the worker(s) or (2) when adequate compensatory measures have been established to abate the hazard. Health and Safety approval of the waiver is required and controls must be documented.

5. TRAINING REQUIREMENTS

5.1. All Employees

Complete general electrical safety training at least once every two years. This training will normally be conducted during 8-hour refresher classes.

5.2. Identified Employees

Identified employees, including electricians, welders, their supervisors and all other employees and their supervisors whose work brings them close enough to exposed parts of energized electrical circuits operating at 50V or more to ground for a hazard to exist, shall be familiar with the safety-related work practices required by the practice, 29 CFR Subpart S 1910.331 through 1910.335 that pertain to their respective job assignments and any other electrical related safety practices not specifically addressed in the above documents but which are necessary for their safety. Identified employees shall be trained in these requirements and at least every two years thereafter.

5.3. Electrical Workers - Additional Training

5.3.1. Electrical workers shall receive training in the requirements of this practice upon initial hire and at least yearly thereafter.

NOTE: Training in the requirements of this practice satisfies the training requirements of 29 CFR 1910, Subpart S.

5.3.2. Electrical workers employed by subcontractors shall be trained in accordance with OSHA 29 CFR 1926.21.

5.3.3. Scope of Training - Training for electrical workers shall include, at a minimum, the following.

A. Skills and techniques necessary to:

-
- 1. Distinguish exposed energized parts from other parts of electric equipment and the hazards involved;
-
- 2. Determine the nominal voltage of exposed energized parts.

B. Clearance distances and corresponding voltages per Section 10 of this practice.

C. Proper use of test equipment and personal protective equipment.

D. Lockout/Tagout practices per Lockout/Tagout Guidelines, of the Health and Safety Guidance Manual.

5.3.4. Pre-Job Safety Briefing - The electrical safety requirements of this practice shall be reviewed during pre-job briefings for electrical work and documented on the LO/TO Permit or Electrical Energized Work Permit.

5.4. Cardiopulmonary Resuscitation (CPR) Training

CPR training is required for electrical workers and their supervisors.

6. ENVIRONMENTAL HAZARDS

Employees who install, repair or remove electrical equipment must take special care to prevent environmental and personnel contamination.

6.1. Hazardous Materials

Specific hazardous materials are listed in the Material Safety Data Sheets (MSDSs) provided to each supervisor.

6.2. PCB

Large transformers and capacitors may contain PCB, a toxic substance. Some older equipment may have capacitors containing up to three pounds of PCBs. When these transformers or capacitors are removed, they shall be disposed of as PCB waste.

NOTE: If a piece of equipment is suspected or known to contain PCB, supervision and the Health and Safety Department shall be notified before performing work on the equipment.

7. PHYSICAL SAFETY BARRIERS, WARNING SIGNS AND LABELS

7.1. Guarding Exposed Parts of Electrical Equipment

Exposed parts of electrical equipment that operate at greater than 50 volts AC or DC shall be guarded against accidental contact by approved cabinets, insulated shields, location and warning labels, and shall be accessible only to qualified personnel.

7.2. Signs and Barricades

7.2.1. Signs and barricades shall provide sufficient warning and protection from electrical hazards.

7.2.2. Signs, Symbols, Tags - Safety signs, safety symbols or accident prevention tags shall be used, when necessary, to warn personnel of potential electrical hazards.

NOTE: Standard accident prevention signs and tags as required by 29 CFR 1910.145 are adequate to meet the requirements of this section.

7.2.3. Barricades - Barricades shall be used in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas exposing employees to uninsulated energized conductors or circuit parts. Conductive barricades shall not be used where they might cause an electrical contact hazard.

8. PORTABLE ELECTRIC TOOLS, EQUIPMENT, CORDS, GFCIs, AND MEASURING INSTRUMENTS

8.1. Portable Electric Tools, Equipment and Cords

8.1.1. Protection Factors - Portable electric tools (except for battery-powered tools) shall be double insulated, case-grounded or low voltage. Such tools shall be visually inspected for external defects or evidence of possible internal damage before each use by the supervisor or the person using the equipment. Hand tools used for working on electrical systems shall be insulated also.

8.1.2. Inspection - Portable cord and plug-connected equipment shall be visually inspected by the person using the equipment before use on each shift for external defects and for evidence of possible internal damage. If during the shift or at anytime during use anything happens that has the potential to result in damage to a portable cord and plug-connected equipment, it shall be removed from service and re-inspected to ensure it is still safe for use.

8.1.3. Tagging and Removing from Services - Defective and damaged items shall be removed from service, using LO/TO procedures, until necessary repairs and tests have been accomplished to render the equipment safe.

8.1.4. Adapters, Plugs and Receptacles - Adapters which interrupt grounding continuity shall not be used. Plugs and receptacles shall mate properly and provide proper grounding continuity.

8.1.5. Securing of Lock-Type Connectors - Lock-type connectors shall be properly secured after connection.

8.1.6. Handling of Portable Equipment - Portable equipment shall be handled in a manner which will not cause damage.

8.1.7. Cords - Flexible electric cords connected to equipment may not be used to raise and lower the equipment. Flexible cords may not be stapled or otherwise hung in a manner that could damage the outer jacket or insulation. Cord number shall be in accordance with the NEC.

8.1.8. Protection Factors for Portable Power Tools - In wet or extremely damp areas, or where workers are well grounded by pipes, tanks, etc., portable power tools must be GFCI protected.

8.1.9. Rated-Load and Circuit Breakers - Only rated-load switches and circuit breakers shall be used as disconnecting means for electric power and lighting circuits.

A. Overcurrent protection of circuits shall not be modified beyond that allowed by 29 CFR 1910.304 (e).

B. Circuits shall not be manually re-energized after tripping until it is determined that it is safe to do so.

C. Employees (other than electrical workers) may reset a tripped 480V or less breaker one time, provided it is not located in a designated emergency panel and when, based on their knowledge, it is safe to do so. Should the circuit breaker trip again, contact supervision so the appropriate maintenance can be obtained. Other types of circuit breakers may only be reset by employees who are trained and knowledgeable of the systems involved.

8.1.10. Trouble Lamps - Non-grounded, double-insulated trouble lamps shall be fitted with non-conducting lamp guards.

8.1.11. Powering Low-Voltage Tools - Low-voltage tools shall be powered from an isolating transformer supplying not more than 50 volts. Both transformers and tools shall be tested and marked like other portable power tools.

8.1.12. Underwater Light - Underwater lights and similar devices shall have non-current carrying conductive parts grounded by a three (or more) wire grounding cord and plug with a GFCI, or shall be of the low voltage isolating type referred to in Section 8.1.11 of this practice.

8.1.13. Portable Electric Lighting in Hazardous Locations - Twelve volts (open circuit) shall not be exceeded for portable electric lighting in hazardous locations such as drums, tanks and vessels.

8.1.14. Electrical equipment installed in classified areas shall not be opened or serviced with the power on until a "Hot Work Permit" has been obtained.

8.1.15. An electrical "cheater" shall only be issued with a "Hot Work Permit". An electrical cheater is an adapter pigtail, which has an explosion-proof plug on one end and a standard plug on the other. It allows a person to operate spark-producing equipment in a hazard-classified area.

8.1.16. Flammable vapors, combustible dust, ignitable fibers or flyings – All equipment used in a classified space (Class 1, Division 1 and Class 1, Division 2 areas) shall be approved for that classification, unless a Hot Work Permit is issued and the area monitored for flammable vapors.

8.1.17. GFCIs are to be used for temporary power at all constructions sites.

8.1.18. GFCIs or an assured grounding program are to be used for all portable electrical tools, equipment and cords, along with 3 wire extension cords.

8.1.19. When using non-intrinsically safe electrical equipment, the following safe distances must be maintained: 10’ from drum pumping/sampling areas and 15’ from tanker and tank car pumping/sampling areas. Also, yellow lines should be painting in these areas to designate these safe distances.

8.2. Extension and Flexible Cords

8.2.1. Visual Inspection - Extension cords shall be visually inspected for external defects and evidence of internal damage before each use by the person using the cords. Flawed cords shall not be used.

8.2.2. Protective Measures - Cords and connectors shall be protected from wet or damp locations, traffic of all kinds, excessive heat, chemicals and other agents, which might cause failure. They shall not be strung through doorways, unless protected from physical damage.

8.2.3. Conductors - Cords shall have conductors of a size appropriate to the required service of the cord (as described in the NEC).

8.2.4. Insulating Protective Equipment - Insulating protective equipment shall be used when energized plug and receptacle connections must be made or handled in wet conditions.

8.2.5. Extension cords shall be of the three- (or more) wire grounding type.

8.2.6. Equipment cords of all types shall be of the three- (or more) wire grounding type.

NOTE: An exception is equipment cords provided by the equipment manufacturer with a two-prong plug and displaying a nationally recognized testing laboratory label.

8.3. GFCIs

8.3.1. GFCI protection shall be provided for single-phase circuits supplying grounded electrical tools in all outdoor applications, in wet or damp areas, and where the worker is likely to be well grounded (in or on tanks, pipes, metal, damp concrete, etc.).

8.3.2. Portable GFCIs shall be used in circumstances where permanent GFCI protection is not provided.

8.3.3. When used, the user shall trip test portable GFCIs daily, before use, by pressing the test button, as required by the GFCI manufacturer.

8.4. Measuring Instruments

8.4.1. Instruments used for electrical measurements shall be used by qualified persons only, according to the manufacturer's directions, or in accordance with specific written procedures approved by Health and Safety.

A. Inspection - Before use, the user shall visually inspect electrical measurement instruments and associated leads, connectors, test leads, etc. for external defects and damage.

B. Rating of Test Equipment - All electronic/electric test equipment should be rated at a higher voltage than the circuit voltage at which they will be used to test/check. Users of test equipment are responsible to verify correct voltage ratings and to inspect for damage or wear that may reduce voltage ratings.

C. Tagging and Removing From Service - Items identified as damaged or unusable shall be removed from service, observing the Lockout/Tagout procedures.

D. Checking for Proper Operation - Test equipment shall be checked for proper operation immediately before and after tests are performed on circuits over 600 volts.

8.4.2. Multimeters shall always be verified operational before use in determining a system's state of energization. This shall be accomplished by testing the meter on a known voltage source. This check verifies operability only and is not a calibration.

8.4.3. Circuit testers shall be used in classified area only if either:

A. They are approved for the classified area; or,

B. A Hot Work Permit is written.

8.5 Equipment Grounding Conductors – Testing

8.5.1. All equipment grounding conductors shall be tested for continuity and shall be electrically continuous.

8.5.2. Each receptacle and attachment cap or plug shall be tested for correct attachment of the equipment grounding conductors.

8.5.3. The equipment grounding conductor shall be connected to its proper terminal: 1) before each use, 2) before equipment is returned to service following any repairs, 3) before equipment is used such as when a cord has been run over, and 4) at intervals not to exceed 3 months, except that cord sets and receptacles which are fixed and not exposed to damage shall be tested at intervals not exceeding 6 months.

8.5.4. Tests performed as required by this program shall be recorded as to the identity of each receptacle, cord set, and cord and plug connected equipment that passed the test and shall indicate the last date tested or interval for which it was tested. This record shall be kept by means of logs, color coding, or other effective means and shall be made available at the job site for inspection by the Assistant Secretary and any affected employee.

9. MAINTENANCE, CONSTRUCTION AND DEMOLITION ACTIVITIES

9.1. Guidelines

9.1.1. Electric equipment and circuits shall be considered to be energized unless they are positively determined to be de-energized by a qualified electrical worker.

9.1.2. Before starting work, preliminary inspections and tests shall be conducted by a qualified electrical worker to determine the actual condition of electrical equipment and circuits.

9.1.3. Any modification or new installation of electrical systems or equipment requires permitting and electrical inspection in accordance with the local authority having jurisdiction (AHJ). All modifications and new installations shall be performed in accordance with and shall comply with the applicable rules of the latest edition of the NEC, except where code requirements are exceeded as noted on construction specifications or construction drawings.

9.1.4. Electrical work shall be performed on equipment de-energized in accordance with "Lockout/Tagout", except as allowed by Section 10 of this practice.

9.1.5. When electrical work involving a LOTO is completed, the necessary inspections, warnings, lock removals and documentation required by the LOTO program shall be followed before the equipment is re-energized.

9.1.6. Before excavation, cutting, drilling or jack hammering adjacent to underground or embedded circuits, the area shall be examined to determine if it is free of energized electrical circuits. This determination for underground work is to be made following "Dig Safe" requirements.

9.1.7. A variety of means including, but not limited to, as-built drawings, consultations with knowledgeable persons, and circuit tracing location equipment shall be used to determine if energized circuits are embedded in walls, floors or ceilings of buildings.

9.1.8. Circuits known or suspected to be in the work area shall be de-energized and locked out, tagged out in accordance with LO/TO procedures or meet the criteria of Section 10.2 of this practice. Where uncertainty exists, those involved with the work using hand-held tools such as drilling and boring equipment, jackhammers, bars, and shovels shall be provided with appropriate insulated electrical protective equipment and gloves to abate the hazard.

9.1.9. All electrical work shall be done by a qualified electrical worker or under the supervision of a qualified electrical worker.

9.1.10. All modifications shall meet the requirements of the more stringent code (NEC or the applicable local or state code) in effect at the time of the original construction.

10. WORKING ON ENERGIZED CIRCUITS AND EQUIPMENT

10.1. Work Practices

Work practices for work performed on energized circuits and equipment shall be consistent with the nature and extent of the associated electrical hazards. Safety precautions that vary from the requirements of this practice shall be evaluated and approved by Health and Safety.

10.2. Work on Exposed Electrical Systems

10.2.1. Work on exposed electrical systems shall not be performed while the system is energized, unless the work is approved by the General Manager, Project Manager and/or Electrical Supervisor for one of the following reasons.

A. For testing or calibration, when tests cannot be done with the circuit or equipment de-energized.

B. For troubleshooting, when the problem cannot be identified unless the circuit or equipment is energized. Where possible, the equipment shall be de-energized while adjustments are made and then re-energized.

C. When the removal of the power could reasonably be expected to cause a hazardous material release to the environment or pose a greater safety hazard than working on the exposed energized circuits or equipment.

D. When de-energizing the equipment would introduce additional or increased hazards or is unfeasible due to equipment design or operational limitations.

Examples of increased or additional hazards include deactivation of emergency alarms, shutdown of hazardous locations ventilation equipment, or removal of illumination for an area.

10.2.2. Written justification for the performance of energized work shall be included in the approved "Electrical Energized Work" Permit (Appendix 1). This justification shall:

A. Clearly identify the system or equipment to be worked in the energized state;

B. Clearly identify why it must be worked energized;

C. Provide a brief comparison of risks involved for working the equipment energized versus de-energizing a system;

D. Describe the work to be performed.

NOTE: Existing procedures, which have been previously approved for energized work, do not require a new justification with the comparison of risks until that procedure is changed or revised.

10.2.3. Hot Sticks are industry-accepted insulated tools for line work such as pulling fuses and cut-outs. While the use of Hot Sticks is considered energized work, justification is not required, as Hot Sticks can and should be used for local isolation of equipment where practical.

10.3. Energized Parts

Conductors and parts of electric equipment that have been de-energized, but have not been locked out or tagged out, or otherwise made nonhazardous in accordance with LO/TO procedures, shall be treated as energized parts and the requirements of this section apply.

10.4. Qualified Electrical Worker Requirements

10.4.1. Only qualified electrical workers may work on energized electric circuit parts or equipment under this practice. Such persons shall be capable of working safely on energized circuits and shall be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, insulated tools and know the hazards involved with stored energy.

10.4.2. When no electrical exposure of 50 volts or greater is present in panels or cabinets, trained and qualified electrical workers are not required for opening covers or doors to access annunciating devices and status indicators. This includes items such as bells, horns, lights or LEDs designed for alarm or trouble status indication. Actions normally associated with the re-setting of alarms and annunciating devices are not considered electrical work unless they are performed during construction of the system or during maintenance troubleshooting and repair operations on the system.

10.5. Stored Electric Energy

10.5.1. Stored electric energy that will endanger personnel shall be released, using approved grounding methods before performing work. Capacitors and like equipment shall be discharged, and high capacitance elements shall be short-circuited and grounded since stored electric energy endangers personnel. Also, when working near high lines, within the approach distance, the line worker should be able to see both grounds.

10.5.2. CAUTION: Where appropriate, the terminals of capacitors shall not be short-circuited until the capacitors have been de-energized for at least five minutes.

10.6. Protective Equipment and Apparel

10.6.1. Protective Equipment - Employees shall be safeguarded from injury by approved protective equipment while working in areas where there are potential electrical hazards. All personal protective equipment shall be of safe design and construction for the specific part(s) of the body to be protected and for the work to be performed. All such protective equipment shall be maintained in a safe, reliable condition. Protective equipment shall be periodically inspected or tested, or both, through the conduct of regularly scheduled and documented, preventive maintenance operations (PMOs) as required by the applicable reference(s) listed in Section 13 of this practice. Wherever the insulating capability of insulating protective equipment may be subject to damage, the insulating material shall be protected by means such as leather protectors over rubber gloves and suitable protection to prevent abrasion or puncture of rubber blankets. (See ANSI/IEEE C-2.)

10.6.2. Storage of Electrical Insulating Equipment and Clothing - Electrical insulating equipment and clothing shall be stored flat, undistorted right side out and unfolded, as appropriate, in the protective containers. Blankets may be stored rolled, provided the inner diameter of the roll is at least 2 inches. Such storage shall not be directly above or close to hot pipes, heat radiation or other sources of artificial heat, nor shall it be exposed to direct sunlight or other sources of ozone such as switchgear rooms. Storage temperature shall not exceed 95 degrees Fahrenheit.

10.6.3. Storage and Cleaning of Live-Line Tools - Live-line tools shall be kept clean and dry and be stored undistorted in protective containers. Live-line tools shall be cleaned in accordance with manufacturer's recommendations.

10.7. Maximum Use Voltage

10.7.1. Insulating Blankets, Covers, Gloves - Maximum use voltage, phase-to-phase or phase-to-ground of insulating blankets, covers and gloves shall be as follows.

Table 1 - Voltage Limits by Class

Class 00	up to 500V	
Class 0	up to 1000V	(Red Label)
Class 1	up to 7.5 kV	(White Label)
Class 2	up to 17 kV	(Yellow Label)
Class 3	up to 26.5 kV	(Green Label)
Class 4	up to 36 kV	(Orange Label)

10.7.2. Live-Line Tools - Maximum use voltage, per foot of length, phase-to-phase or phase-to-ground for live-line tools shall be as follows:

Fiberglass Handles	93 kV
Wood Handles	69 kV

10.7.3. Electrical Protective Equipment items shall be clearly marked as follows.

A. Class 00 equipment shall be marked Class 00.

B. Class 0 equipment shall be marked Class 0.

C. Class 1 equipment shall be marked Class 1.

D. Class 2 equipment shall be marked Class 2.

E. Class 3 equipment shall be marked Class 3.

F. Class 4 equipment shall be marked Class 4.

G. Non-ozone-resistant equipment other than matting shall be marked Type I.

H. Ozone-resistant equipment other than matting shall be marked Type II.

I. Other relevant markings such as the manufacturer's identification and the size of the equipment may also be provided.

J. Markings shall be non-conducting and shall be applied in such a manner as not to impair the insulating qualities of the equipment.

K. Markings on gloves shall be confined to the cuff portion of the glove.

10.7.4. Insulating equipment shall be inspected for damage before each day's use and immediately following any incident that can be reasonably suspected of having caused damage. Insulating gloves shall be given an air test along with this inspection.

10.7.5. Rubber insulating blankets may be salvaged by severing the defective portion of the blanket from the undamaged portion of the blanket. The resulting undamaged area may not be smaller than 22 inches by 22 inches for Class 1, 2, 3 and 4 blankets. The salvaged portion of the blanket must include the area with the required marking.

10.8. Protective Apparel

10.8.1. Rubber insulating equipment shall be tested using the intervals indicated in Table 2.

TABLE 2 - RUBBER INSULATING EQUIPMENT TEST INTERVALS

Type of Equipment	**When to Test**
Rubber insulating line hose	Upon indication that insulating value is suspect
Rubber insulating covers	Upon indication that insulating value is suspect
Rubber insulating blankets See Note 1	Before first issue and every 12 months thereafter
Rubber insulating gloves See Note 1	Before first issue and every 6 months thereafter
Rubber insulating sleeves See Note 1	Before first issue and every 12 months thereafter

NOTE: If the insulating equipment has been electrically tested but not issued for service, it may not be placed into service unless it has been electrically tested within the previous 12 months.

10.8.2. Protective apparel shall be used when conducting work on energized electrical components/equipment as indicated below (see Table 3). The employee shall use protective apparel listed below. The individual user of protective apparel is responsible for visually checking apparel for wear or defects that may degrade safety performance. Defective safety apparel shall be removed from service and shall not be used.

Table 3 - PERSONAL PROTECTIVE MEASURES

50 Volts and Above

Safety Glasses	Required
Insulating Gloves	Required
Leather Protectors	See Note A
Two-Person Rule	See Note B
Blankets	See Note C
Head Protection	See Note E

10.8.3. NOTES

A. Class 0 and Class 00 insulating gloves may be worn without leather protectors if the insulating capability of the glove is not subject to damage during use. The use of the Class 0 and Class 00 gloves without leather protectors shall be limited to situations requiring manual dexterity not afforded with the leather protectors in place. Any other class of glove may be used in similar situations if the class of glove is one class higher than the voltage involved. Insulating gloves that have been used without protector gloves may not be used at a higher voltage until they have been retested. Gloves used for 480V and below shall be kept clean and dry.

B. The Two-Person Rule is required for electrical work on or in close proximity to exposed energized electrical circuits/equipment at or above 480V. The second electrical worker shall not perform hands-on work, but shall observe the work being performed, identify hazards and ensure that the electrical worker performing the work is aware of the hazard and the actions required to avoid it.

C. Blankets shall be utilized to the maximum extent practical to insulate exposed energized parts in the vicinity of the work.

D. Rubber mats are required for work on energized circuits above 480V and are recommended for use when working on energized circuits from 50-479V.

E. Nonconductive head protection shall be worn wherever there is a danger of head injury from electric shock or burns due to contact with exposed energized parts. Exceptions for tight quarters shall be reviewed with Health and Safety on a case-by-case basis.

Table 4 - Rubber Glove Use

Glove Class	Leather Protectors Required
Class 00	No, where a high degree of dexterity is required.
Class 0	No, where a high degree of dexterity is required.
Class 1	No, 0V to 1,000V - Yes, 1,000V to 7,500V
Class 2	No, 1,000 to 7,500V - Yes, 7,500V to 17,000V
Class 3	No, 7,500 to 17,000V - Yes, 17,000V to 26,500V
Class 4	No, 17,000 to 26,500V - Yes, 26,500V to 36,000V

F. Hearing protection will be used during work on energized circuits at 600V or greater. This included voltage testing, ground attachment after testing, operation of exposed contactors, and installation or removal of breakers, fuses, or covers which would expose electrical components when removed. A double layered switching hood will also be used during these activities.

G. Full Flash protection including four-inch gauntlet gloves, Nomex flash hood and long sleeve Nomex clothing or Nomex capes are required for the following areas:

A. Operating metal clad 2300 thru 13800-volt breakers or enclosed disconnects from control station directly on switch gear.

B. Inserting or retracting 2300 thru 13800-volt breakers or contactors and draw out potential transformers.

C. Operating 460 thru 13800-volt open disconnects where less than 15 feet of hot stick is used, unless the circuit has been tested or inspected and found to have no active load (maximum reactive load not to exceed 10 amps). Open 480 volt disconnects with your left hand. The procedure for opening disconnects is to stand to the right side, turn your face away from the disconnect, and pull down sharply with your left hand. This way, if the disconnect blows, it blows by you, the door is hinged on the left, it swings away from you, and your face is looking the other way.

D. Work is to be performed on any service entrance main breaker or main disconnect that is on the secondary side of 2.3 KV, 4.2 KV or 13.8 KV power transformer.

10.8.4. Flame Resistant (FR) Protective Clothing

10.8.4.1. All work on exposed energized equipment 50V or greater will require FR clothing with arc rating of 4 cal/cm2 or greater.

10.8.4.2. All work on exposed energized equipment 240V or greater will require FR clothing or layers of FR clothing with total arc rating of 8 cal/cm2 or greater.

10.8.4.3. All work on equipment rated at 1kV or greater will require FR clothing with arc rating of 25 cal/cm2 or greater.

10.8.4.4. All work on exposed energized equipment 1kV or greater will require FR clothing and full flash suit with total arc rating of 40 cal/cm2 or greater.

10.9. General Protective Equipment and Tools

10.9.1. When working near exposed energized conductors or circuit parts, each employee shall use insulated tools or handling equipment. When the insulating capability of insulated tools or handling equipment is subject to damage, the tool or equipment shall be replaced, or approval for use must be given by the Health & Safety Department.

A. NOTES

- 1. Insulated tools shall be used in addition to the personal protective equipment requirements specified in this practice.

- 2. Factory manufactured insulating tools, connectors, or adapters rated for the voltage involved shall always be used. Before using any other equipment or tools that have been modified from their original configuration including modifications made by the addition of insulating material (i.e., insulating tape or putty), Health and Safety's written approval must be obtained. Approval will be based on H&S' evaluation or verification and approval from the manufacturer, or a statement from a registered professional engineer indicating the equipment or tool's suitability for the intended use.

10.9.2. General use hand tools (screw driver, pliers, etc.) shall be inspected by the user and used in conjunction with appropriate protective clothing and equipment.

10.9.3. Ropes and hand-lines used near energized parts shall be nonconductive.

10.10. Illumination

10.10.2. Employees shall not enter spaces containing exposed energized parts or rotating equipment unless illumination is provided that enables the employee to safely perform the work. Minimum illumination criteria are contained in the national Electrical Safety Code. (See reference in Section 13.3.)

10.10.3. Where an obstruction or lack of illumination precludes observation of the work to be performed, employees shall not perform tasks near exposed energized parts.

10.10.4. Employees shall not reach blindly into areas, which may contain energized parts.

10.11. Confined and/or Enclosed Work Spaces

Employees shall use protective barriers, shields or insulating materials as necessary to avoid inadvertent contact with exposed energized parts while working in confined and/or enclosed work spaces. All conductive materials such as pipes, rods, etc. should be handled to prevent contact with exposed energized conductors.

10.12. Conductive Apparel

Conductive articles of jewelry and clothing (such as watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive threads or metal headgear) may not be worn if they might contact exposed energized parts. However, such articles may be worn if they are rendered nonconductive by covering, wrapping or other insulating means.

10.13. Housekeeping Duties

Where live parts present an electrical contact hazard, employees may not perform housekeeping duties at such close distances to the parts that there is the possibility of contact, unless adequate safeguards (such as insulating equipment or barriers) are provided. Electrically conductive cleaning materials (including conductive solids such as steel wool, metalized cloth and silicon carbide, as well as conductive liquid solutions) may not be used in proximity to energized parts unless procedures are followed which will prevent electrical contact.

10.14. Overhead Lines

10.14.1. Precautions - If work is to be performed near overhead lines, the lines shall be de-energized and grounded, or other safety measures shall be provided before work is started. Protective measures such as guarding, isolating or insulating shall be in place to prevent employees from contacting such lines with any part of their body, or indirectly through conductive materials, tools or equipment.

10.14.2. Employees Other Than Qualified Electrical Workers –When working near overhead lines, the longest conductive object that an employee other than a qualified electrical worker may potentially come in contact with, cannot be closer than the following distances for any unguarded, energized overhead line:

A. 10 feet for voltages to ground 50 kV or below;

B. 10 feet plus 4 inches for every 10 kV over 50 kV.

10.14.3. Qualified Electrical Workers - Qualified electrical workers working in the vicinity of overhead lines shall not approach or bring any conductive object without an approved insulating handle closer to unguarded, energized lines than the distances listed in Table 5 below unless all of the following conditions apply:

A. The person is insulated from the energized part (e.g., insulating gloves, with sleeves and leather outer gloves, if necessary, rated for the voltage involved).
B. The energized part is insulated both from all other conductive objects at a different potential from the person.

C. The person is insulated from all conductive objects at a potential different from that of the energized part.

Table 5 - SAFETY DISTANCES FOR QUALIFIED ELECTRICAL WORKERS NEAR OVERHEAD LINE

300 V and less	Avoid Contact
Over 300 V, not over 750 V	l ft. 0 in.
Over 750 V, not over 2 kV	1 ft.6 in.
Over 2 kV, not over 15 kV	2 ft. 0 in.
Over 15 kV, no over 37 kV	3 ft. 0 in.
Over 37 kV, not over 87.5 kV	3 ft. 6 in.
Over 87.5 kV, not over 121 kV	4 ft. 0 in.
Over 121 kV, not over 140 kV	4 ft. 6 in.

10.15. Vehicular and Mechanical Equipment

10.15.1. Clearances - Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of at least 10-feet plus 4 inches, for every 10 kV over 50 kV, is maintained. This clearance may be reduced under the following conditions.

A. If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4-feet. If the voltage is greater than 50 kV, the clearance must be increased 4 inches for every 10 kV over that voltage.

B. If insulating barriers are installed to prevent contact with lines, and if the barriers are rated for the voltage of the line being guarded and are not part of or an attachment to the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.

C. If the equipment is an aerial lift insulated for the voltage involved, and the work is being performed by a qualified electrical worker, the clearance between the uninsulated portion of the aerial lift and the power line may be reduced to the distance given in Table 5.

10.15.2. Contact with Employees on the Ground - Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments unless one of the following conditions prevails:

A. The employee is using protective equipment rated for the voltage.

B. The equipment is located so that no uninsulated part of its structure can come closer to the line than permitted in Section 10.15.1 above.

10.15.3. Position of Employees on the Ground - If any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines is intentionally grounded, employees working on the ground near the point of grounding shall not stand at the grounding location or within 10-feet of the equipment when there is the possibility of overhead line contact. Additional precautions such as the use of barricades or insulation shall be taken to protect employees from hazardous ground potentials, which can develop within the first few feet or more outward from the grounding point.

10.16. Interlocks

Only trained and qualified electrical workers may defeat an electrical safety interlock when directed to do so by an approved procedure or work practice and then only temporarily while working on the equipment. The interlock shall be returned to its operable condition when the work is completed.

10.17. Ungrounded Metal Parts

Employees shall consider all ungrounded metal parts of equipment or devices such as transformer cases and circuit breaker housings to be energized at the highest voltage to which they are exposed, unless the parts are known by test to be free from such voltage.

10.18. Installation and Removal of Fuses

10.18.1. When fuses must be installed or removed with one or both terminals energized, employees shall use the following:

A. Approved special tools;

B. Eye protection;

C. Gloves insulated for the voltage involved.

D. Appropriate protective clothing specified in 10.82 and appropriate arc rating as calculated or specified in 10.8.4.

10.18.2. When installing expulsion-type fuses, employees shall wear personal eye protection and take precautions to stand clear of the exhaust path of the fuse barrel.

11. ACCIDENT RESPONSE AND NOTIFICATION

11.1. Response Procedure

11.1.1. In the event of an accident, employees shall:

A. Reduce further injury or damage if doing so can be performed safely without endangering the employee or others.

B. Follow standard emergency notification procedures for facility-threatening and/or life-threatening medical emergencies.

C. Notify supervision about facility problems, non-medical emergencies and any other unplanned events.

11.2. Reporting

All electric shocks are accidents and must be reported.

11.3. Electrical Shock Response

11.3.1. Employees who attempt to rescue shock victims must not endanger themselves or others.

11.3.2. The electrical source should be de-energized immediately if the victim is still in contact with electrical energy. If not possible to immediately de-energize the source, only a qualified, knowledgeable person should attempt to remove the victim.

11.3.3. Occupational Health - All electrical shocks shall be considered medically serious. Even if the victim shows no apparent signs of injury, he/she shall be evaluated by medical personnel.

12. REFERENCE MATERIAL

29 CFR 1910 Subpart S, "General Industry - Electrical"

29 CFR 1910.137, "Electrical Protective Equipment"

ANSI/NFPA 70, "National Electric Code"

ANSI/IEE Standard C-2, "National Electrical Safety Code"

ANSI/NFPA 70B, "Electrical Equipment Maintenance"

ANSI/NFPA 70E, "Electrical Safety Requirements for Employee Workplaces"

ANSI Z87.1, "Practice for Occupational Eye and Face Protection"

ANSI Z810.1, "Protective Headwear for Industrial Workers"

ANSI/ASTM D120, "Standard Specification for Rubber Insulating Gloves"

ANSI/ASTM D1049, "Standard Specification for Rubber Insulating Covers"

ANSI/ASTM D1050, "Standard Specification for Rubber Insulating Line Hose"

ANSI/ASTM D1051, "Standard Specification for Rubber Insulating Sleeves"

ANSI/ASTM F478, "Standard Specification for In-Service Care of Insulating Line Hose and Covers

ANSI/ASTM F479, "Standard Specification for In-Service Care of Insulating Blankets"

ANSI/ASTM F496, "Standard Specification for In-Service Care of Insulating Gloves and Sleeves"

ANSI A14.5, "American National Standard for Ladders - Portable Reinforced Plastic"

ANSI/UL 45, "Safety Standards for Portable Electric Tools"

APPENDIX 1: ELECTRICAL ENERGIZED WORK PERMIT

THIS PERMIT IS TO BE RENEWED DAILY.

DATE: ______________________________ TIME: ______________________________

LOCATION: ____

DEPT./CONTRACTOR ASSIGNED
JOB: ____

Why is Electrical Hot Work necessary? (Check one or de-energize circuit.)

( ) For testing or calibration, when tests cannot be done with the circuit or equipment de-energized.

( ) For troubleshooting, when the problem cannot be identified unless the circuit or equipment is energized. Where possible, the equipment shall be de-energized while adjustments are made and then re-energized.

( ) When the removal of the power could reasonably be expected to cause a hazardous material release to the environment, or pose a greater safety hazard than working on the exposed energized circuits or equipment.

( ) When de-energizing the equipment would introduce additional or increased hazards or is unfeasible due to equipment design or operational limitations.

Job Description: ____

____

Work Procedure: ____

____

Are all circuits Locked Out/Tagged Out, per LO/TO procedures? ______ YES ______ NO
(List all circuits locked out or list LO/TO Permit number.)

____

Voltage Range: ______________________ Applicable Distance: ________________

Personal Protective Equipment Required:

( ) Rubber Gloves
( ) Lock & Tag
( ) Other

( ) Insulated Blanket
( ) Full Flash Protection
( ) DFR Clothing Arc Rating ____cal/cm2

( ) Hot Stick
( ) Insulated Tools

Electrical Supervisor: ____

Workman Assigned Job: ____

NOTES:
A. A separate permit is required for each MCC/Location.
B. This permit is subject to all distance restrictions required in CHES “Electrical Safety Practices”.

HS 1.28 EMPLOYEE SAFETY (TAILGATE) MEETINGS

HS 1.128 EMPLOYEE SAFETY (TAILGATE) MEETINGS

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HS 1.28 Employee Safety (Tailgate) Meetings

1. PURPOSE

In order to ensure the proper preparation is made for tasks and jobs employees will perform, CHES will conduct employee safety meetings. These meetings will provide safety information and introduce new programs or procedures so that employees are aware of any changes, updates, or general concerns prior to performing their work. The meetings will also include a review of workplace accidents in order for others to benefit from the experience. Any other procedural or operational changes in a work plan will be discussed. All of this is intended to minimize accidents and promote a safe workplace. This procedure is in addition to the formal Safety Committee meeting, and can be held as many times as needed to increase the communication and safety awareness of the project team members.

2. DESCRIPTION

This Procedure specifies the requirement to conduct employee safety meetings. These meetings are intended to provide safety education, introduce new programs or procedures, discuss employee concerns, review workplace accidents, and discuss a procedural or operational change in a work plan.

3. PROCEDURES

A. Frequency and Length

Safety meetings are to be held as needed to address issues at each facility, location or project.

B. Conducting the Meeting

1. General Managers or Project Managers shall conduct safety meetings; however, another qualified employee or an outside specialist may be utilized when appropriate. In any event, the manager must attend and participate in the meetings.

2. Each meeting shall be held at a regularly scheduled time and place. Preparation for the safety meeting should be made well in advance to ensure an effective and informative presentation. All materials, films, slides, etc., should be reviewed before the meeting.

C. Subjects

1. Meeting subjects may include the following:

   a. Review of accidents or unsafe practices, which recently occurred, safety performance information, or inspection/audit findings.

   b. Specific safety topics are suitable for on-going employee education. These may include review of PPE, respirators, contingency plan, fire extinguishers, first aid, safe handling techniques, decontamination, etc.

2. Review Special Projects - Any special project planned for the month may be discussed and should outline general hazards, equipment to be used, and the work practices to be followed. This information must be provided in detail to all employees during site-specific training.

3. Unsafe Work Practices and Conditions - Unsafe conditions and work practices reported by employees or noted during safety audits/inspections may be discussed. The corrective actions may be reviewed to ensure a clear understanding of the hazard and proper procedure.

4. Safety Suggestions and Concerns

    a. Safety suggestions and concerns may be offered by employees present at the meeting. All suggestions are to be discussed, noted in the minutes and, if follow-up action is necessary, a report may be provided during the next meeting.

    b. A verbal response must be provided to each employee who has submitted a suggestion.

D. Recording the Meeting

The minutes of the safety meeting should be recorded immediately following each meeting utilizing the Training Attendance/Certification Sheet. (See Appendix 1.)

4. APPLICATION

This Procedure applies to all CHES employees.

A. General Manager / Project Manager

Shall ensure that safety meetings are conducted as specified in this Procedure. Ample time must be allotted and adequate space provided to conduct the meeting. Projects or locations may specify more frequent meetings based on risk.

B. Manager/Supervisor

1. Plans and schedules employee safety meetings. (Note that Health and Safety Representatives may assist operations with the meeting subject and detail. See 4.C.1.)

2. Ensures the attendance of all employees.

3. Prepares documentation of the meeting and distributes or files the report for record keeping purposes.

C. Health and Safety/EHS Representative

1. May assist operations management with subjects and resources for meeting preparation.

2. Monitors compliance with the requirement to conduct monthly meetings and measure effectiveness of information presented.

D. Employees

Are required to attend scheduled safety meetings, participate in discussions and exercises, and ask questions to clarify or enhance their learning.

5. ISSUING DEPARTMENT AND CONTACT

Health and Safety Department, Vice President of Health and Safety

6. REFERENCES

None

7. SIGN-OFF DEPARTMENT

Law Department

8. DISTRIBUTION

All Operations Managers and Health & Safety and Compliance Staff

9. APPENDIX

Appendix 1: Training Attendance/Certification Sheet

APPENDIX 1: Clean Harbors Environmental Services, Inc.
Training Attendance / Certification Sheet

Location: ______________________ **Course Date:** ______________

Course Name: ______________________ **Course Code(s):** ______________

Employee ID #	Employee Name	Signature	Instructor's Initials

Instructor Name: ______________________ **Instructor Signature**: ______________

General Manager: ______________________ **GM Signature:** ______________

Date: ______________________

HS 1.58 FALL PROTECTION GUIDELINES

Clean Harbors
ENVIRONMENTAL SERVICES®

FALL PROTECTION GUIDELINES

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FALL PROTECTION GUIDELINES

1. PURPOSE

Falls from elevated surfaces cause numerous fatalities every year. This program is intended to specify controls necessary to prevent falls and the related injuries.

2. SCOPE

This program applies to all elevated work (EW) conducted by Clean Harbors. This program covers fall protection, aerial lifts, and the most common form of elevated work platforms (scaffolding) including: Fabricated Frame; Tube and Clamp; System Scaffolds; and Fabricated Frame with Casters. Contact Health & Safety if another form will be used.

3. RESPONSIBILITIES

3.1. General/Project Manager

3.1.1. Ensures that appropriate fall protection systems (personal fall protection or guardrail systems) are used.

3.1.2. Ensures that a fall protection training program is implemented for all fall protection systems.

3.1.3. Ensures that training documentation is maintained.

3.2. Foreman/Supervisor

3.2.1. Ensures that fall protection equipment is worn when required by the job activity.

3.2.2. Responsible for training persons in the proper use, limitations and maintenance of the required fall protection system.

3.3. Health and Safety Manager

3.3.1. Assists the general/project management by identifying job activities, which require a fall protection system.

3.3.2. Assists the general/project management by identifying the proper equipment.

3.3.3. Provides technical assistance to operation management to fully comply with OSHA fall protection requirements.

4. DEFINITIONS

The following definitions apply to the EW program and to the OSHA Scaffolding Standard. See 29 CFR 1926.450 (b) for additional definitions.

Aerial Lift Device: Equipment such as powered platforms, vehicle-mounted elevated and rotating work platforms, extensible boom platforms, aerial ladders, articulating boom platforms, vertical towers and powered industrial truck platforms.

Bearer (putlog): A horizontal transverse scaffold member (which may be supported by runners or ledgers) upon which the scaffold platform rests and which joins scaffold uprights, posts, poles, and similar members.

Body Harness: A design of straps, which may be secured about the employee in a manner to distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.
Brace: A rigid connection that holds one scaffold member in a fixed position with respect to another member or to a building or structure.

Competent Person: One who is capable of identifying existing and predictable hazards in the surroundings or working conditions, which are unsanitary, hazardous, or dangerous to employees and who has authorization to take prompt corrective measures to eliminate them.

Coupler (also referred to as a Clamp): A device for locking together the tubes of a tube and coupler scaffold.

Deceleration Device: Any mechanism, such as a rope grab, ripstitch lanyard, specially woven lanyard, tearing or deforming lanyard, or automatic self-retracting lifeline lanyard, which dissipates a substantial amount of energy during a fall arrest or limits the energy imposed on an employee during a fall.

Equivalent: Alternative designs, materials, or methods to protect against a hazard, which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, material, or designs specified in the standard.

Exposed Power Lines: Electrical power lines which are accessible to employees and which are not shielded from contact. Such lines do not include extension cords or power tool cords.

Fabricated Frame Scaffold (tubular welded frame scaffold): A scaffold consisting of a platform(s) supported on fabricated end frames with integral posts, horizontal bearers, and intermediate members.

Failure: Load refusal, breakage or separation of component parts. Load refusal is the point where the ultimate strength is exceeded.

Guardrail System: A vertical barrier consisting of, but not limited to, toprails, midrails and posts, erected to prevent employees from falling off a scaffold platform or walkway to lower levels and able to withstand 200lbs of force applied in any direction.

Large Area Scaffold: A pole scaffold, tube and coupler scaffold, systems scaffold or fabricated frame scaffold erected over substantially the entire work area. For example, a scaffold erected over the entire floor area of a room.

Lower Levels: Areas below the level where the employee is located and to which an employee can fall. Such areas include, but are not limited to, ground levels, floors, roofs, ramps, runways, excavations, pits, tanks, materials, water and equipment.

Maximum Intended Load: The total load of all persons, equipment, tools, materials, transmitted loads and other loads reasonably anticipated to be applied to a scaffold or scaffold component at any one time.

Mobile Scaffold: A powered or unpowered, portable, caster or wheel-mounted supported scaffold.

Outrigger: The structural member of a supported scaffold used to increase the base width of a scaffold in order to provide support for and increased stability of the scaffold.

Personal Fall Arrest System: A system used to arrest an employee's fall. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline or combinations of these.

Platform: A work surface elevated above lower levels. Platforms can be constructed using individual wood planks, fabricated planks, fabricated decks and fabricated platforms.

Qualified: One who, by possession of a recognized degree, certificate or professional standing, or by extensive knowledge, training and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project.

Rated Load: The manufacturer's specified maximum load to be listed by a hoist or to be applied to a scaffold or scaffold component.

Runner: The lengthwise horizontal spacing or bracing member that may support the bearer.

Scaffold: Any temporary elevated platform (supported or suspended) and its supporting structure (including points of anchorage) used for supporting employees or materials or both.

Stair Tower (Scaffold Stairway/Tower): A tower comprised of scaffold components and which contains internal stairway units and rest platforms. These towers are used to provide access to scaffold platforms and other elevated points such as floors and roofs.

Supported Scaffold: One or more platforms supported by outrigger beams, brackets, poles, legs, uprights, posts, frames or similar rigid support.

Suspension Scaffold: One or more platforms suspended by ropes or other non-rigid means from an overhead structure(s).

System Scaffold: A scaffold consisting of posts with fixed connection points that accept runners, bearers and diagonals that can be interconnected at predetermined levels.

Tube and Coupler Scaffold: A supported or suspended scaffold consisting of a platform (s) supported by tubing, erected with coupling devices connecting uprights, braces, bearers and runners.

Unstable Objects: Items whose strength, configurations or lack of stability may allow them to become dislocated and shift and, therefore, may not properly support the loads imposed on them. Unstable objects do not constitute a safe base support for scaffolds, platforms or employees. Examples include, but are not limited to, barrels, boxes, loose brick and concrete blocks.

Walkway: A portion of a scaffold platform used only for access and not as a work level.

5. FALL PROTECTION

CHES recognizes that working at elevated heights poses a higher risk of injury in the event of a fall. In situations where guardrails are not effective, or could cause greater risk if they were in place, fall protection in the form of a fall arrest system needs to be used. This section outlines the requirements of a fall arrest system that will need to be used.

(**Note** that permanent facilities are covered by 29 CFR 1910.23. Guardrails are required in facilities on every open-sided floor or platform more than 4 feet above the adjacent floor or ground level.)

5.1. Fall Arrest System-General Requirements

5.1.1. The back D ring between the shoulders should be used for fall arrest. The front chest ring may be used for ladder climbing systems, and the side D rings are for positioning or restraint only.

5.1.2. Do not knot a lanyard. Do not connect one lanyard to another. Do not use hooks or connectors that will not completely close over the anchor.

5.1.3. Personal fall arrest systems and their use shall comply with the provisions set forth below. Body belts are not acceptable as part of a personal fall arrest system.

NOTE: The use of a body belt in a positioning device system is acceptable.

5.1.4. Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials and approved for use as fall protection. Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.

5.1.5. Snaphooks shall be:

A. Sized for compatibility with the member to which they are connected.

B. Designed in order to prevent their disengagement through contact with the connecting member.

C. Used to connect to a horizontal lifeline, which may become a vertical lifeline, on suspended scaffolds (or similar work platforms). Snaphooks shall be capable of locking in both directions.

5.1.6. Horizontal lifelines shall be designed, installed, and used under the supervision of a qualified person, as part of a complete personal fall arrest system, which maintains a safety factor of at least two.

5.1.7. Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds.

5.1.8. When vertical lifelines are used, each employee shall be attached to a separate lifeline. Where vertical lifelines are used for scaffold erection, they must be attached to a safe point of anchorage independent of the scaffold.

5.1.9. Lifelines shall be protected against being cut or abraded.

5.1.10. Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses shall be made from synthetic fibers.

5.1.11. Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and be capable of supporting at least 5,000 pounds per employee attached, or shall be designed, installed, and used as follows:

A. As part of a complete personal fall arrest system, which maintains a safety factor of at least two; and

B. Under the supervision of a qualified person.

5.1.12. Personal fall arrest systems, when stopping a fall, shall be rigged such that an employee can neither free fall more than 6 feet nor contact any lower level.

5.1.13. Body belts, harnesses, and components shall be used only for employee protection (as part of a personal fall arrest system or positioning device system) and not to hoist materials.

5.1.14. Personal fall arrest systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection until inspected and determined by a competent person to be undamaged and suitable for reuse.

5.1.15. Preplan to provide for prompt rescue of employees in the event of a fall or ensure that employees are able to rescue themselves.

5.1.16. Personal fall arrest systems shall be inspected prior to each use for wear, damage and other deterioration, and defective components shall be removed from service. Inspections should follow the manufacturers' recommendations but at a minimum, the inspection should evaluate the conditions of "D" rings, buckles, keepers, back pads, webbing, stitching and labels.

5.1.17. Personal fall arrest systems shall not be attached to guardrail systems, nor shall they be attached to hoists except as specified in Section 5.1.18 of this guideline.

5.1.18. When a personal fall arrest system is used at hoist areas, it shall be rigged to allow the movement of the employee only as far as the edge of the walking/working surface.

5.2. Positioning Device Systems

5.2.1. Positioning device systems and their use shall conform to the following provisions:

A. Positioning devices shall be rigged such that an employee cannot free fall more than 2 feet.

B. Positioning devices shall be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 pounds, whichever is greater.

C. Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials. Connectors shall have a corrosion-resistant finish and all surfaces and edges shall be smooth to prevent damage to interfacing parts of this system.

D. Connecting assemblies shall have a minimum tensile strength of 5,000 pounds.

E. Snaphooks shall be: sized for compatibility with the member to which they are connected; and, designed in order to prevent their disengagement through contact with the connecting member

F. Positioning device systems shall be inspected prior to each use for wear, damage, and other deterioration, and defective components shall be removed from service.

G. Body belts, harnesses, and components shall be used only for employee protection (as part of a personal fall arrest system or positioning device system) and not to hoist materials.

5.3. Warning Line Systems

5.3.1. Warning line systems and their use shall comply with the following provisions:

A. The warning line shall be erected around all sides of the roof work area.

B. When mechanical equipment is not being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge.

C. When mechanical equipment is being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge which is parallel to the direction of mechanical equipment operation, and not less than 10 feet (3.1 m) from the roof edge which is perpendicular to the direction of mechanical equipment operation.

D. Points of access, materials handling areas, storage areas, and hoisting areas shall be connected to the work area by an access path formed by two warning lines.

E. When the path to a point of access is not in use, a rope, wire, chain, or other barricade, equivalent in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line erected around the work area, or the path shall be offset such that a person cannot walk directly into the work area.

F. Warning lines shall consist of ropes, wires, or chains, and supporting stanchions erected as follows:

-
- 1. The rope, wire, or chain shall be flagged at not more than 6-foot intervals with high-visibility material.
-
- 2. The rope, wire, or chain shall be rigged and supported in such a way that its lowest point (including sag) is no less than 34 inches from the walking/working surface and its highest point is no more than 39 inches from the walking/working surface.
-
- 3. After being erected, with the rope, wire, or chain attached, stanchions shall be capable of resisting, without tipping over, a force of at least 16 pounds applied horizontally against the stanchion, 30 inches above the

walking/working surface, perpendicular to the warning line, and in the direction of the floor, roof, or platform edge.

-
- 4. The rope, wire, or chain shall have a minimum tensile strength of 500 pounds and after being attached to the stanchions, shall be capable of supporting, without breaking, the loads applied to the stanchions above.
-
- 5. The line shall be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchion tips over.

G. No employee shall be allowed in the area between a roof edge and a warning line unless a personal fall arrest system is used.

H. Mechanical equipment on roofs shall be used or stored only in areas where employees are protected by a warning line system, guardrail system, or personal fall arrest system.

5.4. Prohibited

Safety Monitoring Systems, controlled access zones, and fall protection plans will not be used.

5.5. Training

Users of fall protection equipment will be trained on fall hazards of the work being performed and the correct procedures for erecting, maintaining, disassembling, and inspecting fall protection equipment.

6. LADDERS

6.1. Fixed Ladders

6.1.1. Fixed ladders shall be used at a pitch no greater than 90 degrees from the horizontal, as measured to the backside of the ladder. The preferred pitch for fixed ladders is 75-90 degrees.

6.1.2. Where the total length of a climb equals or exceeds 20 feet, fixed ladders shall be equipped with one of the following:

A. Ladder safety devices; or

B. A cage or well, and multiple ladder sections so that each ladder section does not exceed 30 feet in length. Ladder sections shall be offset from adjacent sections, and landing platforms shall be provided at maximum intervals of 30 feet.

6.1.3. Cages for fixed ladders shall conform to all of the following:

A. Horizontal bands shall be fastened to the side rails of rail ladders, or directly to the structure, building, or equipment for individual-rung ladders.

B. Vertical bars shall be on the inside of the horizontal bands and shall be fastened to them.

C. Cages shall extend not less than 27 inches, or more than 28 inches from the center line of the step or rung (excluding the flare at the bottom of the cage), and shall not be less than 27 inches in width.

D. The inside of the cage shall be clear of projections.

E. Horizontal bands shall be spaced not more than 4 feet on center vertically.

F. Vertical bars shall be spaced at intervals not more than 9-1/2 inches on center horizontally.

G. The bottom of the cage shall be at a level not less than 7 feet nor more than 8 feet above the point of access to the bottom of the ladder. The bottom of the cage shall be flared not less than 4 inches all around within the distance between the bottom horizontal band and the next higher band.

H. The top of the cage shall be a minimum of 42 inches above the top of the platform, or the point of access at the top of the ladder, with provision for access to the platform or other point of access.

6.1.4. Ladder safety devices, and related support systems, for fixed ladders shall conform to all of the following:

A. They shall be capable of withstanding without failure a drop test consisting of an 18-inch drop of a 500-pound weight.

B. They shall permit the employee using the device to ascend or descend without continually having to hold, push, or pull any part of the device, leaving both hands free for climbing.

C. They shall be activated within 2 feet after a fall occurs, and limit the descending velocity of an employee to 7 feet/sec. or less.

D. The connection between the carrier or lifeline and the point of attachment to the body belt or harness shall not exceed 9 inches in length.

6.2. Ladder use

6.2.1. The following requirements apply to the use of all ladders, including job-made ladders, except as otherwise indicated:

A. Single-rail ladders shall not be used.

B. When ascending or descending a ladder, the user shall face the ladder.

C. Each employee shall use at least one hand to grasp the ladder when progressing up and/or down the ladder.

D. An employee shall not carry any object or load that could cause the employee to lose balance and fall.

E. Ladders shall not be tied or fastened together to provide longer sections unless they are specifically designed for such use.

F. Wood ladders shall not be coated with any opaque covering, except for identification or warning labels, which may be placed on one face only of a side rail.

G. When portable ladders are used for access to an upper landing surface, the ladder side rails shall extend at least 3 feet above the upper landing surface to which the ladder is used to gain access.

H. Ladders shall be maintained free of oil, grease, and other slipping hazards.

I. Ladders shall not be loaded beyond the maximum intended load for which they were built, or beyond their manufacturer's rated capacity.

J. Ladders shall be used only for the purpose for which they were designed.

K. Non-self-supporting ladders shall be used at an angle such that the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder (the distance along the ladder between the foot and the top support).

L. Ladders shall be tied off or lashed at the top to prevent accidental displacement.

M. Ladders shall be used only on stable and level surfaces unless secured to prevent accidental displacement.

N. Ladders shall not be used on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental displacement.

O. Slip-resistant feet shall not be used as a substitute for care in placing, lashing, or holding a ladder that is used upon slippery surfaces including, but not limited to, flat metal or concrete surfaces that are constructed so they cannot be prevented from becoming slippery.

P. Ladders shall not be placed on objects such as boxes or drums for additional height.

Q. Ladders placed in any location where they can be displaced by workplace activities or traffic, such as in passageways, doorways, or driveways, shall be secured to prevent accidental displacement, or a barricade shall be used to keep the activities or traffic away from the ladder.

R. The area around the top and bottom of ladders shall be kept clear.

S. The top of a non-self-supporting ladder shall be placed with the two rails supported equally unless it is equipped with a single support attachment.

T. Ladders shall not be moved, shifted, or extended while occupied.

U. Ladders shall have nonconductive side-rails if they are used where the employee or the ladder could contact exposed energized electrical equipment.

V. The top or top step of a stepladder shall not be used as a step.

W. Cross-bracing on the rear section of stepladders shall not be used for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections.

X. Ladders shall be inspected by a competent person for visible defects on a monthly basis and after any occurrence that could affect their safe use

Y. Ladders should be examined visually before use.

Z. Portable ladders with structural defects, such as, but not limited to, broken or missing rungs, cleats, or steps, broken or split rails, corroded components, or other faulty or defective components, shall either be immediately marked in a manner that readily identifies them as defective, or be tagged with "Do Not Use" or similar language and shall be withdrawn from service until repaired.

AA. Fixed ladders with structural defects such as, but not limited to, broken or missing rungs, cleats, or steps, broken or split rails, or corroded components, shall be withdrawn from service until repaired. The requirement to withdraw a defective ladder from service is satisfied if the ladder is:

-
- 1. Immediately tagged with "Do Not Use" or similar language; or
-
- 2. Marked in a manner that readily identifies it as defective; or
-
- 3. Blocked (such as with a plywood attachment that spans several rungs).

AB. Ladder repairs shall restore the ladder to a condition meeting its original design criteria, before the ladder is returned to use.

7. SCAFFOLD USE

Ensure all scaffold users have received user training.

7.1. Weather Conditions

7.1.2. EW platforms must not be used in storms or high wind conditions. Areas of scaffolds affected by snow or ice cannot be used until the snow or ice has been removed and the surface has been sanded or textured to eliminate slips. These areas need to be inspected and approved for use by a CHES competent person.

7.2. Inspections

7.2.1. Scaffolds and scaffold components shall be inspected for visible defects by a CHES competent person before initial use and after any occurrence, which could affect a scaffold's structural integrity. Complete the scaffold construction checklist (Appendix 2) to document this initial inspection. The checklist should be kept on file in the job folder for the duration the scaffold is used.

7.2.2. Scaffolds and scaffold components shall be inspected for visible defects by a CHES competent person before each shift's use. Shift inspections shall be noted on the scaffold inspection tag (Appendix 3). The tag will be placed adjacent to the scaffold access ladder. Do not use a scaffold that has not been inspected by a competent person for that work shift. A new scaffold checklist shall be completed when modifications are made to a scaffold.

7.3. Fall Protection

7.3.1. Fall protection in the form of guardrails or fall arrest systems is required whenever erecting, dismantling or using scaffolding. OSHA requires that fall protection be used while working on scaffolds greater than 10 feet in height. Clean Harbors requires the use of fall protection when working on scaffolds greater than 6 feet in height. Height is measured from the ground to the scaffold platform.

7.3.2. Clean Harbors will rely on a guardrail system as the primary means of fall protection during scaffold use. If guardrails are not feasible, a fall arrest system will be used. Contact Health & Safety for guidance on alternative protective systems.

7.3.3. Fall protection is needed on walkways meeting the height requirements specified above.

7.3.4. The use of fall protection during construction or when dismantling a scaffold may present problems. Contact Health & Safety for recommendations for anchorage points.

7.4. Access

7.4.1. Ensure shoes are free of debris, oily material, etc. before climbing or working.

7.4.2. Do not carry materials as you climb. Keep both hands on the side rails. Hoist or have materials lifted to the platform.

7.4.3. Use an access ladder or equivalent for safe access.

7.4.4. Do not climb on braces, cross-braces or guard rails.

7.4.5. Maintain a clear path of travel to avoid tripping hazard.

7.5. Construction-Information for Scaffold Users

7.5.1. Erecting, moving, dismantling or altering a scaffold may only be performed under the supervision and direction of a trained, competent, qualified person. These actions may only be performed by trained employees selected by the Competent person.

7.5.2. Footing or anchorage shall be sound, rigid and capable of carrying the maximum intended load.

7.5.3. Do not use unstable objects to support scaffolds or planks. Footing must be sound. Before use, the scaffold must be level, plumb and rigid.

7.5.4. Scaffold poles, legs or uprights must be plumb and braced securely to prevent swaying or displacement.

7.5.5. Install guardrails and toe boards on all open sides and ends.

7.5.6. Ensure guardrail height is between 38" and 42" from the base of the work platform. Additional heights must be approved by H&S prior to construction. Guardrails are required on the front edge if the front edge of any platform is more than 12” from the face of work.

7.5.7. Midrails should be approximately mid-way between top rail platform and toe boards. Toe boards must be a minimum height of 4" and must be secured. When the potential exists that workers may be under or walk under the scaffold area, a mesh screen must be added that extends from the top end of the guardrail to the working surface and span the full distance between uprights.

7.5.8. Do not alter the scaffold.

7.5.9. Do not mix scaffold components from different manufacturers, unless authorized by a competent person.

7.5.10. Shield, treat, and protect ropes from corrosive or acidic substances (or substitute non-corrosive material).

7.5.11. Do not use any scaffold component damaged or weakened beyond the required listed capacity. Questionable components should be immediately repaired or replaced, braced to meet rated capacity, or removed from service until repaired.

7.5.12. All planking shall be scaffold grade or equivalent.

7.5.13. All planking and platforms, unless otherwise cleated, restrained by hooks (or an equivalent means), must extend over the supports by the following lengths.

A. For platforms less than 10 feet in length, the planks must extend between 6 – 12 “ over the supports.

B. For platforms more than 10 feet in length, the planks must extend 6 – 18” over the supports.

7.5.14. If platforms overlap, they must overlap not less than 12" and must occur over supports, unless restrained to prevent movement.

7.5.15. Abutted planks (continuous run) must rest on separate supports unless designed to rest on common supports (e.g., "hooked").

7.5.16. Refer to Section 8 of this program for detailed information on scaffold construction requirements.

7.6. General Use

7.6.1. Do not permit debris or materials to accumulate on platforms.

7.6.2. Overhead and falling object protection is required for workers on scaffolds. (Hard hats are always required while working on or around scaffolds).

7.6.3. Makeshift devices (barrels, boxes, etc.) shall not be used to increase the working height of a scaffold.

7.6.4. Ladders shall not be used to increase the working height of a scaffold. (Exception: Large area scaffolds within OSHA standards). See definition of Large Area Scaffold and contact Health and Safety.

7.6.5. Never alter or move a scaffold horizontally while employees are on them, unless they have been designed by a registered professional engineer specifically for such movement.

7.6.6. Ensure wheels of any rolling scaffold are locked prior to use.

7.6.7. Ensure the walking/working platform is fully planked.

7.6.8. Ladders may not be used as work platforms unless each affected employee uses fall protection.

7.6.9. Shield suspension ropes from heat producing processes.

7.7. Electrical Hazards

7.7.1. Do not erect, use, dismantle, alter or move scaffolds or have any conductive material handled on them that might come closer to exposed and energized power lines than as follows:

Voltage	**Minimum Distance**
<300 (Insulated)	3 feet
>300-50,000 (Ins/Uninsulated)	10 feet
> 50,000 (Ins/Uninsulated)	10 feet + 0.4 in for each 1KV over 50,000 volts)

NOTE: Scaffolds may be closer to power lines if the Utility Company, or other qualified person, is contacted and the power lines have been de-energized or relocated to prevent accidental contact. The Health & Safety Manager must be contacted whenever this activity is planned.

7.7.2. Use tag lines when a swing load will be hoisted onto or near scaffolds.

7.7.3. Contact Health & Safety if welding or burning will be conducted while on a scaffold.

7.7.4. GFCIs should be used when operating electrical hand tools on scaffolds.

7.8. Scaffold Loading

7.8.1. Employees must ensure that the maximum intended load capacity of the scaffold in use is not exceeded.

7.8.2. Definition

Maximum Intended Load (MIL): The total load of all persons, equipment, tools, materials, transmitted loads and other loads reasonably anticipated to be applied to a scaffold or scaffold component at any one time.

7.8.3. Capacity - As applied to the scope of this program, each scaffold and scaffold component shall be capable of supporting, without failure, its own weight and at least four times the maximum intended load applied or transmitted to it. (This is an inherent property of each manufactured component and must be met by the manufacturer.)

7.8.4. Design - Scaffolds shall be designed by a qualified person and shall be constructed and loaded in accordance with that design. Non-mandatory Appendix A to 29 CFR 1926.450 contains examples of criteria for calculating load capacities and MIL.

7.8.5. Loading- To avoid overloading a scaffold, the user must understand two factors to properly select and use a scaffold. They are: the maximum intended load and the rated load carrying capacity of the scaffold. Scaffolds are typically rated as light, medium and heavy duty.

Rating	**Rated Load Capacity**
Light-Duty	25 lbs./ft2
Medium-Duty	50 lbs./ft2
Heavy-Duty	75 lbs./ft2

7.8.6. Fabricated Frame Scaffolds - (ex: Safeway, Bil-Jax, Waco, etc.) Because of the prefabricated nature of these scaffolds, the manufacturer's literature will provide information of the capacity. This information must be obtained, maintained on-site and available for review, and followed when using the manufacturer's equipment.

Tube and Coupler - Minimum Size of Members

	Light Duty	**Medium Duty**	**Heavy Duty**
Maximum Load	25 lbs/ft2	50 lbs/ft2	75 lbs/ft2
Posts, Runners, and Braces	Nominal 2" Steel	Nom. 2"	Nom. 2"
Bearers	Nominal 2"	Nom. 2"	Nom. 2.5"
Max. Post Spacing	4' x 10'	4' x 7' or	6' x 6'
Bearers		Nom. 2.5	
Max. Post Spacing		6' x 8'	
Max. Runner Spacing	6.5' (vertically)	6.5'	6.5'

7.8.7. Calculating Scaffold Loading

To calculate loading, you must know the Rated Load Capacity of the scaffold in use (Light, Medium, Heavy Duty) and the size of the platform. As an example, three workers will be working on a light duty scaffold with a 7' x 5' platform. To begin, calculate the maximum capacity of a 7' x 5' platform on a light duty scaffold:

7' x 5' = 35 ft2 (1)

7.8.8. Maximum Capacity

To calculate the Maximum Capacity, multiply the square footage by the rated load capacity:

35 ft2 x 25 lbs./ft2 = 875 lbs. (2)

The Maximum Capacity this light-duty scaffold can safely sustain is 875 pounds.

7.8.9. Maximum Intended Load

A typical worker with tools weighs approximately 250 pounds.

3 Workers x 250 lbs./Worker = 750 lbs. (3)

Since the Maximum Intended Load of 750 lbs. is less than the maximum capacity, 875 lbs., the three workers could safely work on this scaffold.

8. SCAFFOLD CONSTRUCTION GUIDELINES

8.1. Introduction

8.1.1. Erecting a scaffold presents some unique industrial hazards. All risks encountered during this phase of Elevated Work Platform (EWP) activities can be controlled or eliminated. Training and hazard awareness is essential to limit the risk of accidents. All work conducted during scaffold erection must be performed under the direction of a Competent Person (CP). The crew performing the erection must be trained.

8.1.2. The complexity of Scaffold construction varies with the type of scaffold erected from relatively simple (fabricated frame) to extremely complex (tube and clamp). Height increases the complexity and hazards associated with the construction process.

8.1.3. Training on this phase includes materials covered under "User" Training and a review of the manufacturer's material on scaffold erection (video or printed literature, or both). These materials can be obtained from the manufacturer, rental company or, to a limited extent, Corporate Health & Safety.

8.1.4. The following are general items to evaluate during the scaffold construction process. This information supplements the manufacturer's erecting educational materials.

8.2. Scaffold Component Inspection

8.2.1. Prior to erecting a scaffold, evaluate scaffold components to ensure they are not defective or damaged. Any components or equipment that is not fully functional should be put aside and not used until it can be further evaluated to determine if it can be repaired or must be replaced. This repair or replacement must be done by the scaffold supplier, dealer or manufacturer.

8.2.2. Evaluate the following:

A. Rust or Corrosion - Potentially compromises strength. Check inside and out:

-
- 1. Pitting
-
- 2. Excessive (or deep) Rust – Oxidation
- 3. Flaking
-
- 4. Chemical Corrosion
-
- 5. Powdering

B. Damaged Components:

-
- 1. Bent
-
- 2. Flattened
-
- 3. Kinked
-
- 4. Crushed

C. Cracks

-
- 1. Evaluate Welds, Joints along the component or around the circumference.

D. Moving Parts - Move Freely

E. Brackets - Deformed Hooks

F. Cross Brace Holes - "Splitting Out" = Cracks radiating from the rivet holes.

G. Manufactured Planking:

-

1. Missing hooks, locks, rivets.

-
- 2. Bent Side Rails.
-
- 3. Damaged Walking Surface.
-
- 4. If Plywood Decking - Signs of Rot.

H. Casters - Damaged brakes, axles or stems.

I. Paint Areas - Blistering, Cracking, Loose Paint.

8.3. Support and Foundation

8.3.1. Scaffold legs must be placed on a firm foundation to ensure stability and strength and to prevent collapse. An effective foundation will distribute the load evenly over a suitable area. The foundation must be capable of carrying the load. Conditions to consider in evaluating the foundation include:

A. Foundation Base

B. Load

C. Height

D. Weather

8.3.2. Scaffold foundations typically are placed on concrete, asphalt or soil. Foundations built on concrete are generally simple to assess for their ability to sustain the scaffold load. Asphalt's stability is variable due to the under burden and can be further affected by such conditions as temperature. Foundations built on soil require greater information to assess. Soil-type and conditions affect scaffold stability. Base supports described below are typically adequate for scaffolds four levels or less in height. If a scaffold will exceed this height, contact Health & Safety.

8.3.3. Regardless of the height, the foundation should be evaluated for the conditions listed below. Appropriate action should be taken to control conditions that could adversely affect the stability of the foundation.

A. Soil Type (If imprint can be made easily with a shoe heel, an Excavation Competent Person or Qualified Person must be consulted.)

B. Erosion Potential from Weather, Drainage, etc.

C. Frozen Foundation - Freeze/Thaw Cycle

D. Weather: Rain, Other Weathering Influence

E. Traffic

F. Undermining: Excavations, Erosion, Soil Effects

G. Uneven Ground: Consult Health & Safety

H. Others

8.3.4. The following restrictions apply:

A. Unstable objects cannot be used to support scaffolds, platform units or as a working platform.

B. Equipment--e.g. front-end loaders, fork-lifts, truck beds, etc. cannot be used to support a scaffold.

8.4. Base Support

8.4.1. To ensure that the foundation is capable of sustaining the scaffold load, each leg must be placed on a base plate and mudsill. The exception occurs when the legs are erected on an inherently stable base such as concrete or steel (e.g., tanks) that are in good repair.

A. Base Construction - Mud Sill Guidelines

-
- 1. Continuous Both Legs (Width)
-
- 2. 2" x 10" Lumber
-
- 3. Extends approximately 9" beyond center line of leg (2" x 10" x [W+18"])

(**Example**: Five foot wide fabricated frame – Mud Sill length would be 60" + 18" = 78" long)

B. Base Plates

-
- 1. Used on Each Leg
-
- 2. Secured to the Mud Sill (if used)

C. Adjusting Screws (See note below for Tube & Clamp.)

-
- 1. Base plates that can be fitted with screw jack should always have the screw jacks attached. This will facilitate leveling adjustments.
-
- 2. Keep adjusting screws to a minimum; load capacity decreases as extensions increase.
-
-
- 3. Ensure screw "handles" contact the scaffold legs; settling or uneven leg loading may cause leg to "raise up".

NOTE: Tube and Clamp legs must be attached to the base plate directly. Adjusting screws are not permitted nor are they needed.

8.5. Leveling

8.5.1. Once the first section is erected, evaluate to ensure the frame is plumb, level and square. Continue as each section is constructed. The following tools will be needed: bubble level, carpenter's square and tape measure. Perform the following:

A. Level the frame from side to side and legs in both directions.

B. Measure the frame from corner to corner. Ensure the measurements are identical. This will guarantee that corner angles are 90° or the frame is "square". A carpenter's square may also be used to assess the angles.

8.6. Stabilizing the Scaffold

8.6.1. Restraints (ties, guys, braces) are designed to provide lateral stability, to enhance the strength and prevent the scaffold from tipping. The narrower the scaffold, the more likely it will tip. The scaffold is least stable in the narrow direction. Stabilizing the scaffold may be accomplished by attaching the scaffold to an adjacent structure (tying), using guy wires, or increasing the base width (outrigger). When the scaffold is stabilized, it must be tied at intervals not to exceed 30’ horizontally or 26’ vertically.

8.6.2. Restraints are required when scaffold heights exceed four times the base width (4:1) of the scaffold. For example, if a scaffold is three (3) feet wide, restraints are required above 12' (4 x 3' = 12'). Health & Safety must be notified if scaffold height will exceed the 4:1 ratio or 15 feet, whichever is less.

8.6.3. Outriggers can be used to increase the base width permitting greater heights without restraints. Contact Health & Safety for more information.

8.7. Access

8.7.1. Safe and adequate access to the scaffold must be provided. Various forms are available: ladders, stairs, ramps, walkways, direct access from a structure, integral rungs, etc. Cross braces cannot be used for access. An access method must be provided for any platform more than two (2) feet above or below adjacent levels.

8.7.2. Fabricated frame scaffolds typically have integral prefabricated access. This access must meet the following requirements:

A. Rungs must be at least 8 inches long.

B. Rungs must be uniformly spaced except where frame sections connect and can have a maximum spacing between them of 16.75 inches.

C. Rest platforms must be provided every 35 feet.

D. Ladders may not be used as work platforms unless each affected employee uses fall protection.

8.7.3. Hook-on and attachable ladders shall be specifically designed for use with the type of scaffold and meet the following requirements:

A. Rungs must be at least 11.5 inches long.

B. Rungs must be uniformly spaced and can have a maximum spacing between them of 16.75 inches.

C. The bottom step must be not more than 24 inches off the floor.

D. Rest platforms must be provided every 35 feet.

E. Ladders must be positioned so that they do not tip the scaffold.

F. Ladders may not be used as work platforms unless each affected employee uses fall protection.

8.7.4. For stairway-type ladders, contact H&S.

8.8. Platforms-General

8.8.1. Scaffold platforms come in various forms and can generally be classified into three categories: solid wood, "manufactured" or fabricated.

A. If solid wood planking is used, it must be scaffold grade lumber. This is noted by an American Lumber Standards Committee grading stamp on the plank indicating its suitability for scaffolds (e.g., "Scaffold Plank", "Scaf Plk", etc.).

B. "Manufactured" is usually a laminated veneer, similar to plywood, except all grains run parallel to the length. Follow manufacturer's specifications for loading, testing, care, use, handling, storage and inspection.

C. Fabricated platforms can be all metal or wood with metal framing.

8.8.2. Platform Use Guidelines

The following provides general guidelines for scaffold platforms. Refer to 29 CFR 1926.451 (b) for additional details.

A. Each level where work is conducted (Work platforms) must be fully planked for full width with edges close together (no greater than 1" gap).

B. All planking must be scaffold grade or better.

C. Platforms and walkways must be at least 18" wide. (If a narrower width is necessary, guard rails and/or a personal fall arrest system (PFAS) is necessary.)

D. The front edge of all platforms must be 14" or less from the work face (unless guard rails or a PFAS is used).

E. All planking or platforms, unless cleated, restrained by hooks or equivalent, must extend the following lengths over supports:

Platform Length	Extension Over Supports
<10'	6-12'
>10'	6-18"

F. Abutted planks (or continuous run of planks) shall rest on separate supports unless designed to rest on common supports (e.g., "hooked").

G. Overlapped planks shall occur over supports and cannot overlap less than 12" (unless nailed together or otherwise restrained to prevent movement).

H. Do not intermix components of different manufacturers unless authorized by a competent person and components can fit together without force or modification. Structural integrity must be maintained.

I. Do not use components of dissimilar metals.

J. Remove damaged or weakened planks immediately.

K. Remove, clean-up, etc. spills or slippery conditions (chemicals, snow, ice, etc.).

L. Do not paint or otherwise obscure the platform surface. This could hide defects.

8.8.3. Deflection

A. The OSHA Standard [29 CFR 1926.451 (f) (16)] states "Platforms shall not deflect more than 1/60 of the span when loaded." For example, if a seven-foot (7') plank is used on a standard six-foot (6') span and is loaded at the designed load (250-500 lbs.), it should not deflect more than 1.2".

6 Feet = 72" X 1/60 = 1.2"

B. Approximately one inch is clearly visible through a visual observation. If deflection is greater, do not use the plank.

8.9. Guard Rail System

8.9.1. Components: The guardrail system consists of a top and mid-rail.

A. Rail Height:

-
- 1. Top – 38”-42".
-
- 2. Mid - Approximately mid-way between top edge of top rail and the platform surface.

B. Cross Braces as Guard Rails

Cross braces are an acceptable alternative to standard top and mid-rails in field operations when they meet the following criteria:

-
- 1. Top Rail - Cross point is 38-48" above work platform.
-
- 2. Mid Rail - Cross point is 20-30" above work platform.
-
- 3. Cross brace end points at the upright must not be more than 48" apart.

8.9.2. Other Protective System Components

A. Screens/Mesh - When screens or mesh are used they must:

-
- 1. Extend from the top edge of the guard rail to the platform surface; and
-
- 2. Extend fully between support members.

B. Intermediate Members (balusters or rails)

-
- 1. Extend from the top edge of the guardrail to the platform surface.
-
- 2. Be spaced no more than 19 inches apart.

C. Solid Panels

-

- 1. Extend from the top edge of the guardrail to the platform surface.

D. Manila or Plastic Rope

-
- 1. When rope is used as a substitute for standard guardrails, it shall be inspected by a competent person as often as necessary, but at least daily, to ensure it continues to meet the strength requirements of 200 lbs applied as a horizontal or downward force.

8.9.3. Design - Guard rail system components must be specifically designed for scaffold use. Only those components supplied by the manufacturer or rental company may be used. Contact Health and Safety if an alternative is being considered.

8.9.4. Guard Rail Surface

A. Must be designed to prevent injuries from lacerations.

B. Must be smooth and free of defects such as burrs that could cause punctures, lacerations, snagging of clothing, etc.

8.9.5. Prohibitions

A. Rail Ends - Rail ends must not overhang the terminal post unless the overhang does not create a projection hazard.

B. Steel/Plastic Banding - Shall not be used as a guardrail component.

8.10. Falling Object Protection

8.10.1. Employees working on scaffolds shall be protected from falling objects through the installation of toe boards, screens or guardrail systems, or through the erection of debris nets, catch platforms, or canopy structures that contain or deflect the falling objects.

8.10.2. Large objects shall be re-located to prevent the fall hazard.

8.10.3. Areas below scaffolds shall be protected through the installation of toe boards screens or guardrail systems on the scaffolds, or by barricading the area. If toe boards are used, materials or tools may not be stacked above the height of the toe boards.

8.11. Inspection

Inspect each platform for defects or damage that could compromise its integrity.

8.11.1. Wood

A. Split ends that could cause weakness.

B. Damage by fractures or sawed cuts, splintering, rails, concrete or plaster contamination.

C. Spills: oil, corrosive or acidic liquids.

D. Paint

E. Warping:

-
- 1. Bow - Deflection from flat end to end.
-
- 2. Crook - Edgewise deviation.
-
- 3. Cup - Deviation in the face side to side (forming a "cup").
-
- 4. Twist - Deviation from flat, creating curl or spiral.

8.11.2. Metal

A. Review manufacturer's inspection specification. Evaluate for:

-
- 1. Bending
-
- 2. Cracks
-
- 3. Buckles
-
- 4. Corrosion
-
- 5. Broken/Missing Hooks
-
- 6. Gouges

8.11.3. Scaffold Inspections

A. The dynamic nature of our work environmental produces many new, daily, variable, unanticipated hazards that can create a risk to employees working on EWP's. For this reason, it is necessary to be prepared to take rapid action in the event a hazard is identified. Two steps will minimize the likelihood that dynamic site hazards will create a risk to employees:

-
- 1. Daily Inspections
-
- 2. Corrective Action

B. Taking corrective action quickly can help minimize hazards and job delays. Action can include, depending on the nature, exposure, likelihood of risk to the employees working on an EWP:

-
- 1. Speaking to the client, other contractors, etc. to control or eliminate the hazard.
-
- 2. Controlling or eliminating the hazard.

-
- 3. If no action will control or eliminate the hazard, stopping work immediately.

9. AERIAL LIFTS

9.1. Introduction

Clean Harbors is committed to ensuring a safe work environment for our employees. To accomplish this, we have developed an Aerial Lift (AL) Guideline to ensure that the equipment is complete, functional and used in compliance with National (American National Standards Institute ANSI) and OSHA standards and provides a safe elevated work platform (EWP) for employees.

9.2. Rental Agreement

Please notify the equipment Rental or Leasing Company of the following information when arranging for rental or delivery. Clean Harbors considers the equipment incomplete if defects, malfunctions, etc. are found during the pre-start inspection performed by Clean Harbors. We will also consider the equipment incomplete if an up-to-date Operating Manual does not accompany the equipment.

9.3. Receipt of Equipment

9.3.1. Prior to operation of the equipment, ensure that items specified below are satisfied. If they are not, the equipment cannot be used.

A. Operating Manual - Verify that the Operating Manual accompanies the equipment. Review the manufacturers' operating instructions, user safety rules and other pertinent information contained in the Operating Manual.

B. Inspection - Inspect the unit to ensure the equipment is sound and fully functional. See Section 9.4 for items to evaluate.

C. Training - Ensure that the training specified in Section 10.4 is received by the AL operator and others who will perform work from the AL. All employees who may operate the equipment must receive the training. Only those who received EWP User and AL specific operator training are authorized to operate the equipment.

D. Application - Ensure that the equipment will be used within the intended application or specified by the manufacturer.

E. Fall Protection - Appropriate fall protection (equipment and personnel) is available and used. A full body harness and lanyard are required on all AL.

F. Work Area Inspection - Prior to work or movement of the AL, inspect the work area for the following:

-
- 1. Drop-offs or Holes
-
- 2. Bumps and Floor Obstructions

-
- 3. Debris
-
- 4. Overhead Obstructions and Electrical Lines
-
- 5. Hazardous Atmosphere - Ensure that a flammable atmosphere doesn't exist and won't develop.
-
- 6. Inadequate surface and support to withstand all load forces imposed by AL in all operating configurations.
-
- 7. Wind and Weather Conditions
-
- 8. Presence of Unauthorized Persons
-
- 9. Other Moving Equipment in the Area
-
- 10. Adequate ventilation for indoor operation (if used indoors).
-
- 11. Other Possible Unsafe Conditions

G. Take appropriate action to control the hazards identified in the work area inspection. If a hazard can't be eliminated or controlled, contact Health & Safety for further direction.

9.4. Pre-Start Inspections

9.4.1. Before each use (by shift) conduct a visual inspection and/or functional test of the following:

A. Operating and Emergency Controls

B. Safety Devices

C. Personal Protective Devices, including Fall Protection

D. Air, Hydraulic and Fuel System for Leaks

E. Cables and Wiring Harness

F. Loose or Missing Parts

G. Tires and Wheels

H. Placards, Warnings, Control Markings and Operating and Safety Manuals

I. Outriggers, Stabilizers, Extendible Axles and Other Structures

J. Guard-Rail System

K. Items Specified by the Manufacturer

9.4.2. Review the Operating Manual to understand appropriate action to evaluate each item.

9.4.3. Adjustments/Repairs - Only Clean Harbors employees who are trained and authorized are permitted to adjust or repair AL.

9.4.4. Defect/Malfunction Noted - If a defect, malfunction or other problem is noted during the pre-start inspection, DO NOT OPERATE the equipment. Repairs must be made prior to continuing use of the equipment.

9.5. Operations

9.5.1. The guidelines listed below shall be followed when operating an AL:

A. Battery Charging - Charge in a well ventilated area free of ignition sources.

B. Elevated Traveling, Maneuvering - Aerial lifts may not be driven while elevated. They may, however, be maneuvered into position using the following guidelines. The operator shall:

-
- 1. Maintain a clear view of the path of travel.
-
- 2. Maintain a safe distance from obstacles, debris, drop-offs, holes, depressions, ramps and other hazards to ensure safe elevated travel.
-
- 3. Maintain a safe distance from overhead obstacles.

NOTE: Traveling to or from work areas in an elevated position is prohibited.

C. Entanglement - Take action to avoid creating a trip hazard from ropes, hoses, electrical cords, etc.

D. Fall Protection - Full body harnesses and lanyards are required on all AL's. Never attach the lanyard to fixed object that doesn't move with the AL. Guardrails shall be installed and access gates or openings closed, per manufacturer's instructions.

E. Footing - Maintain firm footing. Ensure trip hazards are removed from the platform. Do not sit or climb on the basket or railings.

F. Fueling - Shut down the unit before fueling. Perform fueling in a well-ventilated area free of ignition sources.

G. Height Increasing Methods - Makeshift devices (barrels, boxes, etc.) or ladders or protective structures (toeboard, mid-rail, railings) shall not be used to increase working heights.

H. Load Capacity - Do not exceed the rated capacity of the AL.

I. Load Distribution - Ensure that the load and its distribution on the platform and any platform extension are in accordance with the manufacturer's rated capacity for that specific configuration.

J. Misuse - Do not use the AL as a crane or jack.

K. Modifications - Modifications or alterations are not permitted.

L. Operating Area - Do not operate the unit from a position on trucks, trailers, rail cars, floating vessels, scaffolds, unless permitted by the manufacturer.

M. Other Moving Equipment - When present, take precautions to prevent collision. Acceptable methods include: flagging, roping-off area, warning lights, barricading, flag person, etc.

N. Overhead Clearance - Ensure there is adequate clearance from overhead obstructions.

O. Platform Positioning - Do not position against another object to steady the platform.

P. Power Lines - The AL cannot be operated closer than the following to exposed and energized power lines:

Voltage	**Minimum Distance**
<300 (Insulated)	3 Feet
>300-50K V (Insulated/Uninsulated	10 Feet
>50K V (Insulated/Uninsulated)	10 Feet, plus 0.4 inches for each 1K V over 50K V

If work closer than the above distances is necessary, the local Utility or a qualified electrical person can de-energize or relocate the lines.

Q. Problems/Malfunctions - Report problems or malfunctions immediately.

R. Safety Devices - Do not alter or disable interlocks or other safety devices.

S. Slopes or Inclines - The aerial platform shall not be driven on grades, side slopes or ramps exceeding those for which the aerial platform is rated by the manufacturer. See the operating manual. Set brakes and chock wheels when the Aerial Lift will be used on an incline or slope.

T. Snagged Platform - If the platform or elevating assembly becomes caught, snagged or otherwise prevented from normal motion by adjacent structure or other obstacles such that control reversal does not free the platform, all personnel shall be removed from the platform before attempts are made to free the platform using ground controls.

U. Stability Enhancing - The outriggers, stabilizers, extendible axles, or other stability enhancing means, are used as required by the manufacturer. When stabilizers or outriggers are used, sound footing for the stabilizers and outriggers must be ensured.

V. Travel Speed - Under all travel conditions, the operator shall limit travel speed according to conditions of ground surface, congestion, visibility, slope, location of personnel, and other factors causing a hazard of collision or injury to personnel.

W. Warnings and Instructions - Observe and follow all warnings and instructions indicated on decals, warnings and instructions displayed on the AL. If obstructions must be approached, contact Health & Safety for an acceptable means to safely manage the hazard.

X. Work Area - Rope off or barricade the work area where extensible and articulating boom platforms present a hazard due to pinch points while swinging the unit or from falling objects (tools, etc.). Ensure that personnel and equipment are cleared from area surrounding the AL before lowering the unit.

Y. Backing - The vehicle should have a reverse signal alarm audible above the surrounding noise level or the vehicle is to be backed up only when an observer signals that it is safe to do so.

9.6. Unsafe Conditions

Immediately cease operation and notify the supervisor if:

9.6.1. A malfunction or a suspected malfunction occurs; or

9.6.2. A potentially unsafe condition related to capacity, intended use, or safe operation occurs.

10. TRAINING REQUIREMENTS

10.1. Scaffold User Training

10.1.1. The following topics shall be covered in scaffold user training:

A. Hazard recognition and control;

B. Fall protection equipment. Users of fall protection equipment will be trained on fall hazards of the work being performed and the correct procedures for erecting, maintaining, disassembling, and inspecting fall protection equipment. Fall protection systems including fall arrest systems, positioning device systems and warning line systems;

C. Ladder use;

D. Falling object protection;

E. Electrical hazards;

F. Scaffold loading;

G. Written examination.

10.2. Scaffold Builders

10.2.1. Individuals constructing scaffolds will be trained on the following:

A. Scaffold use;

B. Scaffold construction (Section 8);

C. Legal requirements for the specific scaffold type being constructed (see Appendix 4 & 5);

D. Manufacturer's recommendations and any specific requirements such as torque specs.

NOTE: This training may be documented as part of the pre-job safety meeting.

10.3. Scaffold Competent Person

10.3.1. Scaffold competent persons must be designated by management, must have the authority to correct defects, and must have completed the following training:

A. Scaffold use;

B. Scaffold construction (section 8);

C. Legal requirements for the specific scaffold type being constructed;

D. Review of the manufacturer's information for the type of scaffold being constructed.

10.3.2. The scaffold competent person must be certified in writing to perform this work. This requirement may be met by attending vendor provided training and obtaining appropriate documentation for the type of scaffolding being used. In-house training provided and documented by another CHES approved scaffolding competent person may serve as this certification. A CHES scaffolding competent person will not erect scaffolds higher than 40 feet. Contact Health and Safety if outside assistance will be used or if special cases make this restriction unnecessary. The 40 feet restriction does not apply to pre-shift inspections once the scaffold is complete.

10.4. Aerial Lift Operators

10.4.1. Aerial lift (AL) operators are required to have completed the following training:

A. Scaffold user training;

B. The aerial lift Physical Hazard Data sheet review;

C. Review of the specific manufacturer's operating instructions.

D. Review (or have explained by a Qualified Person) of all decals, warnings and instructions displayed on the AL.

10.5. Fall Protection Training Program

10.5.1. Thorough training in the selection and use of personal fall arrest systems is imperative.

10.5.2. Employees must be trained by a competent person in the safe use of the fall protection system.

10.5.3. Training shall include application limits, proper anchoring and tie-off techniques, estimation of free-fall distance, including determination of deceleration distance and total fall distance to prevent striking a lower level, methods of use, inspection, maintenance and storage of the system.

10.5.4. Employees must be periodically re-trained. Circumstances where retraining is required include, but are not limited to include, changes in the workplace which render previous training obsolete, changes in the types of fall protection systems, or inadequacies in an affected employee's knowledge or use of fall protection systems.

10.5.5. Training documentation shall be provided and maintained to verify the employee trained.

11. REFERENCES

Safety Standards for Scaffold Use, 29 CFR 1910.28-.29.

Safety Standards for Scaffold Use, 29 CFR 1926.450.

Accident Prevention Manual for Industrial Operations, Engineering and Technology, National Safety Council, 9th Edition, 1988.

Preventing Electrocutions During Work with Scaffolds Near Overhead Power Lines, NIOSH Alert, August 1991.

NIOSH TIC Search - Scaffolds, FACE Reports.

Analysis of Construction Fatalities - The OSHA Data Base, 1985-1989. USDOL/OSHA, November 1990.

The 100 Most Frequently Cited OSHA Construction Standards in 1991: A Guide for the Abatement of the Top 25 Associated Physical Hazards.

Bil-Jax, Inc. Product Safety Literature.

Safeway Steel Products, Product Safety Literature.

A Guide to Safe Scaffolding, North Carolina DOL/Division OSHA.

Scaffold Training Institute - User and Competent Person Learning Guide.

OSHA Training Institute: Scaffolds Used in Construction.

American National Standard Institute - ANSI/AIA - A92.2-1990, A92.5-1991, A92.6-1990.

Waco's Guide to Scaffolding - Waco Scaffold and Equipment, 1995.

Standards for Ladders 29 CFR 1910.25-27

Standards for Vehicle-Mounted Elevating and Rotating Work Platforms, 29 CFR 1910.67

12. EQUIPMENT

Equipment purchased for fall protection shall met the necessary OSHA, ANSI, and ASTM requirements and/or recommendations.

APPENDIX 1: Elevated Work Program Summary

The Elevated Work Program covers all elevated work performed by Clean Harbors. This includes use of fall protection where falls of six (6) feet or more are possible, and all operations involving the use of aerial lifts, ladders and scaffolding.

Training is required for all employees who will use scaffolds, build scaffolds and for individuals designated to become a "Scaffold Competent Person". Aerial lift operators must be trained and anyone working from an aerial lift must have scaffold user training. The use of fall protection is included in all these training topics.

Scaffold Use covers the requirements and restrictions for the use of scaffolds. Pre-shift inspections are required. Fall protection in the form of guardrails or personal fall arrest systems is used on all scaffolds. Access to the work platform must meet minimum requirements. Hazards of scaffold use including electrical hazards, falling objects, and loading must be recognized and controlled. Specific control measures for hazards are provided in the program. Summary requirements of this section are covered in the SCAFFOLD Physical Hazard Data Sheet.

Scaffold Construction Guidelines covers the basic requirements for scaffold foundations and support. Scaffolds must be constructed level and on a firm footing. Stabilizing supports are required as height-to-width ratios approach 4:1. Work platforms must cover the entire working level. Guardrail systems must be used. Falling object protection is required where objects can fall onto or from a scaffold to protect all workers. A pre-use inspection by a Scaffold Competent Person is required for all scaffolds once construction is complete. An inspection form is provided in Appendix 2. Special requirements for the construction of fabricated frame scaffolds and tube and coupler scaffolds are provided in Appendix 4 and 5, respectively.

Ladder use and installation requirements for fixed ladders are addressed in Section 6. A Physical Hazard Data Sheet for ladders is available.

Fall protection covers the use and requirements of fall arrest systems. Positioning devices that prevent falls are acceptable controls. Warning line systems that prevent access to the fall hazard may be used. Safety monitoring systems shall not be used. Fall Protection requirements are covered in the Physical Hazard Data Sheet.

Aerial lift operation covers pre-shift inspections, travel position, use on grades and around obstructions. A quick review of this section's requirements is provided in the AERIAL LIFT Physical Hazard Data Sheet.

No program can address all possible options, conditions or equipment used for elevated work. For assistance with special operations, contact your Health and Safety Representative.

APPENDIX 2: Scaffold Inspections

LOCATION: ______________________________
DATE: ______________________________
INSPECTOR: ______________________________

SCAFFOLD CONSTRUCTION CHECKLIST

	YES	NO	ACTION/COMMENT
PLATFORM CONSTRUCTION Are all platforms fully planked with less than 1" between planks or between plans and uprights?			
Are all platforms and walkways at least 18" wide?			
Does the scaffold conform to the 4 (height) to 1 (base width) ratio (including outriggers) if used?			
If no, is the scaffold secured to structure by acceptable means (Guy, ties, braces)?			
Are the means to secure the scaffold 20' apart vertically?			
Are they functional and in good repair?			
Are scaffold supports on firm footing; e.g, base plates, mud sills, etc.?			
Are the footings level, sound, rigid and capable of supporting the loaded scaffold without settling or displacement?			
Is the use of unstable objects prohibited for footings?			
Is the scaffold plumb and braced to prevent swaying or displacement?			

Appendix 2: Scaffold Inspections (continued)

SCAFFOLD CONSTRUCTION CHECKLIST

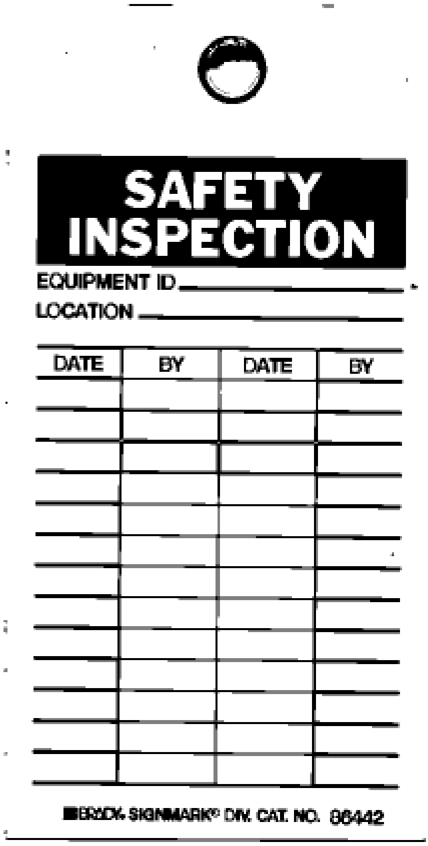
	YES	NO	ACTION/COMMENT
ACCESS Has safe access been provided for platforms that are more than 2 feet above or below the point of access?			
Are cross braces prohibited as a means of access?			
Are adequate means of access provided to all platforms?			
Are ramps and walkways provided with a standard guardrail?			
Are the rungs of fabricated frame scaffolds prohibited from use as a work platform?			
USE Are scaffolds loaded within the rated capacity?			
Have damaged or weakened parts on components been repaired or replaced, braced or tagged and removed from service?			
Is the movement of occupied scaffolds prohibited?			
Is acceptable clearance from electrical lines maintained? (Include scaffold components and material handled on the scaffold.)			
Has snow, ice or other slippery material been removed before permitting work to occur?			
Are tag lines used to control loads during hoisting?			
Is work on scaffolds prohibited during storms or high winds?			

Appendix 2: Scaffold Inspections (continued)

SCAFFOLD CONSTRUCTION CHECKLIST

	YES	NO	ACTION/COMMENT
Are tools, materials and debris removed promptly to avoid hazardous accumulations?			
Are height increasing means (makeshift devices, ladders, etc.) prohibited from use?			
Have provisions been made to prevent platform deflection of more than 1/60 of the span?			
FALL PROTECTION Are all scaffold levels fitted with guardrails (top and mid) and at appropriate heights?			
If screens or mesh screens are used, do they extend from the guard rail top edge to the platform?			
FALLING OBJECT PROTECTION Are hard hats worn by all employees working on a scaffold?			
Have falling object hazards been controlled or eliminated?			
Have toeboards been installed on all sides of the platform?			
MOBILE SCAFFOLDS Are casters locked while the scaffold is in use?			
Is manual force, used to move the scaffold, applied as close to the base as possible?			
Are scaffolds stabilized to prevent tipping during movement?			
Are casters pinned into the frames or adjustment screws?			

APPENDIX 3: Scaffold Inspection Tag



SAFETY INSPECTION

EQUIPMENT ID ____________________

LOCATION ____________________

DATE	BY	DATE	BY

BRADY® SIGNMARK® DIV. CAT. NO. 86442

Use a tag equivalent to the sample illustrated above.

APPENDIX 4: Fabricated Frame Scaffolds 29 CFR 1910.28 (d) Special Requirements

When moving platforms to the next level, the existing platform shall be left undisturbed until the new end frames have been set in place and braced prior to receiving the new platform.

Frames and panels shall be braced by cross, horizontal, or diagonal braces, or combinations thereof, which secure the vertical members together laterally. The cross braces shall be the proper length so that vertical members are automatically installed plumb, level, and square. All brace connections shall be secured.

Frames and panels shall be joined together vertically by coupling or stacking pins or equivalent means.

Where uplift can occur which would displace scaffold end frames or panels, the frames of panels shall be locked together vertically by pins or equivalent means.

Brackets used to support cantilevered loads shall:

Be seated with side brackets parallel to the frames and end brackets 90 degrees to the frame;

Not be bent or twisted from these positions;

Be used only to support personnel.

Scaffolds over 125 feet in height shall be designed by a registered professional engineer.

When the scaffold is stabilized, it must be tied at intervals not to exceed 30’ horizontally or 26’ vertically.

APPENDIX 5: Tube and Coupler Scaffolds 29 CFR 1910.28 (d) Special Requirements

When moving platforms to the next level, the existing platform shall be left undisturbed until the new bearers have been set in place and braced prior to receiving the new platforms.

Transverse bracing forming an "X" across the width of the scaffold shall be installed at the scaffold ends and at least every third set of posts horizontally and every fourth runner vertically. Bracing will extend diagonally from the inner or outer posts or runners upward to the next inner or outer posts or runners. Building ties shall be installed at the bearer levels between the transverse bracing.

On straight run scaffolds, longitudinal bracing across the inner and outer rows of posts shall be installed diagonally in both directions, and shall extend from the base of the end posts upward to the top of the scaffold at approximately a 45 degree angle. On scaffolds whose length is greater than their height, such bracing shall be repeated beginning at least at every fifth post. On scaffolds whose length is less than their height, such bracing shall be installed from the base of the end posts, and then in alternating directions until reaching the top of the scaffold. Bracing shall be installed as close as possible to the intersection of the bearer and post or runner and post.

Where conditions prohibit the attachment of bracing to posts, bracing shall be attached to the runners as close to the post as possible.

Bearers shall be installed transversely between posts, and when coupled to the posts, shall have the inboard coupler bear directly on the runner coupler. When the bearers are coupled to the runners, the couplers shall be as close to the posts as possible.

Bearers shall extend beyond the posts and runners, and shall provide full contact with the coupler.

Runners shall be installed along the length of the scaffold, located on both the inside and outside posts at level heights.

Runners shall be interlocked on straight runs to form continuous lengths, and shall be coupled to each post. The bottom runners and bearers shall be located as close to the base as possible.

Couplers shall be of a structural metal, such as dropforged steel, malleable iron, or structural grade aluminum. The use of gray cast iron is prohibited.

Tube and coupler scaffolds over 125 in height shall be designed by a professional engineer.

When the scaffold is stabilized, it must be tied at intervals not to exceed 30’ horizontally or 26’ vertically.

APPENDIX 6: Manually Propelled Mobile Ladder Stands and Scaffolds 29 CFR 1910.29 Special Requirements

Requirements:

- General Mobile Scaffold design must meet load capacities based upon Light Duty (25 lb/sq. ft.), Medium Duty (50 lb/sq. ft.), or Heavy Duty (75 lb/sq. ft.).

- The maximum level of the mobile scaffold cannot exceed four times (4 X) the minimum width of the base including suitable outriggers unless guying is provided.

- Guardrails between 36" and 42" in height with a mid rail and toe boards 4" height are required for all mobile scaffolds above 6 ft. in height.

- Minimum platform width for mobile scaffolds is 20".

- Casters must be designed to support four times (4 X) the designed working load, and must have effective positive wheel locks to prevent movement.

- Leveling screw jacks or similar means for adjusting height must be provided in the base section whenever leveling of the scaffold platform is required.

- All mobile scaffolds that are to exceed 50 feet height must be approved in writing by a registered engineer and be erected by the manufacturer or their authorized agents.

Other specific requirements may exist for specific types of mobile scaffolds. For these specifics, consult 29 CFR 1910.29 and/or the Health and Safety Department.

HS 1.29 FIRST AID PROCEDURE

HS 1.29 FIRST AID PROCEDURE

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HS 1.29 FIRST AID PROCEUDRE

1. Purpose

This Procedure has been put in place in order to ensure the immediate and subsequent well-being of any CHES employee who requires first aid treatment.

2. Description

This Procedure specifies appropriate measures to be taken to ensure the immediate and subsequent well-being of any CHES employee who requires first aid treatment. These measures will fulfill the requirements of 29 CFR 1910.151, or in the case where there is a local jurisdiction different than 29 CFR 1910.151, those requirements must be checked and complied with (e.g., Canadian Occupational Health and Safety Regulations, specifically Canada Labour Code (CLC), Part II, Part XVI).

3. Procedures

A. First Aid Responders

1. The number of first aid responders required for fixed facilities will vary with the size of the location and or project. The number of responders selected should be based on the following:

    a. First aid attendants should be able to function as a two-person team. Therefore, at least two trained employees should be available on the site at any time, with the exception of a smaller location (less than 20 full time employees) in which one employee is acceptable.

    b. The likelihood of multiple injuries should be considered.

    c. Allow for vacation or other absence from work.

    d. Allow for greater occupancy of the facility during day shift.

    e. Allow for shutdowns or other peak work situations.

2. First aid responders shall be re-certified every three years by an approved training organization. CPR re-certification is to be conducted as required by the training agency. (American Red Cross – annually; American Heart Association - every two years, St. John Ambulance – recommends annually.)

B. Standard First Aid Kits

Approved first aid kits shall be provided at each facility and in each CHES road truck. Appendix 1 describes what kits are needed and the number required. Ensure these kits and contents meet or exceed state criteria in those states where ANSI Z308.1 has been adopted as the state –recommended requirement. Kits at Canadian facilities need to comply with CLC, Part II, Part XVI, Schedules I and II.

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4. Application

This Procedure applies to all CHES employees.

A. General Manager / Project Manager Responsibilities

1. Conducts or arranges for First Aid and CPR training for designated personnel.
2. Provides standard approved first aid kits at facilities and in each CHES truck.
3. Makes plans in advance for emergency transportation for treatment at a CHES approved medical facility (unless the injuries are beyond the capability of the clinic).
4. Posts emergency numbers including the medical facility, the hospital, physician(s), ambulance and poison control hot line in highly visible areas.
5. Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

Note: Canadian OH&S regulations do not limit applicability to corrosives, but to any agent meeting the definition of a hazardous substance.

B. Health and Safety Manager Responsibilities

1. Assists in determining the number of employees who should be trained in first aid.

2. Assists the General Manager or Project Manager in ensuring that all designated personnel are trained in accordance with the Bloodborne Pathogens Exposure Control Plan and this Procedure.

3. Assists General Manager or Project Manager in complying with this Procedure.

C. Employee Responsibilities

1. All employees will report all injuries to their supervisor immediately.

5. Issuing Department and Contact

Health and Safety Department, Vice President of Health and Safety

6. References

OSHA, ANSI and HRSDC - Human Resources and Social Development Canada

7. Sign-off Department

Law Department

8. Distribution

All Operations Managers and Health & Safety and Compliance Staff

9. Forms/Exhibits/Appendices

Appendix 1: CHES Standard Facility and Truck First Aid Kit
(See next 3 pages.)

APPENDIX 1: Clean Harbors Environmental Services, Inc.
Standard Facility and Truck First Aid Kit

Page 1 of 3

For project sites, an approved first aid kit, with the contents to those specified in this appendix shall be constructed to be weatherproof or placed inside of a weatherproof container. The individual packages are to be sealed in order to maintain them in a clean, sterile, usable condition. Prior to having a first aid kit sent to a project site, the contents will be checked by operations management, or their designee, and at least weekly on each job site. Replenishment of any contents that are expended or expired will be their responsibility of operations management as well. First aid kits at fixed facilities must be inspected, inventoried and replenished at least once per month and the facility general manager is responsible to ensure the kits are properly maintained.

These items are intended for use in rendering only basic first aid care for minor injuries or illnesses or for helping to stabilize a more serious injury prior to transportation to a medical facility for definitive medical care. CHES does not have personnel trained in the use of, nor provide equipment or supplies for, more advanced first aid or medical care.

Kits are designed to provide materials for the number of employees at a particular location or project. Kits will be installed at the ratio of one kit for every 25 employees working at the facility. Kits may be located strategically throughout the facility property as long as this minimum ratio is achieved.

The minimum quantities to be stocked in each standard facility or truck kit is as follows:

Page 2 of 3

Appendix 1 (continued)

Customizing First Aid Kits
(* First Aid Kits should accompany Bloodborne Pathogen Kits.)

CHES Truck

- Fast-aid (first aid guide)
- antiseptic swabs (10 swabs)
- plastic adhesive bandages (16 each)
- elastic non-sterile gauze (1 roll)
- sterile square gauze pads (6 each)
- waterproof adhesive tape (1 roll)
- waterjel - sterile soaked burn-dressing (1 each)
- instant ice pack (1 each)
- alcohol wipes (5 each)
- sterile eye wash (1 bottle)
- 1 CPR mouth and nose shield
- knuckle bandages (10 each)
- 1 triangle bandage
- 1 pair scissors
- Latex or nitrile gloves – 1 pair/bag (non-latex gloves should be available if personnel are latex allergic)
- The above items are ideally contained in a plastic truck mountable kit

Locations with 25 Employees or Less

- 2 Roll adhesive tape ½” X 5 YD
- 10 individual foil packets water-jell first aid cream
- 4 gauze pads 3” X 3”
- 12 gauze pads 2” X 2”
- 100 adhesive bandages 1” X 3”
- 1 cold pack
- 2 plastic strips 2” X 4 1/2”
- 2 eye pads
- 2 ammonia inhalants
- 10 antiseptic wipes
- 1 triangle bandage
- 1 pair scissors
- 1 forceps
- 6 burn cream 1/8 oz.
- 3 insect sting relief
- eye wash
- first aid manual
- 1 CPR mouth and nose shield
- Latex or nitrile gloves – 1 pair/bag (non-latex gloves should be available if personnel are latex allergic)

Appendix 1 (continued)

Locations with 25-75 Employees

- 2 Roll adhesive tape ½” X 5 YD
- 10 individual foil packets water-jell first aid cream
- 25 gauze pads 3” X 3”
- 12 gauze pads 2” X 2”
- 100 adhesive bandages 1” X 3”
- 100 adhesive bandages ¾ X 3
- 20 knuckle bandages
- 40 fingertip bandages
- 1 elastic bandage 2”
- 1 pkg. cotton tip swabs
- 2 cold pack
- 2 plastic strips 2” X 4 1/2”
- 8 eye pads
- 6 tongue depressors
- 1 can burn spray
- 10 ammonia inhalants
- 10 antiseptic wipes
- 1 triangle bandage
- 1 pair scissors
- 1 forceps
- 6 burn cream 1/8 oz.
- 3 insect sting relief
- eye wash
- first aid manual
- 2 CPR mouth and nose shields
- Latex or nitrile gloves – 1 pair/bag (non-latex gloves should be available if personnel are latex allergic)

Locations with 75+ Employees

- 2 Roll adhesive tape ½” X 5 YD
- 30 individual foil packets water-jell first aid cream
- 25 gauze pads 3” X 3”
- 2 rolls adhesive tape 1” X 5 yrds.
- 1 elastic bandage 2”
- 1 elastic bandage 3”
- 12 gauze pads 2” X 2”
- 200 adhesive bandages 1” X 3”
- 200 adhesive bandages ¾ X 3
- 40 knuckle bandages
- 16 butterfly closures
- 25 fingertip bandages
- 1 elastic bandage 2”
- 1 pkg. Cotton tip swabs
- 3 cold pack
- 2 plastic strips 2” X 4 1/2”
- 8 eye pads
- 6 tongue depressors
- 1 can burn spray
- 10 ammonia inhalants
- 40 antiseptic wipes
- 1 triangle bandage
- 1 pair scissors
- 1 forceps
- 10 burn cream 1/8 oz.
- 10 insect sting relief

- eye wash
- first aid manual
- 2 CPR mouth and nose shields
- Latex or nitrile gloves – 1 pair/bag (non-latex gloves should be available if personnel are latex allergic)

HS 1.103 HEARING CONSERVATION GUIDELINES

HS 1.103 HEARING CONSERVATION GUIDELINES

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HS 1.103 HEARING CONSERVATION GUIDELINES

1. PURPOSE

Clean Harbors Environmental Services Companies, Inc. (CHES) is committed to providing a safe and healthful workplace for our employees. Exposure to high noise levels for long periods of time can cause irreparable hearing loss that occurs slowly, over the course of months or years, and often goes unnoticed until permanent damage has occurred. Through the use of engineering controls, training, work practices, administrative controls and personal protective equipment, CHES has sought to prevent hearing loss among our employees. To ensure the continued effectiveness of our prevention program, CHES has established a Hearing Conservation Program.

The guidelines described in this document are to be considered general guidelines. Each facility or site should develop a more detailed site-specific hearing conservation plan to account for any unique aspects of its operations not adequately covered by these general guidelines.

2. SCOPE

This program establishes guidelines for: 1) noise level monitoring, audiometric testing, and proper use and care of hearing protection; 2) training in all aspects of hearing conservation for CHES employees; and 3) evaluation and application of appropriate noise control strategies when noise levels exceed recommended limits. Appropriate noise control strategies include but are not limited to: engineering controls, administrative controls, and personal protective equipment.

3. RESPONSIBILITIES

3.1. Health and Safety Department

3.1.1. Establishes audiometric testing criteria with medical surveillance provider.

3.1.2. Ensures employee notification of standard threshold shifts and medical restrictions with medical surveillance providers.

3.1.3. Develops noise level monitoring program, evaluate results and implement controls.

3.1.4. Notifies employees of noise exposures.

3.1.5. Explains noise-monitoring results prior to posting during safety meetings.

3.1.6. Assists in the selection of hearing protection.

3.1.7. Audits work sites to determine compliance with procedures.

3.1.8. Health and Safety Manager will assist the General or Project Manager in the development of the site-specific plan.

3.19 Health & Safety Manager will educate employees about the benefit of wearing hearing protection at home.

3.2. Training Department

3.2.1. Develops the hearing conservation training module and ensures there is a mechanism to verify workers' understanding of the training material.

3.3. General/Project Manager

3.3.1. Posts a copy of Clean Harbors' Hearing Conservation Program and OSHA Noise standard (29 CFR 1910.95) in a visible place accessible to all workers.

3.3.2. Posts a copy of noise monitoring results in a visible place accessible to all workers.

3.3.3. Enforces the proper medical restrictions placed upon an employee with a Standard Threshold Shift.

3.3.4. Enforces the proper use and care of hearing protection.

3.3.5. Implements a written site-specific hearing conservation program.

3.3.6. Ensures that all personnel working in hazardous noise exposure areas are adequately informed of the hazard and receive training in the site-specific hearing conservation program.

3.3.7. Ensures that engineering controls are investigated and utilized, when necessary, to reduce exposures.

3.3.8. Ensures that persons participating in personal noise sampling are notified of the results.

3.4. Supervisor/Foreman

3.4.1. Maintains a safe work environment by utilizing engineering or work practice controls, where feasible, to keep noise exposures below 85 decibels (dB(A)) as an 8-hour TWA.

3.4.2. Enforces the proper medical restrictions placed upon an employee with a Standard Threshold Shift.

3.4.3. Provides and enforces proper use of hearing protection while controls are being implemented or are not feasible.

3.4.4. Enforces the proper use and care of hearing protection.

3.5. Employees

3.5.1. Review and comply with the procedures and requirements of this program.

3.5.2. Follow noise level monitoring procedures.

3.5.3. Avoid sources of noise for at least 14 hours prior to an audiological exam.

3.5.4. Comply with medical restrictions and hearing protection requirements.

3.5.5. Notify supervisor of deficiencies in hearing protectors.

3.5.6. Utilize hearing protection when required or advisable.

3.5.7. Keep hearing protection in clean, undamaged condition. Do not alter manufacturer design.

3.6. CHES' Contracted Medical Monitoring Firm/Medical Provider

3.6.1. Notifies employees, by written statement on physical exam information sheet, of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately before an audiometric examination.

3.6.2. Selects, evaluates and reports audiometric test protocols.

3.6.3. Ensures that audiometric tests conform to 29 CFR 1910.95, Appendices C, D, & E.

3.6.4. Maintains audiometric testing results in personal medical files along with personal dosimeter results, when available, for the duration of the affected employee's employment as required by 29 CFR 1910.95 (m).

3.6.5. Notifies in writing the manager of industrial hygiene whenever any person has been notified of a standard threshold shift (where applicable).

4. NOISE LEVEL MONITORING

4.1. Allowances

Noise monitoring is conducted to determine employee noise exposures and identify activities and equipment, which present a health or safety hazard. Noise monitoring allows the following:

4.1.1. Identification of employees, job positions and operations with 8-hour TWA exposure above 85 decibels (dB(A));

4.1.2. Selection of hearing protection with sufficient attenuation to reduce noise levels to 85 dB(A) as an 8-hour TWA;

4.1.3. Classification of noise exposures for prioritizing controls and protection;

4.1.4. Evaluation of noise sources and methods of control.

4.2. Monitoring Program

The monitoring program will be implemented when information indicates that an employee's noise exposure may exceed the OSHA action level of 85 dB(A) as an 8-hour time weighted average. The monitoring program may include area sound level measurements and personal dosimeter measurements.

Canadian exposure evaluations shall be conducted using the appropriate regulatory criteria.

4.2.1. Monitoring Procedures

Employees will be monitored when the activities they perform may create noise levels exceeding 85 decibels (dB(A)). Selection of employees will be based upon the following criteria:

A. Operations with known sound levels above 85 dB(A) as determined by equipment manufacturer's information.

B. Suspected exposures above 85 dB(A)

1. Target anticipated noisy equipment/operations

2. Random sampling during suspect activities.

C. Referrals

1. Audiometric testing determines a threshold shift

2. Employee complaint

3. Management referral (supervisor, foreman, H&S)

4.2.2. Performance of Noise Monitoring

Noise surveys are designed to obtain accurate information of worker noise exposure representative of worker activities. Personal samples are preferred and should be collected for the length of the entire work shift. Area samples may be collected in order to target suspected sources of noise exposure, but should be followed with personal noise samples. Complete guidelines for the performance of noise monitoring are available from the Health & Safety Department. Affected employees shall have an opportunity to observe any noise measurements conducted.

4.2.3. Calibration Checks

A. Perform pre-use calibration check on noise monitoring equipment prior to and immediately upon completion of noise-monitoring event utilizing calibration-checking devices specified by the manufacturer.

B. All equipment shall be calibrated, on a regular basis, as per the manufacturer’s requirements.

4.3. Evaluation of Results

Noise data will be evaluated by CHES Health and Safety using the following criteria:

4.3.1. All noise levels in the range of 80-130 dB(A) will be included in calculation of employee noise dose.

4.3.2. The OSHA Permissible Exposure Limit (PEL) of 90 decibels will be used as the criterion level for 100% dose. The OSHA action level of 85 dB(A) will correspond to a 50% dose.

4.3.3. An employee's exposure is in compliance with the CHES 8-hour TWA recommended level when:

A. Full Shift Sample determines that the average noise exposure is below 85 dB(A).

B. Partial Shift Sample determines an average noise exposure below 85 dB(A), the projected 8-hour dose is below 50%, and there is sufficient evidence that the employee's exposure was below 80 dB(A) at all times during unsampled periods.

4.3.4. A non-compliance condition exists when:

A. Average noise exposure level for a partial or full shift sample exceeds 85 dB(A) as an 8-hour TWA.

B. Projected eight-hour dose exceeds 50% dose for a partial or full shift sample.

4.4. Clean Harbors Recommended Exposure Limits

Eight-Hour Shift: A noise level of 85 dB(A) is the Clean Harbors recommended maximum exposure limit for an 8-hour shift. (This criterion level corresponds to one-half of the OSHA permissible exposure limit, or a 50% dose.)

Shifts Longer Than Eight Hours: The 85 decibel recommended exposure limit is based on eight hours of exposure. Hearing protection should be worn if the levels below are known or anticipated to exceed the levels listed below. If a work shift is longer or shorter than eight hours, the recommended limit will decrease or increase as follows:

Length of Shift	**Recommended Exposure Limit**	**Corresponding OSHA 90 dB Dose Level**
16 hrs	80 dB(A)	25%
10 hrs	83 dB(A)	39%
8 hrs	85 dB(A)	50%
4 hrs	90 dB(A)	100%
2 hrs	95 dB(A)	200%

4.5. Employee Notification

4.5.1. All noise results will be posted in the workplace. Results should be posted as long as possible as a daily reminder of high noise areas and activities.

4.5.2. Results will be explained prior to posting during safety meetings.

4.5.3. Results will be maintained for a minimum of two years by the Health & Safety Department.

5. AUDIOMETRIC TESTING

5.1. Frequency

Audiometric testing is conducted to establish baseline hearing levels, determine the effectiveness of the control program, and identify any hearing loss experienced by employees due to occupational noise exposure. The audiometric testing program consists of a baseline audiogram, annual audiograms, exposure history questionnaire and audiologist evaluation.

5.2. Employees Covered

Audiometric testing is required for all employees who are exposed to noise levels equal or greater than 85 decibels as an eight-hour time weighted average. All CHES employees covered by the Medical Surveillance Program will be provided with an audiogram during their initial and annual medical exams. Follow-up audiometric testing will be provided if a hearing loss defined by OSHA as a Standard Threshold Shift (STS) is determined.

5.3. Audiometric Testing Procedures

5.3.1. Test procedures and equipment will comply with requirements of the OSHA Occupational Noise Exposure Standard (29 CFR 1910.95 (g) and Appendices C, D and E).

5.3.2. Hearing Ranges Tested: Audiometric tests shall measure an employee's hearing threshold at sound frequencies of 500, 1000, 2000, 3000, 4000 and 6000 Hz. Tests at each frequency shall be conducted separately for each ear.

5.4. Evaluation of Audiometric Results

5.4.1. Each employee's annual audiogram is compared to that employee's baseline audiogram obtained during the pre-employment physical.

5.4.2. Hearing Loss: An employee is determined to have a hearing loss if comparison of hearing thresholds in the 2000, 3000, and 4000 Hz ranges show an average change of 10 decibels or more in either ear. This hearing loss is defined by OSHA as a Standard Threshold Shift (STS).

5.4.3. Establishment of a New Baseline - An annual audiogram may be substituted for the baseline audiogram when:

A. The STS is permanent (hearing thresholds do not improve during 30-day retest); or

B. The annual audiogram indicates significant improvement from the baseline audiogram.

5.5. Procedures for Standard Threshold Shifts (STS)

5.5.1. Employee and Corporate Health and Safety Departments will be informed in writing of an STS by CHES' medical provider within 21 days. Please see Appendix 4A - 4F for the protocol.

5.5.2. Retest: A retest of the employee's hearing levels should be made within 30 days of the audiogram when an STS is determined.

A. If retesting determines that the STS was temporary and not persistent, the employee will be notified of the new determination. No hearing-related medical restrictions will be applied.

B. If retesting determines that the STS is persistent, a physician will review the employee's medical and work history to determine if the hearing loss is work related or could be aggravated by occupational noise exposure. The physician will also determine if further medical evaluation is needed.

5.5.3. STS Related to Work Exposure: If the physician determines that an STS is either work related or may be aggravated by workplace noise exposures, the following steps must be performed:

A. The employee is required to use hearing protection. The hearing protector(s) shall attenuate employee exposure to an 8-hour TWA of 85 decibels or lower. Employee will be fitted with hearing protection and trained in their use.

B. If the employee is already using hearing protection, retraining and refitting will be provided. Hearing protection with greater NRR attenuation will be provided, as needed, to attenuate employee exposure for an 8-hour TWA to 85 decibels or lower.

C. Refer employee for clinical audiological evaluation or otological examination if a medical pathology is suspected, or if additional testing is necessary.

D. Generate an Occupational Injury and Illness Report for STS that are determined to be work related. Record information on OSHA 300 form for the branch where the employee is stationed.

E. Notify CHES' Industrial Hygienist of employee's STS so that employee's position can be targeted for noise level monitoring and use of hearing protection can be evaluated or re-evaluated.

6. ENGINEERING AND ADMINISTRATIVE CONTROLS

6.1. Preferred Methods

6.1.1. The preferred method of noise control is the use of engineering controls to reduce noise at the source. OSHA requires that engineering controls are evaluated and implemented before reliance on personal protective equipment.

6.1.2. Engineering or administrative controls are necessary when noise levels exceed permissible limits. As a rule of thumb, permissible limit is exceeded when it is difficult for two persons standing three feet apart to speak without shouting to be heard. When engineering controls cannot sufficiently reduce sound levels, administrative controls and personal protective equipment may be considered.

6.2. Engineering Control Strategies

The following categories describe methods, which should be evaluated and applied, if feasible, to reduce noise levels at the source:

6.2.1. Equipment Purchases/Rentals

A. Equipment Maintenance

B. Equipment Modification

C. Equipment Operation

D. Minimize Vibration

6.2.2. See the Noise Physical Hazard Data Sheet (Appendix 2) for detailed information on selection and implementation of engineering controls in these categories.

6.3. Administrative Controls

An administrative schedule may be developed to rotate employees in and out of the work area so that their cumulative noise dose remains below permissible levels. Due to the difficulty in enforcing such a schedule, it is preferable to reduce noise levels initially to acceptable levels.

6.4. More Than One Noise Source

Noise from different pieces of equipment contributes to the overall sound level in the work area. When more than one noise source is involved in an area, the loudest source should be evaluated and controlled first.

7. HEARING PROTECTION

7.1. Availability

Hearing protection provided by CHES at no cost to the Employee.

7.2. Required Use

7.2.1. Hearing protection is required in the following situations:

A. Standard threshold shift hearing loss exists.

B. Employees performing an activity or operation with equipment known or suspected to generate noise levels above:

1. 85 decibels over an eight-hour shift;

2. In areas which exceed 90dBA regardless of the amount of time spent in the area;

3. Or the limits outlined in Section 4.4.2.

NOTE: A site specific Hearing Conservation Program is required for locations and operations where exposure exceeds 85 dBA.

7.3. Selection

Hearing protection in combination with engineering and administrative controls must attenuate (reduce) employee exposure below 85 decibels. The adequacy of hearing protection attenuation shall be re-evaluated periodically and whenever employee noise exposures increase. Hearing protection attenuation shall be determined by the following method:

7.3.1. Determine employee's TWA noise exposure as measured on the A-weighted scale.

A. Subtract 7 dB from the hearing protection device's NRR.

B. Divide that value by two (2) for a 50% safety factor.

C. Subtract this new value from the employee's TWA noise exposure to determine the attenuated exposure.

7.3.2. If a combination of ear muffs and earplugs may be necessary, the dual hearing protection attenuation shall be determined by the following method:

A. Perform the attenuation calculations for the higher of the two NRR's.

B. Add 5 dB to this value.

C. Subtract this new value from the employee's TWA noise exposure to determine the dual protection attenuated exposure.

7.3.3. Ideal Attenuation Level

A. 75-80 decibels in the ideal range for effective communication while wearing protection. The hearing protection device should attenuate to this range for all tasks if possible.

7.4. Fitting, Use, Maintenance

7.4.1. To achieve optimal attenuation, employees and supervisors must be instructed on the proper fitting, use and maintenance of hearing protection.

A. Ear Plug Fit: earplugs should be inserted according to manufacturer's directions. Generally, the outer ear should be pulled up and away from the head with the opposite hand, and the earplug should be inserted directly into the ear canal with the other hand. Expandable earplugs should not extend into curves of outer ear.

B. Ear Plug "Fit Test": with earplugs inserted, firmly cup hands over both ears while listening to a steady noise. The noise levels should seem the same with ears covered, and uncovered.

C. Ear Muff Fit: earmuffs should form an airtight seal around the outer ear. Adjust muffs to avoid interference from eyeglasses or respirator face pieces.

D. Maintenance: hearing protectors should be kept clean, intact and free of contamination to ensure proper fitting and attenuation.

7.4.2. Employees will be trained to avoid the following factors that can reduce the attenuation capabilities of hearing protectors:

A. Air Leaks: an airtight seal within the ear canal for ear plugs and around the external ear for ear muffs is required. Proper fitting of hearing protectors will avoid this problem.

B. Transmission of Noise through Hearing Protector: sound waves can travel through earmuff cushions and earplugs. Inspect hearing protectors and discard deteriorated or damaged muffs plugs.

C. Dislodged Plugs/Muffs: physical activity may cause earplugs to work loose or muff cushions to break their seal. Hearing protectors should be inspected periodically during use and readjusted if necessary.

D. Deterioration: ear plugs, muff cushions and headbands can shrink, crack or harden due to age, dirt or perspiration. Hearing protectors should be inspected daily to ensure that a proper fitting will be possible.

E. Alteration of Design by Employees: modifying hearing protectors to increase comfort or allow more sound to pass through can significantly reduce attenuation. Manufacturer's design should not be altered.

8. TRAINING

8.1. Annual Training

Annual hearing conservation training is provided to all employees whose job activities may expose them above an eight-hour time-weighted average of 85 decibels.

8.2. Program Guidelines

8.2.1. The hearing conservation training program includes the following components, and will be updated periodically to address changes in equipment, protective equipment or work practices:

A. Physical properties of noise;

B. Physiological effects of noise on hearing;

C. Purpose and procedures of noise monitoring;

D. Purpose and procedures of audiometric testing;

E. Explanation of standard threshold shift and medical restrictions;

F. Purpose, selection, fitting, use and care of hearing protection;

G. Review contents of the OSHA Occupational Noise Exposure Standard, 29 CFR 1910.95 or applicable Canadian legislation.

H. Posting the location of the OSHA standard, or applicable Canadian legislation, in the workplace and location where a copy of the standard and/or the training materials may be obtained; and

I. Outline the CHES Hearing Conservation Program and specific Policies.

9. RECORDKEEPING

9.1. Requirements

9.1.1. Audiometric test results shall be maintained for the duration of an employee’s employment.

9.1.2. Employee noise exposure measurements shall be maintained for at least two years from the date of monitoring.

9.1.3. Documentation of annual training shall be maintained by the Training Department for the duration of the employee’s employment.

9.1.4. Record confirmed standard threshold shifts on each office's OSHA 300 form.

9.1.5. Upon request, these records will be supplied to: employees, former employees, designated employee representatives or OSHA, with concurrence of Clean Harbors' Corporate, Health and Safety, Legal and Human Resources Departments.

10. POSTING

Post a copy of the OSHA Occupational Noise Exposure Standard, 29 CFR 1910.95 or the applicable Canadian legislation, in a visible place accessible to all workers.

11. REFERENCES

US. Department of Labor, Occupational Safety and Health Act of 1970, General Industry Noise Standard 29 CFR 1910.95.

NIOSH, A Practical Guide to Effective Hearing Conservation Programs in the Workplace, DHHS, (NIOSH) Publication No. 90-120.

Berger, Eliot; "Hearing Protector Performance: How They Work and What Goes Wrong in the Real World." (EAR Cabot Corporation, Earlog #5, 1980.)

12. APPENDICES

Appendix 1 – Hearing Conservation Program Follow Up Procedures

Appendix 2 – Noise Physical Hazard Data Sheet

Appendix 3 – Manager/Supervisor Questionnaire

Appendix 4A – 4F: STS Work- Relatedness Protocol

APPENDIX 1: Hearing Conservation Program Follow-up Procedures

1. Permissible Noise Exposure Limits

Length of Shift	Recommended Exposure Limits	Corresponding OSHA 90 dB Dose Level
16 hrs	80 dB(A)	25%
10 hrs	83 dB(A)	39%
8 hrs	85 dB(A)	50%
4 hrs	90 dB(A)	100%
2 hrs	95 dB(A)	200%

2. When Noise Exposure Exceeds Permissible Limits

2.1. Post results in area accessible to all employees.

2.2. Evaluate engineering controls to reduce sound levels.

2.3. Ensure hearing protection is worn by all employees conducting the monitored operation.

2.4. Provide training in use of hearing protection.

2.5. Provide annual training using Hearing Conservation module.

2.6. Provide audiogram during annual medical exam.

3. When Hearing Loss (STS) Is Reported During Annual Medical Exam

3.1. Conduct noise monitoring during the employee's job activities.

3.2. Evaluate engineering controls to reduce sound levels.

3.3. Ensure hearing protection is worn during all activities where noise levels exceed permissible levels listed above.

3.4. Provide re-training in use of hearing protection.

3.5. Provide annual training using Hearing Conservation module.

3.6. Provide follow-up audiogram within 30 days of first audiogram.

3.7. Provide annual audiogram during annual medical exam.

3.8. Record on OSHA 300 and generate an Occupational Injury and Illness report for hearing loss (STS), which are determined by a physician to be work related.

APPENDIX 2: Noise Physical Hazard Data Sheet

Page 1 of 2

TASK	**HAZARD**	**CONTROL**
________	**NOISE**	As a rule of thumb, noise reduction is necessary when two persons standing three feet apart have difficulty speaking and must shout to be heard.

Equipment Purchases/Rentals

- Select quiet equipment.
- Use mufflers on fuel-powered machines.
- Use silencers on pneumatic tools.
- When using impact tools, select the smallest tool which is capable of performing the work.

Equipment Maintenance

- Ensure mufflers are working correctly.
- Keep equipment tuned-up, efficient, and properly lubricated.
- Replace parts worn by corrosion or bent out of shape.
- Clean dirt and grease build-up from moving parts.

Equipment Modification

- Reduce vibrating surfaces by adding dampers, and increasing mass.
- Enclose equipment with absorption panels.
- Perforated metal mesh fan belt guards produce less noise than guards made of solid sheet metal.

Equipment Operation

- Operate equipment as recommended by manufacturer.
- Use mufflers on double diaphragm pumps.
- Operate compressors with panels closed.
- Locate machinery as far from occupied work areas as possible.
- Locate machinery away from walls, structures, or other enclosures that can reflect noise into the work area.
- Prevent or reduce impact between machine parts and material handled.
- When using excavation equipment, drop material as low to the ground as possible.

Minimize Machinery Vibration

- Tighten loose parts.
- Correct misalignment, unbalanced rotors, slipping clutches and worn belts.
- Keep adequate lubrication.
- Isolate vibrating structures with springs or shock mounts.

APPENDIX 2: Noise Physical Hazard Data Sheet – page 2 of 2.

TASK	HAZARD	CONTROL
______	NOISE	**Recommended Noise Limits**

Shift Length	Recommended Limit
16 hours	80 dB
10 hours	83 dB
8 hours	85 dB
4 hours	90 dB

Hearing Protection

- Use Hearing Protection when engineering controls cannot reduce noise levels below PEL:

Ear Plugs and Muffs	Plugs or Muffs
Vactor	Backhoe
Scarifier	Pressure Washer
Carbide Saw	Coppus Blower
Jackhammer	Vacuum Pump
Abrasive Blasting	Compressor with Panels Up
d/d Pump without Muffler	

APPENDIX 3: Manager/Supervisor Questionnaire Investigation of Recordable Hearing Shifts

This employee has incurred a significant decrease in hearing. More detailed information is needed to investigate the reason for the change and to determine if additional preventative actions are needed. Please provide the information requested below and return it to HCI along with the Employee Questionnaire.

Employee Name: ______________________ **Date of Birth:** ______________
Employee ID Number: ______________________ **Date of Hire:** ______________

WORK HISTORY AND NOISE EXPOSURE

List each job employee has held, starting with the current position, and the corresponding noise information. If noise dosimetry time weighted averages were calculated, list under "Noise Exposure." If the noise measurements of the work area were done, indicate if a 8 hour TWA or a sound level survey in the appropriate "Area Noise Level" column.

Time in position Mo/Year to Mo/Year	Department	Job	Shift Length (hours)	Noise Exposure dBa (TWA)	Area Noise Level dBA (TWA)	Area Noise Level dBA SLS	Hearing Protection Make, Type, and NRR
EX: 1/2000 to 1/2005	***Maintenance***	***Electrician***	***12***	***92 dBA***			***E.A.R. Foam Earplug***

Is the noise exposure equal from all directions or greater from the right or left?
☐ Same ☐ Louder from Right ☐ Louder from Left

Does the employee use a two-way radio or communication device? ☐ Yes ☐ No

If "Yes", is a speaker/lapel microphone worn? ☐ Yes ☐ No
If "Yes", where is the speaker/lapel microphone worn? ☐ Right ☐Left ☐ Center

Has employee ever been exposed to loud blast of sound at work? ☐ Yes ☐ No
Was hearing protection used at the time? ☐ Yes ☐ No

HEARING PROTECTION DEVICE (HPD)

Provide information regarding the current HPD use including details of employee's ability to wear HPD correctly.

Provide the current HPD information:

Does the employee demonstrate correct HPD fit? Roll, pull down up, and hold in place until it expands?
Comments:

Based on personal observations, has the employee complied with the current HPD policy in the past regarding the use tof wearing HPDs in designated areas and/or designated equipment when operating it or within 25 feet of its operation?
Comments:

MILITARY SERVICE

Dates of Military Service	Branch	Exposed to hazardous noise?	Describe Noise Exposure	Was hearing protection used?	Type of HPD Used:
		☐Yes ☐No		☐Yes ☐No	
		☐Yes ☐No		☐Yes ☐No	

SECOND JOB/OTHER NOISE HISTORY

Does employee hold a second noisy job?	☐Yes ☐No	If “Yes” is hearing protection used? ☐Yes ☐No
Has employee ever been exposed to a sudden blast of sound without hearing protection?	☐Yes ☐No	If “Yes” please explain:

NONOCCUPATIONAL NOISE EXPOSURE HISTORY

The following details will supplement the annual history completed by the employee. Provide, if known:

Activity		# year of exposure	# of hours of exposure/year	Hearing Protection Used?
Power tools (carpentry, woodworking, etc.)	☐Yes ☐No			☐Yes ☐No
Hunting or shooting	☐Yes ☐No			☐Yes ☐No
Chainsaw	☐Yes ☐No			☐Yes ☐No
Gas-powered lawnmower, blower, etc.	☐Yes ☐No			☐Yes ☐No
Tractor, or other farm machinery	☐Yes ☐No			☐Yes ☐No
Metal working	☐Yes ☐No			☐Yes ☐No
Grinders, riveters	☐Yes ☐No			☐Yes ☐No
Air-driven or explosive-driven tools	☐Yes ☐No			☐Yes ☐No
Personal mechanic work	☐Yes ☐No			☐Yes ☐No
Airplane piloting	☐Yes ☐No			☐Yes ☐No
Model airplane flying	☐Yes ☐No			☐Yes ☐No
Powerboat or ski jet	☐Yes ☐No			☐Yes ☐No
Motorcycle	☐Yes ☐No			☐Yes ☐No
Snowmobile	☐Yes ☐No			☐Yes ☐No
Car racing	☐Yes ☐No			☐Yes ☐No
Go-carts	☐Yes ☐No			☐Yes ☐No

MEDICAL HISTORY

Describe any medical condition you are aware of which could have affected the employee’s hearing (e.g., ear infections, ear aches, ear infections, etc.):
Other possible significant information:

Completed by: ______________________ **Signature:** ______________________

Date: ______________________ **Title:** ______________________

Phone number: ______________________

APPENDIX 4A – 4G: STS Work Relatedness Protocol

APPENDIX 4A
Hearing Conservation Program

Protocol For Determining Work-Relatedness of a Standard Threshold Shift (STS)

Definition: According to 29 CFR 1910.95, a Standard Threshold Shift is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.

If an STS is detected, it must be confirmed by a repeat audiogram performed within 30 days of the initial test. Employees should be informed to avoid unprotected loud noise exposure for at least 14 hours prior to the retest. Once an STS has been confirmed by repeat audiogram, the physician responsible for the hearing conservation program, will obtain necessary information to determine if the STS is work-related or non-work-related.

1. The Employee will complete a comprehensive hearing questionnaire (see **Appendix I**).
2. The Employer (safety professional) will provide to the licensed healthcare professional responsible for the hearing conservation program, workplace noise exposure information and dosimetry if available (**Appendix II**).
3. If the etiology of the STS is uncertain, the employee will be referred to an Otolaryngologist (ENT) for a thorough hearing evaluation including audiometry. Most employees will likely require an ENT consultation to assist in determining work-relatedness.
4. Once the work-relatedness of the STS has been determined by the physician responsible for the hearing conservation program, the Work Relatedness and OSHA Recordability Statement (**Appendix III**) will be completed.
5. The Employer (safety professional) will then complete the Evaluation of Hearing Protection (**Appendix IV**), and perform employee refitting and retraining, and complete **Appendix V**.
6. A new baseline audiogram will be established.

The following criteria suggest **noise induced** hearing loss (which may or may not be a work-related hearing loss):

- It is a sensori-neural loss (can only be confirmed by air conduction vs. bone conduction testing by a clinical audiologist, although one can guess that the majority of the loss is sensori-neural by the configuration).

- It is almost always bilateral (can be worse in one ear due to protection by the head)

- The majority of the loss is in the high frequencies.

- There is often a “notch” at 4000 Hz (can be 3000 Hz and 6000 Hz also), very indicative of noise induced hearing loss.

- With continued exposure with no hearing protection, it gets worse over time in the high frequencies.

- Over time the loss also spreads to the middle and lower frequencies.

The following criteria suggest **non-noise induced** hearing loss (non-work related):

- Any conductive hearing loss (can only be confirmed by air conduction vs. bone conduction testing by a clinical audiologist, although one can guess that the majority of the loss is conductive based on the configuration.)

- A flat hearing loss in one or both ears (i.e. nearly equal hearing loss across all frequencies)

- A unilateral hearing loss (i.e. normal hearing in one ear and a significant loss in the other ear).

- A low frequency hearing loss in one or both ears.

The physician reviewing the STS must use the rules in 29 CFR 1910.95 to determine if the hearing loss is work-related in accordance with the OSHA Occupational Noise Standard, and 29 CFR 1904.10 to determine if the hearing loss is OSHA recordable in accordance with the OSHA Recordkeeping Standard. If an event or exposure in the work environment either caused or contributed to the hearing loss, or significantly aggravated a pre-existing hearing loss, you must consider the case to be work related.

Once all relevant information related to the employee’s STS is gathered, if the work-relatedness of the STS is still uncertain, the physician reviewing the case can consult with Pam Gordon, MS, CCC-A. Pam Gordon is an AllOne Health hearing conservation consultant. She is available as needed to discuss the etiology of an employee’s STS. She can be contacted at pamgordon@gordonhearing.com

APPENDIX 4B: Employee Questionnaire

Send to: AllOne Health
600 West Cummings Park Suite 3400
Woburn, MA 01801

Tel: (781) 935-8581
FAX: (781) 938-4678

NAME	DOB	PLANT	DATE

Yes **No**
☐ ☐ Have you ever gone to a specialist (audiologist or ENT doctor) for ear or hearing problems?

Have you ever had any of the following medications? If yes, for how long did you/have you been taking them?

Yes	No		Duration	Yes	No		Duration
				☐	☐	Gentamicin	
☐	☐	Streptomycin		☐	☐	Quinine	
☐	☐	Neomycin		☐	☐	Large amounts of aspirin	
☐	☐	Kanamycin		☐	☐	Diuretics	

Have you ever had any of the following noise exposures outside of work?			# years of exposure	# of hrs of exposure/yr.	Used hearing protection?	
Yes	**No**				**Yes**	**No**
☐	☐	Power tools (carpentry, woodworking, etc.)			☐	☐
☐	☐	Hunting or shooting			☐	☐
☐	☐	Chainsaw			☐	☐
☐	☐	Gas-powered lawnmower, blower, etc.			☐	☐
☐	☐	Tractor, or other farm machinery			☐	☐
☐	☐	Metal working			☐	☐
☐	☐	Grinders, riveters			☐	☐
☐	☐	Air-driven or explosive-driven tools			☐	☐
☐	☐	Airplane piloting			☐	☐
☐	☐	Powerboat			☐	☐
☐	☐	Motorcycle			☐	☐
☐	☐	Snowmobile			☐	☐
☐	☐	Car racing			☐	☐
☐	☐	Go-carts			☐	☐
☐	☐	Loud music or concerts			☐	☐
☐	☐	Stereo headphones (Ipods, MP3 players)			☐	☐
☐	☐	Other noisy hobbies or activities – Describe: ______________________			☐	☐

Please provide any other information regarding non-work related noise exposure:

Have any of your blood relatives had any significant hearing loss prior to age 50?

Yes	No		Yes	No	
☐	☐	Mother	☐	☐	Sisters
☐	☐	Father	☐	☐	Brothers
☐	☐	Aunts	☐	☐	Daughters
☐	☐	Uncles	☐	☐	Sons

Have you ever had any of the following?

Yes	No		Yes	No	
☐	☐	Measles or mumps	☐	☐	Very high fever (greater than 104 degrees)
☐	☐	Meningitis or encephalitis	☐	☐	Ruptured ear drum
☐	☐	Ear drainage	☐	☐	Tubes in ear(s)
☐	☐	Balance disorder	☐	☐	Frequent ear wax buildup
☐	☐	Brain disease or tumor	☐	☐	Facial numbness or paralysis
☐	☐	Stroke	☐	☐	Seizure / convulsions / epilepsy
☐	☐	Brain, ear, or mastoid bone surgery	☐	☐	Serious head injury / knocked unconscious
☐	☐	Skull fracture	☐	☐	Exposed to an explosion or blast
☐	☐	Diabetes (high sugar)	☐	☐	Arteriosclerosis (hardening of the arteries)
☐	☐	High blood pressure	☐	☐	Meniere’s disease
☐	☐	Autoimmune disorder	☐	☐	Tobacco smoking
☐	☐	Scarlet Fever	☐	☐	Influenza
☐	☐	Thyroid Disorder	☐	☐	Heart Disease
☐	☐	Multiple Sclerosis	☐	☐	Cancer
☐	☐	Arthritis	☐	☐	Ear Infections
☐	☐	Ear Surgery	☐	☐	Ringing in Ears
☐	☐	Use Hearing Aids	☐	☐	Dizziness/Vertigo

Comments/Additional Information:

Name:

Date:

List Current Medications:

Any Side Effects:

Have you ever been exposed to the following solvents and/or chemicals (at work)?

		Respirator Worn?	
		Yes	No
Arsenic	Hrs. per day for years	☐	☐
Carbon Disulfide	Hrs. per day for years	☐	☐
Carbon Monoxide	Hrs. per day for years	☐	☐
Cyanide	Hrs. per day for years	☐	☐
Lead and Derivatives	Hrs. per day for years	☐	☐
Manganese	Hrs. per day for years	☐	☐
Mercury & Derivatives	Hrs. per day for years	☐	☐
N-Hexane	Hrs. per day for years	☐	☐
Stoddard Solvent	Hrs. per day for years	☐	☐
Styrene	Hrs. per day for years	☐	☐
Toluene	Hrs. per day for years	☐	☐
Trichlorethylene	Hrs. per day for years	☐	☐
Xylene	Hrs. per day for years	☐	☐

Have you had any significant solvent exposure outside of work? If so, please describe:

Did you ever serve in the military? ☐ Yes ☐ No If yes,
Years of Active Duty:
Years in Reserves:

Were you exposed to high noise in the service? ☐ Yes ☐ No
Artillery ☐ Yes ☐ No
Flying ☐ Yes ☐ No

What % of time did you wear hearing protection while exposed to noise in the military? %

Occupational History

Noise Exposure History at **Current** Employer
List current department first and work back to each department in which you have worked.

Department	Did You Work In A Noise Hazard Area?	Time in Department MM/YR to MM/YR	Year Hearing Protection Given Make, Type, NRR	%Time Hearing Protection Worn While In a Noise Hazard Area

Is the noise exposure equal from all directions or greater from the right or left?
☐ Same ☐ Louder from Right ☐ Louder from Left

Do you use a two-way radio or communication device? ☐ Yes ☐ No

If "Yes", is a speaker/lapel microphone worn? ☐ Yes ☐ No
If "Yes", where is the speaker/lapel microphone worn? ☐ Right ☐Left ☐ Center

Have you ever been exposed to loud blast of sound at work? ☐ Yes ☐ No If so, when:?
Was hearing protection used at the time? ☐ Yes ☐ No

Former Employers

Name of Employer	Years Worked in High Noise	Year Hearing Protection Issued	% Time Hearing Protection Worn

Do you currently have a second noisy job? ☐ Yes ☐ No If "yes" is hearing protection used? ☐ Yes ☐ No

Have you ever been exposed to a sudden blast of sound without hearing protection? ☐ Yes ☐ No If "Yes" please explain:

Please provide any additional information on **work-related** noise exposure:

APPENDIX 4C: Safety Professional

Employee:

Date form completed:

Completed/approved by:

Name of Safety Professional:

Work History (with current employer)			**Noise exposure data (Fill in columns with data as available for each job title**				
Years Employed.	**Job Title**	**Job Description**	**Personal dosimetry (this employee)**	**Personal dosimetry (representative employee)**	**Area Monitoring**	**Qualitative judgment of noise conditions in work area**	**Comments**

HEARING PROTECTION DEVICE (HPD)
Provide information regarding the current type of HPD used by the employee.

Does the employee demonstrate correct use of the HPD?

Based on personal observations, has the employee complied with the current HPD policy regarding the use of HPDs in designated areas, or while operating designated equipment, or within 25 feet of its operation?

Comments:

Can you provide any information about this employee's noise exposure outside of work? If so, please describe:

Do you have any other information relevant to the employee's hearing loss?

APPENDIX 4D: Work Relatedness

WORK RELATEDNESS AND OSHA RECORDABILITY STATEMENT

To Be Completed by the Healthcare Professional

Employee Name:

The determination of whether a Standard Threshold Shift (STS) is "work related" is accomplished on a case-by-case basis. Recordkeeping rule 76 FR 44045 states that "A case is work related if one or more events or exposures in the work environment either causes or contributed to the hearing loss, or significantly aggravated a pre-existing hearing loss".

After review of all of the relevant information (including reports from the Audiologist and Otolaryngologist) it is determined that:

The STS **IS** work related.

The STS ***IS NOT*** work related.

If a work related STS has occurred AND if the absolute hearing loss in that ear without age correction is equal to or greater than an average of 25dB at 2000, 3000, and 4000Hz, the STS is OSHA recordable:

The STS **IS** recordable on the OSHA 300 log. The shift must be logged as the date of (M/D/Y)
/ / .

The STS ***IS NOT*** recordable on the OSHA 300 log. If it has been recorded on the log, the entry may be lined out.

____
Signature of Licensed Healthcare Professional
(Audiologist or Physician)

____
DATE

APPENDIX 4E: Evaluation of Hearing Protection

Employee Name:	**Date:**

What type of hearing protector does the employee currently use?_____ List make and model:_____

_____ Disposable Plug
_____ Non-disposable plug
_____ Canal cap/semi insert
_____ Muff
_____ Plug and muff together

Calculate the "Attenuation Level" for the employee's hearing protector:

NRR of hearing protector _____
NRR minus 7 _____
Divide by 2 _____
=Attenuation level _____

Employee's current time weighted average exposure level:_____ dBA
(If multiple days/shifts tested, use the average TWA of all days/shifts tested)

Subtract the Attenuation level from the TWA exposure level to find the "Effective Protection Level" for that employee. It must be at least less than 85 dBA.

Employee TWA _____
Minus Attenuation level - _____
= _____ "Effective Protection Level"

Calculate the number of decibels of attenuation needed to achieve an "Ideal Effective Protection Level" of ***75-80 dBA*** while using the protector. This is the ideal range for effective communication with the hearing protector. This figure may be less than the "Effective Protection Level".

Employee's final "Ideal Effective Protection Level _____

Consider a different hearing protector that will achieve the "Ideal Effective Protection Level" of 75-80 dBA. (e.g. plugs such as Mild Attenuation/Flat Response).

__________________________ ____________________
Name of Safety Professional Signature

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APPENDIX 4F:

EMPLOYEE REFITTING AND RETRAINING

To Be Completed by the Employer

Employee Name:

Once a “Standard Threshold Shift” has been confirmed, the employer must do the following:

1. Inform the employee of the STS in writing within 21 days of receiving the result back from the hearing conservation program professional.
2. Refit and retrain the employee in the use of hearing protection.

THIS PROCEDURE MUST BE FOLLOWED IFTHE STS IS DETERMINED TO BE WORK-RELATED. IF THE STS IS DETERMINED TO BE NON-WORK RELATED IT IS STILL PRUDENT (BUT NOT MANDATORY) TO REFIT AND RETRAIN THE EMPLOYEE IN THE USE OF HEARING PROTECTION TO MINIMIZE FUTURE WORKPLACE NOISE EXPOSURE

Does the employee wear the hearing protectors at all times while working in high noise areas? Ask the employee’s supervisors and fellow employees about his proper use of hearing protection.

Comments:

Have the employee fit his hearing protection while in your presence with no coaching from you. Make sure the plug is inserted in the ear canal as far as it will go.

Comments:

Retrain the employee on the proper fitting and use of hearing protection. Review any booklets or videos on hearing conservation.

Document the items discussed, have the employee sign the document and keep it in the employee’s file.

____
Signature of Employee

____
Signature of Trainer

____
Date

APPENDIX 4G:

Manager and/or Supervisor Questionnaire
Investigation of Recordable Hearing Shifts

This employee has incurred a significant decrease in hearing. More detailed information is needed to investigate the reason for the change and to determine if additional preventative actions are needed. Please provide the information requested below and return it to HCI along with the Employee Questionnaire.

Employee Name: ______________________________ **Date of Birth:** ____________________
Employee ID Number: ______________________________ **Date of Hire:** ____________________

WORK HISTORY AND NOISE EXPOSURE

List each job employee has held, starting with the current position, and the corresponding noise information. If noise dosimetry time weighted averages were calculated, list under "Noise Exposure." If the noise measurements of the work area were done, indicate if a 8 hour TWA or a sound level survey in the appropriate "Area Noise Level" column.

Time in position Mo/Year to Mo/Year	Department	Job	Shift Length (hours)	Noise Exposure dBa (TWA)	Area Noise Level dBA (TWA)	Area Noise Level dBA SLS	Hearing Protection Make, Type, and NRR
EX: 1/2000 to 1/2005	*Maintenance*	*Electrician*	*12*	*92 dBA*			*E.A.R. Foam Earplug*

Is the noise exposure equal from all directions or greater from the right or left?
☐ Same ☐ Louder from Right ☐ Louder from Left

Does the employee use a two-way radio or communication device? ☐ Yes ☐ No

If "Yes", is a speaker/lapel microphone worn? ☐ Yes ☐ No
If "Yes", where is the speaker/lapel microphone worn? ☐ Right ☐Left ☐ Center

Has employee ever been exposed to loud blast of sound at work? ☐ Yes ☐ No
Was hearing protection used at the time? ☐ Yes ☐ No

HEARING PROTECTION DEVICE (HPD)

Provide information regarding the current HPD use including details of employee's ability to wear HPD correctly.

Provide the current HPD information:

Does the employee demonstrate correct HPD fit? Roll, pull down up, and hold in place until it expands?
Comments:

Based on personal observations, has the employee complied with the current HPD policy in the past regarding the use tof wearing HPDs in designated areas and/or designated equipment when operating it or within 25 feet of its operation?
Comments:

MILITARY SERVICE

Dates of Military Service	Branch	Exposed to hazardous noise?	Describe Noise Exposure	Was hearing protection used?	Type of HPD Used:
		☐Yes ☐No		☐Yes ☐No	
		☐Yes ☐No		☐Yes ☐No	

SECOND JOB/OTHER NOISE HISTORY

Does employee hold a second noisy job?	☐Yes ☐No	If "Yes" is hearing protection used? ☐Yes ☐No
Has employee ever been exposed to a sudden blast of sound without hearing protection?	☐Yes ☐No	If "Yes" please explain:

NONOCCUPATIONAL NOISE EXPOSURE HISTORY

The following details will supplement the annual history completed by the employee. Provide, if known:

Activity		# year of exposure	# of hours of exposure/year	Hearing Protection Used?
Power tools (carpentry, woodworking, etc.)	☐Yes ☐No			☐Yes ☐No
Hunting or shooting	☐Yes ☐No			☐Yes ☐No
Chainsaw	☐Yes ☐No			☐Yes ☐No
Gas-powered lawnmower, blower, etc.	☐Yes ☐No			☐Yes ☐No
Tractor, or other farm machinery	☐Yes ☐No			☐Yes ☐No
Metal working	☐Yes ☐No			☐Yes ☐No
Grinders, riveters	☐Yes ☐No			☐Yes ☐No
Air-driven or explosive-driven tools	☐Yes ☐No			☐Yes ☐No
Personal mechanic work	☐Yes ☐No			☐Yes ☐No
Airplane piloting	☐Yes ☐No			☐Yes ☐No
Model airplane flying	☐Yes ☐No			☐Yes ☐No
Powerboat or ski jet	☐Yes ☐No			☐Yes ☐No
Motorcycle	☐Yes ☐No			☐Yes ☐No
Snowmobile	☐Yes ☐No			☐Yes ☐No
Car racing	☐Yes ☐No			☐Yes ☐No
Go-carts	☐Yes ☐No			☐Yes ☐No
Loud music or concerts	☐Yes ☐No			☐Yes ☐No
Indoor athletic events (professional, major/minor league, etc.)	☐Yes ☐No			☐Yes ☐No
Stereo headphones, Ipods, or similar personal music devices	☐Yes ☐No			☐Yes ☐No
Other noisy hobbies or activities – Describe:	☐Yes ☐No			☐Yes ☐No
________________________________				☐Yes ☐No
Noisy second job(s) – Describe:	☐Yes ☐No			☐Yes ☐No
________________________________				☐Yes ☐No
Artillery in the military	☐Yes ☐No			☐Yes ☐No
Flying in the military	☐Yes ☐No			☐Yes ☐No
Other (describe)	☐Yes ☐No			☐Yes ☐No

Firearm Use		Approx # of rounds fired/year?	Hearing Protection?	Right or Left Handed Shooter?
Hunting	☐Yes ☐No		☐Yes ☐No	☐ Right ☐Left ☐ Either
Target Shooting	☐Yes ☐No		☐Yes ☐No	☐ Right ☐Left ☐ Either
Type of firearms used:				
Most recent firearm use:				

OFF-DUTY ACTIVITIES

List all off-duty hobbies, activities, etc. you are aware which the employee participates in when not at work.

MEDICAL HISTORY

Describe any medical condition you are aware of which could have affected the employee's hearing (e.g., ear infections, ear aches, ear infections, etc.):
Other possible significant information:

Completed by: ____________________ **Signature:** ____________________

Date: ____________________ **Title:** ____________________

Phone number: ____________________

HS 1.48 LADDERS – STEP, FIXED, EXTENSION

LADDERS – FIXED, STEP, EXTENSION

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LADDERS – STEP, FIXED, EXTENSION 1

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LADDERS – STEP, FIXED, EXTENSION

1. INTRODUCTION

Inspect at designated intervals. If no defect is found for a particular item, place check ( ) mark under date. If defective item is found, place (X) under date, tag with "Dangerous - Do Not Use", and remove from service. Before placing back in service after repair is complete, re-inspect noting new date. Start cycle from new in-service date or next scheduled interval.

2. BASIC SAFETY RULES

2.1 Ensure ladders are placed on stable and level surfaces.

2.2 Do not stand on the top two rungs.

2.3 Do not stand on the top of a step ladder.

2.4 Do not carry anything in your hands that could cause injury in the event of a fall.

2.5 Face the ladder when ascending or descending.

2.6 Ensure the ladder has the correct load capacity for the task.

2.7 Ensure the ladder is used for its intended purpose.

2.8 Extension ladders are to be placed at a 4:1 ratio.

2.9 Ladder rungs, cleats, and steps shall be parallel, level and uniformly spaced, when the ladder is in position for use.

2.10 The ladder side rails shall extend at least 3 feet (.9m) above the upper landing surface. When ladders are not able to be extended then the ladder shall be secured at its top to a rigid support that will not deflect.

2.11 Climber is prohibited from carrying equipment or materials which prevent the safe use of ladders.

2.12 Climber shall always use both hands when climbing up or down the ladder.

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APPENDIX 1: Step Ladder Inspection Checklist

Ladder Number: _______________ Construction: _____ Wood Inspection Frequency: **MONTHLY**
When Purchased _____ Metal ( ) OK ( ) Needs Repair
(if known): _______________ _____ Other
Location: _______________

Date and Initials

Inspection Items												
Loose steps/rungs? (Loose if can be moved with hand pressure).												
Loose nails, screws, bolts, or other metal parts?												
Cracked, split, or broken uprights, braces, steps, or rungs?												
Slivers on uprights, rungs, or steps?												
Damaged or worn non-slip bases?												
Rusted or corroded spots?												
Wobbly (from side strain?												
Loose or bent hinge spreaders?												
Stop on hinge spreader broken?												
Sharp point of spreader covered or removed to protect pinch point?												
Broken, split, or worn steps?												

Continued on next page.

Appendix 1: Step Ladder Inspection Checklist – Page 2

Date and Initials

Inspection Items												
Loose hinges?												
Rungs uniformly spaced (max. 12")?												
Rungs parallel and level?												
Side rails (at top) not less than 11.5"?												
Height no greater than 20 feet?												
Bottom four steps of metal stepladders fitted with non-slip material?												
Metal ladders not used near electrical service?												
Maximum Height: Metal and wood 20 feet?												
Joints between steps and side rails tight?												
Hardware and fittings securely attached?												
Movable parts operate freely without binding or under play?												
Safety feet in good condition?												
Rungs/ steps free of grease, oil or other slippery substances?												

APPENDIX 2: Fixed Ladder Inspection Checklist

Date: ____________________________ Construction: _____ Wood Inspection Frequency: **QUARTERLY**

Signature: ________________________ _____ Metal ( ) OK ( ) Needs Repair

_____ Other

Ladder Location: ___________________________________

Inspection Items	**Date and Initials**											
Loose steps/rungs? (Loose if can be moved with hand pressure).												
Loose nails, screws, bolts, or other metal parts?												
Cracked, split, or broken uprights, braces, steps, or rungs?												
Slivers on uprights, rungs, or steps?												
Side rails of through or side-step ladder extend 3 1/2 feet above parapets & landing?												
Rusted or corroded spots?												
Wobbly (from side strain)?												
Rungs/ steps free of grease, oil or other slippery substances?												
Broken, split, or worn steps?												

Continued on next page.

Appendix 2: Fixed Ladder Inspection Checklist – Page 2

Date and Initials

Inspection Items												
Loose, worn or damaged rungs or side rails?												
Damaged or corroded parts?												
Corroded bolts and rivet-heads on inside of metal stocks?												
Damaged or corroded handrails or brackets?												
Weakened or damaged rungs on brick or concrete slabs?												
Base of ladder obstructed?												
Cage needed? (Required on fixed ladders more than 20 feet to a maximum unbroken length of 30 feet unless ladder safety device is used.)												
Cages extended to within seven to eight feet of base?												
Platform needed? (Required when ladder extends greater than 20 feet, provided each 30 feet.)												

APPENDIX 3: Extension Ladder Inspection Checklist

Ladder Number: ______________ Construction: ____ Wood Inspection Frequency: **MONTHLY**
When Purchased ____ Metal ( ) OK ( ) Needs Repair
(if known): ______________ ____ Other
Location: ______________

Date and Initials

Inspection Items												
Loose steps/rungs? (Loose if can be moved with hand pressure).												
Loose nails, screws, bolts, or other metal parts?												
Cracked, split, or broken uprights, braces, steps, or rungs?												
Slivers on uprights, rungs, or steps?												
Damaged or worn non-slip bases?												
Rusted or corroded spots?												
Wobbly (from side strain)?												
Broken, split, or worn steps?												
Loose, broken or missing extension locks?												
Defective locks that do not seat properly when ladder is extended?												

Continued on next page.

Appendix 3: Extension Ladder Inspection Checklist – Page 2.

ITEM	Date and Initials											
Deteriorated or missing rope?												
Metal ladders not used near electrical service.												
Extension: Metal - Single or Individual 30 feet (max)												
Two section 40 feet (max)												
Greater 60 feet (max)												
Wood – Single or Individual 30 feet (max)												
Two section 60 feet (max)												
Rungs/ steps free of grease, oil or other slippery substances?												

HS 1.109 LINE AND EQUIPMENT OPENING PROGRAM

HS 1.109 LINE AND EQUIPMENT OPENING PROGRAM

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HS 1.109 LINE AND EQUIPMENT OPENING PROGRAM

1. PURPOSE

Line and Equipment Opening shall be done only if it can be done safely. People doing such work shall be fully protected against injury. All line and equipment opening requires a **Line Opening Permit** unless the task is covered by a standard operating procedure. The CHES- **Hazardous Work Permit** may be used as a Line Opening Permit by checking the LINE/EQUIP OPENING box on the form. The CHES- Hazardous Work Permit may also be used for Hot Work or Fire System Deactivation as well as other tasks requiring the use of personal protective equipment (PPE).

Line opening permits are used to control hazards associated with opening process chemical and waste lines and equipment.

2. SCOPE

This program covers the opening of equipment and piping systems containing chemical products or wastes. Potable (drinking) water lines are excluded from coverage under this section.

3. RESPONSIBILITIES

3.1. Supervisors or Authorized Persons

3.1.1. Supervisors or authorized persons shall make lines and equipment safe for the line and equipment opening jobs. Examples of things commonly done to prepare for such work are:

A. Installing Lockout/Tagout per approved procedures;

B. Bleeder/vent opening;

C. Draining;

D. Flushing with water or appropriate flush media;

E. Steaming to remove build-up inside lines;

F. Purging;

G. Inerting;

H. Use of barricades.

3.1.2. Supervisors or authorized persons shall ensure that people doing line and equipment opening work are aware of:

A. Hazards of material and equipment to be worked on including required monitoring and action levels;

B. The protective gear required for the job and its proper use;

C. Location of nearest safety shower and eye wash;

D. Where barricades are needed;

E. Evacuation routes and procedures.

3.2. Personnel conducting line and equipment openings

3.2.1. Notify and get permission from Supervisor or authorized person responsible for the equipment prior to beginning work.

3.2.2. Assure that the job is well prepared.

3.2.3. Follow written job instructions included in this permit.

3.2.4. Use personal locks and tags per Lockout/Tagout procedures.

3.2.5. Keep unprotected people away from the line and equipment opening area.

3.2.6. Report to Supervisor or authorized person any change in conditions, which could cause a safety problem.

4. DEFINITIONS

Line: Any rigid or flexible pipe that contains or is cross-tied to a pipe containing process or hazardous waste material.

Line and Equipment Opening: Physically disconnecting or dismantling any equipment containing process or hazardous waste materials including:

Removing covers from lines or ducts;

Disassembling lines, hoses or equipment;

Removing or installing blinds;

Unplugging lines;

Repairing pumps;

Changing filters;

Direct line sampling.

5. PPE FOR LINE AND EQUIPMENT OPENING WORK

5.1. Minimum PPE

5.1.1. Minimum PPE for line openings involving hazardous waste or process chemicals includes a full-face respirator. Chemical protective clothing will be specified on the line-opening permit by the Supervisor or authorized person unless specific written job procedures are available.

5.1.2. Refer to the H&S Guidance Manual, Personal Protective Equipment Program, for PPE selection guidance.

6. PROCEDURES

6.1. Line and equipment opening work

- 6.1.2. Line and equipment opening work shall be done only with permission of the Supervisor or client responsible for the equipment. The supervisor will issue a LINE OPENING PERMIT. Client permission must always be obtained. Document the name of the Client contact granting permission for the line opening on Line Opening Permit. Follow client mandated procedures if they are in place. Note that they may also include line opening limitations and requirements.

- 6.1.3. Hazardous waste line and equipment opening work requires documented job pre-planning in the form of a Line Opening Permit.

6.2. Minimum requirements for permit issuance

- 6.2.1. Line Opening Permits must be issued at the opening locations.

- 6.2.2. A Lock-out/Tag-out permit is required for any line opening.

- 6.2.3. Signature of Supervisor or authorized person must be on the permit.

- 6.2.4. Signatures of the people performing the line and equipment opening must be on the Hazardous Work Permit.

- 6.2.5. The Supervisor or authorized person shall ensure that all individuals performing work are trained in the use of all PPE required for the task. PPE selection is the result of a formal hazard assessment. The permit documents this assessment.

- 6.2.6. The working copy of permit is issued to the worker and kept near the area.

- 6.2.7. A copy of active permits may be placed at designated locations such as the Control Room or other job control area. This should provide information on all work being conducted.

6.3. Other requirements

- 6.3.1. Do not remove PPE until necessary repairs have been completed or equipment has been properly blinded or otherwise secured. Conditions for downgrading PPE must be specified in the permit.

- 6.3.2. If a hot work permit is required, atmospheric testing is mandatory. Follow the Hot Work Program.

- 6.3.3. The supervisor or authorized person will sign the permit indicating that the work is complete. The completed permit is filed in the job folder or as directed.

APPENDIX 1: Hazardous Work Permit

(See next 4 pages)

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HAZARDOUS WORK PERMIT

HAZARDOUS WORK ☐ **HOT WORK** ☐ **LINE/EQUIP OPENING** ☐ **LOCKOUT/TAGOUT** ☐ **(Check all that apply)**

Permit authorization and permit termination for each type of permit must be completed on the last page of this permit

Start Time/Date: /	Expires: /	Completion Time:	
Client:	Client Contact:	Client Phone #:	Dig Safe #:
CHES Job #:	CHES Location:	CHES Phone #:	H&S Rep:

Job Location:

Scope of Work - Task 1:	Task 4:
Task 2:	Task 5:
Task 3:	Task 6:

Special Conditions:

EMERGENCY TELEPHONE NUMBERS - Fire: Police: Ambulance/Rescue:

Emergency Assembly Area: primary secondary

Hospital Name & Location:

HAZARD IDENTIFICATION

(circle task number) **(List specific substances in air monitoring section)**

CHEMICAL/BIOLOGICAL $^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Toxic: $^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Corrosive: $^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Flammable: $^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Combustible: $^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Reactive:

$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Shock Sensitive $^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Path Waste $^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Oxygen Deficiency

PHYSICAL

$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Abrasive Blasting	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Extreme Cold/Heat	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Lighting	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Sharp Objects	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Underground Utilities
$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Drum Sumps	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Floor Holes	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Live Electrical Circuits	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Slips/Trips/Falls	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Vactor/Cusco
$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Drilling In Soil	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Hot Work	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Manlifts/Highlifts	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Soil Excavation	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Vehicle Traffic
$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Drum Handling	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Hotsy	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Noise	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Tank Excavation	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Waterblaster
$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Elevated Work Area	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Ladders	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Overhead Utilities	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Trenching	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Work On/Near Water
$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Excavation/Trench	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Lifting	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Pneumatic Tools	$^{1}_{4}{}^{2}_{5}{}^{3}_{6}$ Uncontrolled Work Area	

PERSONAL PROTECTIVE/SAFETY EQUIPMENT

(Review requirements with H&S)(Line opening; minimum level C)

__ SCBA	__ Supplied Air Resp.	__ SAR w/Egress Bottle	__ Air Purifying Respirator/Cartridge: ___________	
__ Protective Coverall Type: _______________	__ Outer Gloves Type: _______________	__ Inner Gloves Type: _______________	__ Fully Encapsulating Suit Type: _______________	Cartridge Use Time: _________
__ Barrier Cream	__ Evacuation Plans	__ GFCI Required	__ Nomex Coveralls	__ Safety Shower
__ Bonding/Grounding	__ Explosion Proof Equip	__ Hardhats	__ Non-Sparking Tools	__ Ventilation
__ Chemical Goggles	__ Eye Wash	__ Harness/Lanyard	__ Over Boots	Type: _____________
__ Communications	__ Face Shield	__ Hearing Protection	__ PFD's	__ Welding/Cutting
__ Cylinders Secured	__ Flashback Prev. Device	__ Hearing Prot.; Double	__ Reflective Vests	Shaded Lenses
__ Eliminate Ignit. Source	__ Flash Suit	__ MSDS's Reviewed	__ Safety Glasses	

EQUIPMENT INSPECTIONS – Foreman must initial to verify equipment has been inspected and is safe to use/operate.

_______ D/D Pump (pressure relief valve) _______ Hoses/Hose Connections _______ Shower/Eyewash

________ Fall Protection (harness, lanyard
Anchor points support > 5000 lbs)
________ Fire Extinguisher(s)
________ Forklift

________ Ladder(s)
________ Retrieval Device
________ SAR/SCBA
________ Scaffold

________ Vactor Butterfly
________ Wire Rope/Sling
OTHER ________ ______________________________
________ ______________________________

LINE/EQUIPMENT OPENING PREPARATION

(Line opening portion is required for breaking process chemical or waste chemical lines, pumps, or associated valves)

☐ Locked Out (verified) ☐ Line/Equipment Drained ☐ Bleeder/Vent Open/Pressure Released ☐ Line/Equipment Steamed
☐ Line/Equipment Flushed with: ☐ Water ☐ Other media ________________________________
☐ Line/Equipment Purged/Inerted with: ☐ N_2 ☐ CO_2 ☐ Other media ______________________

HOT WORK

ATTENTION: The Fire Safety Supervisor or appointee shall inspect the work area and confirm that precautions have been taken to prevent fire prior to approving the hot work permit. Local Fire Department notification may be required for hot work or fire system de-activation.

RESTRICTIONS: DO NOT perform hot work if any the following conditions exist- CONTACT HEALTH AND SAFETY:

- Oxygen level exceeds 22%
- Lower explosive limit exceeds 0%
- Organic vapor levels exceed 10ppm
- If fire hazards cannot be moved or guarded from the hot work

WORK ON WALLS OR CEILINGS:

☐ Ensure heat transfer through conductive material is prevented.
☐ Ensure that material is noncombustible and without combustible covering (i.e. insulation, etc).
☐ Combustibles moved away from opposite side of wall (May require an additional fire watch on the blind side of the wall if all potential hazards cannot be eliminated.)

PRECAUTIONS

☐ Sprinklers must be in service if present.
☐ Cutting/welding and all other equipment must be in good repair.
☐ Shut down ducts or conveyor systems that may convey sparks to distant combustibles.
☐ Combustible Gas Meter/LEL required for the duration of the process.
☐ General/Local ventilation must be adequate to provide control of smoke, fumes or toxic vapors.
☐ Flammable liquids / combustible materials within 35 feet must be moved or protected with covers, guards, or metal shields if not removable.
☐ No open-container work (sampling, pumping, or consolidating of flammable/combustible liquids) within 50 feet.
☐ Use fire blankets to secure all openings, cracks, and holes where sparks may migrate to potential fire hazards.
☐ Atmospheric monitoring conducted. (Document in Air Monitoring section)
☐ Evaluate any product pipelines in the area for potential fire hazards.
☐ Remove all paint coatings and residual contamination from the surface and clean down to the bare metal or similar.
☐ Combustible floor wetted down, covered with damp sand, or shielded.
☐ Signs and barriers posted (if publicly accessible).
☐ Welding curtains used where applicable
☐ Type ABC fire extinguisher required Number ________ Size ___________

FIRE WATCH:
☐ Required (Present for duration of work and for 30 minutes after the operation)
☐ Supplied with fire extinguisher / hose
☐ Trained in use of equipment and alarms

CONTACT HEALTH & SAFETY *FOR APPROVAL PRIOR* TO PERFORMING HOT WORK ON ENCLOSED EQUIPMENT/SYSTEMS

☐ Containers must be cleaned of all combustibles/flammables.

☐ Containers/product lines must be drained and purged of vapors with water and/or inert gas.

LOCKOUT/TAGOUT

DIAGRAM OF SYSTEM (OPTIONAL)

LOCKOUT/TAGOUT

DESCRIPTION OF WORK TO BE PERFORMED

METHOD TO VERIFY ISOLATION

LOCKBOX EQUIPMENT TO BE USED ☐Y ☐N

(All isolating devices, blinds, locks, etc., must be identified and have a tag attached and listed on this form.)

Hazardous Energy Sources Present:

- ☐ Mechanical Energy (i.e. moving parts)
- ☐ Pneumatic Energy (i.e. air or nitrogen driven)
- ☐ Electrical Energy (i.e. plugged in or battery)
- ☐ Thermal Energy (i.e. steam or frost)
- ☐ Chemical Reaction Energy (i.e. exothermic or endothermic)
- ☐ Hydraulic Energy (i.e. water, oil, or other fluids)
- ☐ Residual or stored energy may be present
- ☐ Potential energy may be present
- ☐ Material is conductive and may retain a charge
- ☐ System may retain pressure
- ☐ Explosion hazard
- ☐ Gravity flow hazard may exist

TAG NUMBER*	DEVICE BEING ISOLATED	ISOLATION METHOD	DEVICE LOCATION

ENERGY RESTORATION:

	YES
ALL PERSONNEL ACCOUNTED FOR AND IN THE CLEAR	☐
EQUIPMENT FREE OF TOOLS AND DEBRIS	☐
LOCKOUT/TAGOUT HARDWARE REMOVED	☐
PROPER EQUIPMENT OPERATION VERIFIED	☐
LOCKOUT/TAGOUT TERMINATED	☐
OR	
CLIENT ASSUMES RESPONSIBILITY FOR ENERGY RESTORATION	☐

If Client assumes responsibility, supervisor must attempt to obtain the client contact information in the termination section

*Required for multiple LO/TO permits on one project.

ATMOSPHERIC MONITORING LOG

Instrument Type/ Manufacturer ________________________________ **DATE LAST CALIBRATED** ____________________________
Instrument Type/ Manufacturer ________________________________ **DATE LAST CALIBRATED** ____________________________
Instrument Type/ Manufacturer ________________________________ **DATE LAST CALIBRATED** ____________________________

ENVIRONMENTAL CONDITIONS: (weather, temp, wind, etc.) ____
____
____

		ACTION LEVELS	
SUBSTANCE	**LEVEL B MAX.**	**LEVEL C MAX.**	**LEVEL D MAX.**

ATMOSPHERIC MONITORING LOG **Continued**

TIME	***LOCATION***	Parameter Monitored						***COMMENTS***	***Sampler's***
		O_2	***LEL***	***CO***	***H_2S***				
		Instrument							
	ACTIVITY								***Initials***

ADDITIONAL COMMENTS: ____

PERMIT AUTHORIZATION

AFFECTED PERSONNEL/CHES CREW *PRINT NAME AND SIGN*

____________________ ____________________ ____________________ ____________________
____________________ ____________________ ____________________ ____________________
____________________ ____________________ ____________________ ____________________
____________________ ____________________ ____________________ ____________________

HAZARDOUS WORK AUTHORIZATION TO PROCEDE: Foreman's Signature: ____________________
LINE OPENING AUTHORIZATION TO PROCEDE: Foreman's Signature: ____________________
HOT WORK AUTHORIZATION TO PROCEDE: Foreman's Signature: ____________________
LO/TO AUTHORIZATION TO PROCEDE: Foreman's Signature: ____________________

FORMAN'S COMMENTS/MINUTES OF SAFETY MEETING: ____

____

HEALTH & SAFETY COMMENTS: ____

____

FOREMAN: ____________________ / __________ **HEALTH & SAFETY**: ____________________/__________

PERMIT TERMINATION

Haz. Work Termination	**Line Opening Termination**	**Hot Work Termination**	**LO/TO Termination**
☐ Decontamination of personnel and equipment is complete. ☐ All waste is labeled and staged for proper disposal. ☐ All postings/notifications removed. ☐ Work completed and accepted.	☐ Work completed and accepted.	☐ The work area and all adjacent areas to which sparks and heat may have spread (including floors above and below and on opposite sides of walls) were inspected 30 minutes after the work was completed and were found fire safe. ☐ All fire systems are re-activated. ☐ Work completed and accepted.	☐ All Lockout and Tagout Devices have been removed. ☐ Verified that equipment is back to normal operating conditions. ☐ All affected personnel notified that system is back in service. ☐ Work completed and accepted. ☐ Client signature obtained for release to restore energy.
Date:	**Date:**	**Date:**	**Date:**
Time:	**Time:**	**Time:**	**Time:**
Signature:	**Signature:**	**Signature:**	**Signature:**

CLIENT CONTACT ______________/__________________ ________/________
PRINT/SIGN(If Available) DATE/TIME

IN THE EVENT OF AN EMERGENCY EVACUATION, ALL PERMITS ARE CANCELLED.

HS 1.22 LOCKOUT-TAGOUT GUIDELINES

LOCKOUT-TAGOUT GUIDELINES

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HS 1.22 LOCKOUT-TAGOUT GUIDELINES

1. PURPOSE

The purpose of this program is to prevent accidents and injuries caused by unintentional start-up of equipment, systems or release of hazardous energy during repair or servicing operations.

2. SCOPE

This program shall apply to confined space entry, equipment maintenance, utility maintenance, or other work involving sources of hazardous energy performed by Clean Harbors Environmental Services, Inc. (CHES), employees or contractors and subcontractors. Reliance on Lockout/Tagout performed solely by the Client is prohibited unless Client policy prohibits use of our equipment and approval has been obtained from Health and Safety.

Contractors and subcontractors working at CHES facilities or job sites shall be informed of the requirements of this program and their obligations.

3. RESPONSIBILITIES

3.1. Health and Safety Department

3.1.1. Develops effective hazardous energy control procedures.

3.1.2. Advises Management on interpretation and implementation of this program.

3.1.3. Conducts audits and inspections of facilities and field operations to ensure program is effectively implemented; and,

3.1.4. Reviews program annually and revises as needed.

3.2. Facility/Field Service Managers

3.2.1. Identify and designate qualified, authorized persons to implement the procedures within this program. (See definitions of qualified, authorized person.).

3.2.2. Provide equipment and personnel to effectively implement this program.

3.2.3. Advise contractors/subcontractors of the requirements this program when contractors/subcontractors will be involved in work in hazardous energy control situations.

3.2.4. Enforce compliance with the requirements of this program.

3.2.5. Establish site-specific lockout-tagout procedures. Included in these procedures will be the identification of energy sources, which require control as well as the equipment and machinery affected prior to any work that requires testing, repair or replacement.

3.2.6. Ensure that SOPs have been written and training in lockout/tagout requirements has been provided:

A. When guards or safety devices are removed from equipment;

B. During servicing of equipment or machinery;

C. When an employee must place any part of the body where it may be caught by moving machinery (cleaning or oiling parts, etc.);

D. When contact with any form of energy is possible, e.g., electrical, hydraulic, pneumatic, etc.;

E. During all confined space entries when applicable.

3.2.7. Provide the procedures for release of lockout/tagout equipment including machine inspection, notification to employees, removal of lockout/tagout devices, and testing or startup of equipment or machines.

3.2.8. Provide all employees affected the information necessary concerning the lockout-tagout system used by contractors on CHES property or project sites. The contractor's equipment and procedures may vary from those required in this procedure.

3.2.9. Ensure employees are issued and only use approved locks and tags.

3.3. Field Service Account Managers/Specialists

3.3.1. Identify the need for LO/TO while scoping the job.

3.3.2. Request the Client provided information specified in 5.1.

3.3.3. Provide the supervisor with the information collected including what LO/TO equipment to take to the job.

3.4. Supervisors (including working in capacity of Authorized Employee)

3.4.1. Evaluate work to be performed to determine if hazardous energy is present.

3.4.2. Designate qualified authorized persons to implement procedures contained in this program and serve as Authorized person in charge of project or task.

3.4.3. Assure suitable equipment is available for identification, measurement, and control of hazardous energy.

3.4.4. Conduct Pre-Work Safety meetings with affected employees to discuss work, energy control procedures, and their assignments.

3.4.5. Coordinate energy control procedures among work crews when work must be transferred to another shift.

3.4.6. Coordinate energy control procedures between CHES and contractor/subcontractor, and client personnel when joint energy control procedures must be implemented.

3.4.7. Assure energy control effectiveness has been verified before authorizing work.

3.4.8. Authorize commencement of work.

3.4.9. Conduct post work inspections to assure service/repair has been properly executed.

3.4.10. Assure that all persons included in an energy control procedure are present, or positively accounted for prior to restoring energy to a de-energized system.

3.4.11. Authorize removal of lockout hardware and restoration of energy.

3.4.12. Make final entries on Lockout/Tagout Permit and place permit in accessible permanent file.

3.4.13. Are responsible for equipment specific lockout-tagout procedures and training employees in the identification of activities requiring energy control, lockout/tagout, isolation procedures, SOPs, testing, and reactivating equipment and machinery.

3.4.14. Obtain assistance from facility management or Health and Safety if uncertain about the application of a control procedure or equipment operation.

3.5. Authorized/Qualified and Affected Employees

3.5.1. Perform work as directed by Supervisor.

3.5.2. Report unusual conditions pertaining to hazardous energy control to Supervisors.

3.5.3. Maintain hardware provided by CHES in a serviceable condition.

3.5.4. Report absences to Supervisor when the facility or job site must be left for any reason.

3.5.5. Apply and remove energy control devices assigned specifically to them.

3.5.6. Shall not remove energy control devices assigned to others.

3.5.7. Must comply with all established procedures for controlling hazardous energy sources.

3.5.8. Shall not attempt to operate any switch, valve, or other energy-isolating device when it is locked or tagged out.

3.6. Engineering/Maintenance

3.6.1. Shall ensure that any new equipment, or overhauled equipment, can accommodate the locks that are used for LOTO when subsequent application of this procedure is required.

3.6.2. Plant engineering, along with plant supervision, will inspect equipment and identify all devices (switch, valve or any other energy isolating device) that is to be used for the lockout and tagout.

4. DEFINITIONS

Affected Employee: An employee whose job requires operation/use of equipment, machine, or process, which is being serviced, maintained, or set-up under lockout conditions or whose job requires work to be performed in areas in which such work is being performed.

Authorized/Qualified Employee: An employee who locks or implements a lockout procedure on machines, equipment, or processes to perform servicing, maintenance, or set-up upon that machine, process, or equipment. An authorized employee and an affected employee may be the same person when the affected employee's duties also include performing maintenance or service on a machine, equipment, or process, which must be locked out. The employee(s) shall be able to demonstrate by experience and training, the ability to recognize potentially hazardous energy and its potential impact upon facility or job site conditions, and has the knowledge to implement adequate means and methods to control and isolate such energy.

Capable of Being Locked Out: An energy isolating device will be considered to be capable of being locked out either if it is designed with a hasp or other attachment or integral part to which, or through which, a lock can be affixed, or if it has a locking mechanism built in to it. Other energy isolating devices will also be considered to be capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy-isolating device or permanently alter its energy control capability.

Dissipate: For the inclusion within this program, the terms dissipate and dissipation shall always be related to energy control. Its meaning shall be to cause energy to be spread out or reduced to a level tolerable to humans.

Energized: Connected to an energy source or containing residual or stored energy.

Energy Isolating Device: A device that physically prevents the transmission or release of energy. Such devices may include, but are not limited to, the following:

- A manually operated electrical circuit breaker;

- A mechanical, electrical, hydraulic or pneumatic disconnect switch;

- A slide gate;

- A slipblind;

- A line valve;

- Blocks;

- Similar devices used to block or isolate energy.

Energy: As used within this program, the term energy shall be considered to be any of the following, either singly, or in combination:

- Mechanical energy due to motion;

- Potential energy due to pressure, springs, or gravity;

- Electrical energy due to generated electrical current, static electricity, or residual stored electrical energy;

- Thermal energy from high or low temperatures; or

- Chemical reaction energy.

Hazardous Energy: Hazardous energy is any of the above forms of energy, which has not been controlled in any way to prevent unrestricted flow to equipment or systems or its unrestricted release.

Isolated Energy: Energy is considered isolated or blocked when its flow would not be reactivated by a foreseeable unplanned event. The term "isolate" means to set apart from others. The term "block" means an obstacle or obstruction; or, to make unsuitable for passage or progress by obstruction, to prevent normal functioning.

Lockout: The placement of a lockout device on an energy-isolating device, in accordance with this procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout Device: A device that utilizes a positive means such as a lock, normally keyed type, to hold an energy-isolating device in the safe position and prevent the energizing of a machine, equipment or process.

Residual Energy: Energy such as electrical, chemical, thermal or mechanical which is stored within a port, component, or subsystem of an equipment or process following shutdown of equipment/process. Examples of residual energy would be electricity in capacitors, tension in springs, or the potential energy of an unsupported suspended load.

Tagout Device: A prominent warning device capable of being securely attached to an energy isolating device that identifies the applier or authority who has control of the lockout and contains information/instructions to prevent operation of an energy isolating device.

5. GENERAL PROCEDURES

Lock-Out/Tag-out of equipment, processes, or utilities shall be performed in accordance with the following. (Specific information on each topic is detailed in the **Guidance Manual**).

a. Training

Prior to engaging in any work involving Lock-Out/Tag-out, employees shall have training in Lock-out/Tag-Out Procedures and have a thorough working knowledge of the equipment/process involved in the Lock-out/Tag-out Procedures.

b. Person in Charge (Authorized Employee)

For each Lock-out/Tag-out project, an Authorized Employee trained in Lock-out Procedures, shall be designated as the person in charge (qualified person) and shall have the authority to direct the actions of others and the responsibility for effective application of Lock-out/Tag-out Procedures.

c. Procedure Application

The Authorized person shall determine need for Lock-out Procedures.

d. Safety Meeting

The Authorized person shall conduct a pre-work safety meeting. All affected personnel shall sign the permit documenting meeting and permit review.

e. Lock-out Permit

A Lock-out Permit is completed by the authorized Employee to assure all hazardous energy, both primary and residual, has been identified, evaluated, and effectively controlled. The Authorized and Affected employees must sign the permit.

f. Release from Lock-out

The Lock-out Permit is used by the Authorized employee to record the actions taken to release a piece of equipment or process from lock-out status. The Permit is used to assure employees and equipment are clear of points of operations or other hazards when the equipment/process is re-energized following completion of work.

g. Lock-out Transfer

Lock-out Procedures which involve multiple shifts will require transfer of the responsibility for the lock-out to a qualified person (qualified Authorized person) with the on-coming shift.

h. Lock-out/Tag-out Hardware

Padlocks of substantial construction are the preferred means of securing energy control devices to prevent unauthorized tampering with, or removal of, energy control devices. Other methods and equipment may be acceptable. Verify acceptability with Health and Safety. Tags may be used as a means of securing an energy control device **only** under specific circumstances. These are reviewed in Lock-out/Tag-out Guidelines..

i. Work at an Owner's Site or in a Subcontractor Status

When Clean Harbors personnel are working at an Owner's site and with their equipment or processes, or when working in a subcontractor status, the Owner or Contractor is responsible for informing Clean Harbors personnel of the proper Lock-out/Tag-out Procedures. Clean Harbors personnel shall institute the Procedures detailed in the Lock-out/Tag-out Guidelines in addition to whatever procedures are instituted by the Owner or Contractor. Clean Harbors personnel shall not proceed with work until hazards are identified and proper Lock-out /Tag-out Procedures are implemented.

j. Contractor Interface

Where contractors or subcontractors are working at Clean Harbors facilities or job sites, Clean Harbors Lock-out/Tag-out Procedures must be instituted in addition to any procedures instituted by the contracted personnel.

6. HAZARD ASSESSMENT

The hazards presented by energized equipment are varied and potentially complex. Before conducting repair or servicing operations on equipment or systems, they must be evaluated to determine if hazardous energy is or may be present. If so, hazardous energy sources must be identified, located, and controlled prior to start of work. Preparations must be made to assure appropriate lockout hardware and test equipment are available to isolate the energy, prevent it from being released and evaluate the effectiveness of energy controls. The following sources of information can be used for the assessment.

6.1. Client Provided Information

The following information should be requested from the client:

6.1.1. Is the equipment to be serviced/repaired powered by an outside energy source or provided with energy from an outside source;

6.1.2. Does the equipment to be serviced/repaired have the capability to store energy in some way;

6.1.3. What are the known hazards of the equipment;

6.1.4. What energy control procedures does the client use when servicing/repairing the equipment;

6.1.5. What precautions or procedures will the client implement for protection of employees in or near the area in which CHES will be working;

6.1.6. Requirements of the clients Lockout/Tagout Program; and,

6.1.7. Procedures for coordinating Lockout/Tagout procedures if CHES and client personnel will be working together on the equipment.

6.2. Residual Energy Control

6.2.1. Qualified, authorized persons familiar with the equipment/system being serviced shall review instruction manuals, manufacturers literature, wiring diagrams and other available information to identify and locate sources of residual energy.

6.2.2. An appropriate method of controlling residual energy shall be selected and the suitable equipment obtained to implement the control. Residual energy controls may include, but not be limited to, electrical circuit grounding, releasing pneumatic/hydraulic line pressure, allowing a suspended object to come to rest at ground level, relieving spring compression, cleaning vessels to remove residual chemicals, draining residual product from transfer lines, or bracing/blocking objects in a fixed position to prevent movement.

6.2.3. A lockout device shall be applied and secured to the residual energy control to prevent re-accumulation of the residual energy or because removal would permit residual energy to be transmitted to equipment/system being serviced.

6.2.4. A tag shall be applied to the residual energy lockout device.

6.2.5. Application of the residual energy controls shall be recorded on the Lockout/Tagout Permit with the time, date, and name of person(s) applying device(s).

7. PERMIT SYSTEM

7.1. Completion

Special Note: For Confined Space Entry permit requirements, with Lockout/Tagout, the Confined Space Entry permit is sufficient.

7.1.1. LO/TO permits must be completed for all LO/TO activities unless a specific exception is provided. Specific exceptions covering routine and relatively non-hazardous tasks must be approved in writing by the General Manager and Health & Safety. Detailed SOPs or job instructions are required for any exception.

7.1.2. LO/TO is not required for drinking water lines. It is necessary to obtain permission from authorized personnel prior to shutting off a branch line.

7.1.3. LO/TO is not required for cord and plug connected equipment when the plug is disconnected and equipment is under the sole control of the person performing the work.

7.1.4. A CHES approved Lockout/Tagout Permit must be thoroughly prepared by the Supervisor or Authorized Person in Charge prior to initiation of Lockout/Tagout procedure. See Appendix 2 for the Lockout/Tagout Permit example. The following information shall be documented on the Lockout/Tagout Permit by the Supervisor:

A. Identity of equipment/system requiring service/repair;

B. Scope of work:

1. Prior to beginning a lockout task, an equipment specific procedure must be developed by the shift supervisor or an authorized employee. This procedure will be developed using the Permit Form. The equipment's diagrams, pictures, or other information can assist to develop the procedure. The permit must:

   a. List all shutdown or isolation steps to safely prepare the equipment;

   b. Identify each energy type (electrical, thermal, etc);

   c. Identify method used to isolate the energy (close, open, disconnect, etc.).

2. The permit serves as a task-tracking log to control the installation and removal of employee's locks and tags. Each worker will sign on and off the permit **and** place his or her own personal lock on the lockbox.

C. Type of hazardous energy present. (Electrical, mechanical, chemical, etc.);

D. Energy sources. (Includes residual energy);

E. Energy isolation devices ;

F. Lockout devices used to secure energy isolation devices;

NOTE: Each energy isolation device capable of being locked must be locked;

G. Tags must be applied to each lockout device;

H. Test procedures to assure energy controls are effective;

I. Authorized Persons implementing Lockout/Tagout procedure;

J. Where more than one LO/TO permit will be used at the same time, the permits shall be numbered and that number shall be noted on the DANGER - DO NOT OPERATE tags. The tag number shall also be recorded on the permit in column 1.

7.1.5. The signature of the Supervisor or Authorized Person in Charge indicates all information is complete and accurate.

7.2. Availability and Posting

The Permit will be posted at the job site to assure it is readily available for reference. Facilities may designate an area where all active permits are maintained instead of posting them in the work area.

7.3. Permit Duration

The Permit is valid for the time period required to complete the assignment identified on the Permit. If the job exceeds one shift, either the responsibility for the Lockout/Tagout condition will be transferred or a new Permit will be issued.

7.4. Canceling the Permit

The Supervisor or Authorized Person in Charge must terminate the operation and cancel the Lockout/Tagout Permit under the following conditions:

7.4.1. Work covered by the Lockout/Tagout Permit has been completed and all Affected Employees are clear of the area and accounted for;

7.4.2. A condition not allowed by the Permit arises; or

7.4.3. The scope of work changes rendering the LO/TO ineffective.

7.5. Exceptions

7.5.1. A permit for locking out and tagging a piece of equipment is not required if all of the following apply:

A. The machine or equipment has no potential for stored or residual energy or re-accumulation of stored energy after shutdown, which could endanger personnel;

B. The machine or equipment has a single source, which can be readily identified and isolated (plug can be pulled and is under the direct control of the worker);

C. The isolation and locking out of that energy source will completely de-energize and activate the machine or equipment;

D. The machine or equipment is isolated from that energy source and locked out during servicing or maintenance;

E. A single lockout device will achieve a locked out condition;

F. The lockout device is under the exclusive control of the authorized employee(s) performing the servicing or maintenance;

G. The servicing or maintenance does not create hazards for other employees.

7.5.2. An example, which meets this requirement, is a hard-wired bench grinder.

A. The bench grinder does not store energy when it is off.

B. There is only one source of energy (electrical).

C. Disconnecting the breaker will completely de-energized and deactivate the grinder.

D. The mechanic will apply a lock to the breaker before beginning work on the grinder.

E. Only a single lock is required.

F. The mechanic uses his/her personal safety lock. (No one else has a key for the lock.)

G. Work on the grinder does not create a hazard for anyone else in the area.

7.6. Equipment Recommendations

7.6.1. The following equipment is recommended by Health and Safety at facilities and sites that require control of energy source:

A. Locks used for lockout/tagout will be specific for lockout/tagout only.

B. Personal Locks will be issued by the plant supervision to the individual(s) responsible for application of a lockout procedure.

C. Multiple-lock hasps will be issued when lockout procedures require more than one lock to be used for lockout at a time.

D. Warning Tags are to accompany the placement of each lock. An identification tag must accompany every lock out device. The tag will not be removed except by the employee who placed it on the machine or equipment at the completion of the work requiring lockout procedure.

E. Equipment Isolation Lock Sets (i.e., locks used only for multiple isolation device lockouts) are to be maintained in keyed-alike sets with only one unique key per set. The lock-sets require specific identification such as same color or number.

F. Proprietary Group Lock applied to group lock box by supervisor before approval to begin work is authorized by supervisor.

G. Group Lock Box is used to control keys to danger locks.

H. Satellite Lock Box is a secondary lock box (or boxes) to which authorized employees affix their personal safety locks and tags. Authorized employees may be either CHES employees or contractor employees.

8. SAFETY MEETING

8.1. Information

A Safety meeting should be conducted for all affected employees to discuss the nature of the work. The permit should be reviewed and the following information must be discussed during the Safety Meeting:

8.1.1. Identification of Authorized Persons who will implement Lockout/Tagout procedures;

8.1.2. Identification of equipment or process to be serviced/repaired;

8.1.3. Scope of work;

8.1.4. Anticipated duration of work;

8.1.5. Equipment shutdown procedures;

8.1.6. Hazardous energy types requiring control (electrical, mechanical, hydraulic, etc.);

8.1.7. Energy source(s) (electrical power circuits, product transfer lines, springs, service lines, etc.);

8.1.8. Energy isolation devices to isolate identified energy from equipment to be serviced/repaired (electrical disconnect boxes, drive shaft linkages, valves, etc.);

8.1.9. Lockout devices to be used to secure energy isolation device(s) (Locks, hasps, chains, cables, etc.);

8.1.10. Energy isolation procedures; and,

8.1.11. Energy isolation test procedures.

8.2. Documentation

8.2.1. The Supervisor or Authorized Person in charge must document the following information on the Lockout/Tagout Permit: Information discussed; those in attendance; any questions posed by the crew; and scope of work assignments.

8.2.2. Signature: Each crewmember must sign the permit once they are satisfied they understand all operational and safety aspects of the assigned work.

8.2.3. Withholding Signature: Any crew member who has not had their questions answered to their satisfaction, does not thoroughly understand their responsibilities, or is unsure of methods to safely perform the operation may withhold their signature until their questions are answered and the information is provided. No employee will be compelled to perform Lockout/Tagout related work until they understand and agree with LO/TO methods.

9. LOCKOUT/TAGOUT GUIDELINES

The following procedures are provided to help control the hazards typically encountered during equipment repair/servicing operations. Because each situation will be unique and present obvious and less than obvious hazards, it is vital that each action be taken to identify repair/service operations.

9.1. Limiting Unauthorized Participation

Only those employees who have been authorized by the Supervisor to perform equipment service/repair and implement Lockout/Tagout procedures may participate in such operations.

9.2. Host Employer/Another Employer

Meet with and apprise the client contact of the host employer or other contractors working on the site that CHES will be performing equipment service/repair that requires implementation of Lockout/Tagout procedures. CHES and client/contractors must coordinate Lockout/Tagout procedures when work will be performed jointly upon the same equipment.

9.3. Lockout/Tagout Hardware and Use

9.3.1. Under most normal circumstances, each Authorized employee will apply a personal lockout device (e.g. lock) issued to them to the hazardous energy source. The key to that lock shall be at all times under the sole control of that Authorized employee. Duplicate keys shall not be shared. Locks must be substantial and individually keyed. Personal locks are installed at the start of each shift and removed at the end of the shift or project.

9.3.2. Where there are a multiple number of locks/energy control devices to apply under one permit, the following procedures shall be used (Group Lockout/Tagout):

A. Locks used by Supervisor or Authorized Person in Charge for LO/TO procedures may be series locks (multiple locks keyed alike).

B. Keys to series locks shall be issued only to and only used by the Supervisor or Authorized person in Charge.

C. Series keyed locks are the first locks installed and are not removed until the permit is terminated.

D. All authorized employees must be provided with personal locks and "Danger- Do Not Operate" tags. These locks must be substantial and individually keyed. They must not be part of a master keyed system. Keys must remain in the possession of the employee.

E. Personal locks are installed by each Authorized employee at the start of each shift and removed at the end of the shift or project on each hazardous energy control location. Alternately, the key to the series locks may be placed in a substantial box such as lock box or toolbox and the personal locks of each Authorized person attached to the lock hasp or similar position of the box to minimize the number of personal locks required.

9.3.3. All locks used for LO/TO must be identified by a properly completed DANGER - DO NOT OPERATE tag.

9.3.4. All equipment capable of being locked shall be locked out.

9.3.5. Equipment that is not capable of being locked shall be shut off and tagged with properly completed DANGER - DO NOT OPERATE tag. When a tag is a used without a lock, a second means of isolation is required such as lifting a lead, removing a fuse, disconnecting or blanking lines, closing two valves in series, removing the valve handle, etc. Where appropriate, two danger tags should be used on the two isolation points.

9.3.6. A DANGER - DO NOT OPERATE tag shall be regarded the same as a lock when used instead of a lock.

9.3.7. DEVICES THAT ARE TAGGED AND NOT LOCKED SHALL NEVER BE ACTIVATED WHEN VERIFYING THE EFFECTIVENESS OF THE LO/TO.

9.3.8. When the same isolation point is locked out as a part of two separate LO/TO permits, a separate lock and tag must be applied for each permit.

9.3.9. Lockout Devices must be standardized by color, shape, or size.

9.4. Equipment/System Shutdown

9.4.1. The equipment/system requiring service/repair should be shutdown in a manner that will not present a hazard to employees in the work area. Shutdown should be performed as follows:

A. Inform affected employee(s) in work area of equipment/system shutdown;

B. Clear area in vicinity of equipment/system if shutdown will present a potential hazard to bystanders;

C. Locate equipment/system controls (on/off, start/stop type controls);

D. Shutdown equipment/system in a safe manner (Place controls in off or stop position.);

E. Locate the energy isolation devices and place in an OFF position. (See definition of Energy Isolation Device in Section 4 for examples.) ON/OFF SWITCHES (CONTROL POWER) ARE NOT ENERGY ISOLATION DEVICES. Line voltage must be isolated;

F. Each authorized employee applies lockout and tagout device to prevent operation of energy isolation device.

G. In the event that the Lock Box Procedure is to be used (see Section 9.3), Supervisor (acting as Authorized Employee overall in charge) shall apply lockout devices to prevent operation of the energy isolation controls. The controls will be secured with lockout devices. Appropriate tag shall be applied. Keys to these devices shall then be placed into lockbox. Each authorized employee involved in the work area (including the Supervisor) must then apply his or her own individual CHES issued lock to the lockbox;

H. Tags bearing the words "DANGER - DO NOT OPERATE" shall be attached to lockout device and bear the name of the person applying the device, the date, and the device being isolated and/or reason for isolation. The permit number should be recorded if more than one LO/TO permit is in use; and

I. An entry shall be made on the Lockout/Tagout Permit stating the date, and lockout device(s) applied to equipment/system energy isolation device(s).

9.5. Electrical Lock Out/Tag Out Guidelines

While any employee is exposed to contact with parts of fixed electric equipment or circuits which have been deenergized, the circuits energizing the parts shall be locked out or tagged or both in accordance with these guidelines. The procedures outlined in this section apply to electrical energy control and are a supplement to these overall guidelines. Permit completion, hazard assessment, prework inspection, and other relevant sections of these LO/TO Guidelines apply to all Electrical LO/TO procedures.

Note 1: As used in this section, fixed equipment refers to equipment fastened in place or connected by permanent wiring methods.

9.5.1. "Procedures." A written copy of these procedures and guidelines shall be available for inspection by all CHES employees.

9.5.2. "Deenergizing equipment." Safe procedures for deenergizing circuits and equipment shall be determined before circuits or equipment are deenergized.

A. The circuits and equipment to be worked on shall be disconnected from all electric energy sources. Control circuit devices such as push buttons, selector switches, and interlocks, may not be used as the sole means for deenergizing circuits or equipment. Interlocks for electric equipment may not be used as a substitute for lockout and tagging procedures.

B. Stored electric energy, which might endanger personnel, shall be released. Capacitors shall be discharged and high capacitance elements shall be short-circuited and grounded if the stored electric energy might endanger personnel.

NOTE: If the capacitors or associated equipment are handled in meeting this requirement, they shall be treated as energized.

C. Stored non-electrical energy in devices that could reenergize electric circuit parts shall be blocked or relieved to the extent that the circuit parts could not be accidentally energized by the device.

9.5.3. "Application of locks and tags."

A. A lock and a tag shall be placed on each disconnecting means used to de-energize circuits and equipment on which work is to be performed, except as provided in paragraphs 8.5.3.C and 8.5.3.E (1-3). The lock shall be attached so as to prevent persons from operating the disconnecting means unless they resort to undue force or the use of tools.

B. Each tag shall contain a statement prohibiting unauthorized operation of the disconnecting means and removal of the tag.

C. If a lock cannot be applied, a tagging procedure alone may be applied with the approval of Health and Safety provided that the tagging procedures will provide a level of safety equivalent to that obtained by the use of a lock.

D. A tag used without a lock, as permitted by paragraph 8.5.3.C of this section, shall be supplemented by at least one additional safety measure that provides a level of safety equivalent to that obtained by use of a lock. Examples of additional safety measures include the removal of an isolating circuit element, blocking of a controlling switch, or opening of an extra disconnecting device.

E. A lock may be placed without a tag only under the following conditions:

1. Only one circuit or piece of equipment is de-energized; and,

2. The lockout period does not extend beyond the work shift; and,

3. Employees exposed to the hazards associated with reenergizing the circuit or equipment are familiar with this procedure.

9.5.4 **"**Verification of de-energized condition." The requirements of this paragraph shall be met before any circuits or equipment can be considered and worked as de-energized.

A. A qualified person shall operate the equipment operating controls or otherwise verify that the equipment cannot be restarted.

B. A qualified person shall use test equipment to test the circuit elements and electrical parts of equipment to which employees will be exposed and shall verify that the circuit elements and equipment parts are deenergized. The test shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage backfeed even though specific parts of the circuit have been deenergized and presumed to be safe. If the circuit to be tested is over 600 volts, nominal, the test equipment shall be checked for proper operation immediately after this test.

9.5.5. "Reenergizing equipment."

These requirements shall be met in the order given before circuits or equipment are reenergized, even temporarily.

A. A qualified person shall conduct tests and visual inspections, as necessary, to verify that all tools, electrical jumpers, shorts, grounds, and other such devices have been removed, so that the circuits and equipment can be safely energized.

B. Employees exposed to the hazards associated with reenergizing the circuit or equipment shall be warned to stay clear of circuits and equipment.

C. Each lock and tag shall be removed by the employee who applied it or under his or her direct supervision. However, if this employee is absent from the workplace, then the lock or tag may be removed by a qualified person designated to perform this task (following the requirements listed in Section 12 of these Guidelines and provided that):

1. The employee who applied the lock or tag is not available at the workplace; and

2. The employee is aware that the lock or tag has been removed before he or she resumes work at that workplace; and

3. There shall be a visual determination that all employees are clear of the circuits and equipment.

9.6. Testing and Positioning Machines and Equipment; Temporary Removal of Locks and Tags

9.6.1. When situations dictate the removal of a LOTO device for testing, troubleshooting, or positioning of equipment, the following will be completed:

9.6.1.1. The Affected Employee requesting the removal notifies the Authorized Employee that a test of the machine or equipment is needed.

9.6.1.2 The Authorized Employee will clear the machine or equipment area of Affected Employees, tools, and materials and inform Affected Employees that the LOTO devices will be removed.

9.6.1.3. The Authorized Employee will remove the locks and tags.

9.6.1.4. Energize and proceed with testing and positioning.

9.6.1.5. After testing or positioning, established LOTO procedures will be followed to de-energize the equipment or systems and reapply the LOTO devices.

10. PRE-WORK INSPECTION/ENERGY ISOLATION VERIFICATION

10.1. Control Effectiveness

10.1.1. Prior to beginning work following a Lockout/Tagout procedure, the effectiveness of the controls must be verified. This should be performed by the Supervisor. As an alternative, it may be performed by a qualified employee who has been designated by the Supervisor to authorize work, or to reject the lockout procedure as being unsatisfactory due to inadequate energy control procedures. When lockout procedures must be implemented by multiple crews, the verification should be performed by the supervisors of each crew. The verification should be performed as follows:

A. Use Lockout/Tagout Permit to account for all personnel involved in operation;

B. Clear points of operation of personnel/material, which could be affected by start-up of equipment/system;

C. Inspect energy isolation devices to assure they are in the off position, secured with locks, and appropriately tagged;

D. Inspect residual energy control devices to assure they are in place, secured with locks, and appropriately tagged;

E. WARNING: DEVICES THAT ARE TAGGED AND NOT LOCKED SHALL NEVER BE ACTIVATED WHEN VERIFYING THE EFFECTIVENESS OF THE LO/TO.

F. Attempt to operate energy isolation device, and observe equipment/system to assure it remains inoperative;

G. Attempt to operate equipment/system controls. (On/Off switches) Equipment/system should remain inoperative;

H. RETURN ACTIVATION CONTROLS TO OFF POSITION FOLLOWING TEST TO PREVENT UNINTENTIONAL ACTIVATION FOLLOWING RESTORATION OF ENERGY TO EQUIPMENT;

I. If work is to be conducted on or near exposed de-energized electrical parts, a qualified person must verify with a voltmeter that the circuit is de-energized;

J. If inspection/testing reveals inadequate control of primary/residual energy source(s), the person(s) verifying energy controls shall contact the Supervisor before taking any further action. The inadequacy of the controls must be recorded in the Method to Verify Isolation section of the Lockout/Tagout Permit with the date and name of person making the entry;

K. The date, time, and name of person(s) conducting the inspection(s) and test(s) shall be recorded on the Lockout/Tagout Permit.

11. WORK AUTHORIZATION

11.1. Authorization Procedures

Upon successful verification of the energy controls, the Supervisor, acting as overall authorized person in charge, shall authorize servicing/repair of equipment/system. The authorization shall be performed as follows:

11.1.1. Supervisor shall assure all required inspections/tests have been performed by checking Lockout/Tagout Permit entries;

11.1.2. Supervisor shall assure all affected employees are aware of the status of the equipment/system by verbally advising them in a Pre-Work Safety Meeting. The meeting minutes will be recorded on the Lockout/Tagout Permit;

11.1.3. Supervisor shall note on Lockout/Tagout Permit the date and time that the equipment/system was deemed safe and ready for service/repair.

11.2. Energy Restoration

11.2.1. Upon completion of work, the authorized person(s) shall inform Supervisor that job has been completed. The de-energized equipment/system will then be prepared for start-up. Energy should be restored in a way that will minimize hazard to persons/property in the area. Energy restoration shall be performed as follows:

A. Supervisors shall use the Lockout/Tagout Permit to account for personal involved in lockout procedure. (See 12.1 if all employees cannot be accounted for.);

B. Supervisor shall instruct affected employees and others in area to remain clear of points of operation of equipment/system;

C. Supervisor shall inspect equipment/system to assure points of operation are free of tools, debris, or other material, which could be placed into motion if following restoration of energy to equipment/system;

D. Lockout devices, energy control devices, and tags applied to energy isolating devices and residual energy controls shall be removed by those who applied them;

E. Energy shall be restored to equipment/system through activation of energy isolation device, as directed by the equipment owner;

F. Proper operation of equipment/system shall be verified by Supervisor prior to returning it to service, as directed by the equipment owner. Note that if the Client/equipment owner will not remove their lockout device(s), or will be responsible for energy restoration, the CHES supervisor will notify the client contact of the completion of the work and the need for energy restoration. The Client's signature or name and date of notification must be included on the permit.

G. Completion of work, removal of lockout devices, verification of proper operation, and return to service shall be recorded on Lockout/Tagout Permit with date, time and name of supervisor or qualified authorized person responsible for work.

12. RETENTION

12.1. Retention Period

Canceled Permit must be retained for one (1) year to facilitate review of the Lockout/Tagout program.

12.2. Copies

Copies of all Lockout/Tagout permits should be available in one of the following locations:

11.2.1. Health and Safety folder (Filed by job Supervisor);

11.2.2. In CHES Facilities, all Lockout/Tagout Permits should be filed in a central Lockout/Tagout Permit File. This file should be maintained by Facility Compliance Manager or Safety Representative.

12.3. Operation Problems

Any problems encountered during a Lockout/Tagout operation shall be noted on the Permit and must be communicated to Health and Safety by the job Supervisor as soon as possible, but no later than the conclusion of the job.

13. ABSENT EMPLOYEES

13.1. Accounting for Employees

13.1.1. Accounting for employees involved in lockout procedures is required to assure employees are clear of areas which could expose them to existing or potential hazards when the equipment/system is re-energized and tested prior to returning it to service. Should there be any authorized or affected employees who cannot be accounted for, the Supervisors shall initiate the following to attempt to locate the absent employee(s):

A. Lockout/Tagout Permit shall be used to account for affected and authorized employee(s);

B. Supervisors shall obtain a Lockout Absent Employee Notification Form. (See Appendix 3.);

C. Supervisor shall record name(s) of absent employee(s) in first section;

D. Supervisor shall instruct crewmembers to search work area for absent employee(s). Page employee over public address system if one is available;

E. Searchers shall pay special attention to locations in which employee presence would result in physical harm through start-up of equipment/system;

F. When it has been determined that the absent employee is not present and is incapable of being injured by start-up of the equipment/system, the Supervisor shall dispatch an employee to contact the home(s) of the absent employee(s) and to search outlying areas as needed;

G. If the employee(s) have not been located following the required searches, the supervisor shall sign the Absent Employee Notification Form to document the required searches were conducted and the inability to account for absent employee(s);

H. The supervisor shall appoint employee(s) in numbers dictated by equipment/system configuration to secure all possible points of access to prevent the absent employee(s) from returning to the area;

I. The supervisor shall then return the equipment/system to service providing all other conditions in paragraphs f and g have been fulfilled;

J. Copies of the Absent Employee Notification Form shall be posted conspicuously in the work area;

K. Supervision of the area in which the equipment/system is located shall be informed of the absent employee(s)' identity and that the employee(s) are to be prevented from entering the work area until they have been informed that the lockout is no longer in effect.

14. CONTRACTORS/SUBCONTRACTORS

14.1. Procedures

14.1.1. Where CHES Lockout/Tagout procedures involve contractors/ subcontractors, they shall be informed of their obligation to provide employee protection through a Lockout/Tagout procedure. The CHES Manager or Supervisor responsible for completion of work involving contractors/subcontractors shall serve as the CHES interface with those parties. CHES will integrate its Lockout/Tagout procedures with those of contractors/subcontractors as follows:

A. The CHES Lockout/Tagout procedure will be used to provide initial authorization for LO/TO work;

B. Contractors/Subcontractors are required to provide protection for their employees through the use of their LO/TO procedure;

C. The Contractor's LO/TO procedure shall be used within the bounds of the CHES LO/TO. In other words, the CHES locks and tags are the first applied and the last removed. No device may be locked out without CHES' approval;

D. A Pre-Work conference shall be held with contractor/ subcontractor supervisor and CHES Supervisor to discuss the procedures contained within their respective programs and work to be performed to assure both are fully understood.

15. DISCIPLINE

Effective implementation of this program is dependent on all affected employees complying with its provisions. All affected employees shall be informed during training of the contents of this program and that failure to comply with its requirements will be grounds for progressive discipline up to and including discharge.

16. TRAINING

16.1. Guidelines

16.1.1. All affected and authorized employees shall be trained in the requirements of this program prior to engaging in any Lockout/Tagout related work.

16.1.2. Affected employees will receive initial training on the control of hazardous energy and an overview of the facility's lockout/tagout program.

16.1.3. Authorized employees must receive detailed initial training on the facility's lockout/tagout program and procedures. Also, authorized employees should receive training on any new procedures when the new procedures are issued and receive refresher training if an incident occurs and requires a review.

16.1.4. Training shall be documented using CHES training documentation forms. Copies of the forms shall be retained in the office training files and forwarded to the Corporate Training Department for inclusion in the Corporate Training Data Base.

17. REVIEW

To assure the continued effectiveness of the Lockout/Tagout Guidelines, CHES will perform a periodic review of Lockout/Tagout operations and Lockout/Tagout Guidelines.

17.1. Lockout/Tagout Operation Review

17.1.1. Lockout/Tagout operations will be audited/inspected at least annually by a person knowledgeable in the CHES Lockout/Tagout Guidelines who IS NOT participating in the operation being inspected. Observed deficiencies will be noted and reported to the job Supervisor for correction and to the Health and Safety Department.

17.1.2. Lockout/Tagout operations will also be reviewed if it is determined that:

A. Energy control procedures failed to protect employees involved in Lockout/Tagout operations;

B. A hazard not covered by the Lockout/Tagout procedure is detected;

C. An injury or near miss occurred during an operation involving Lockout/Tagout procedures;

D. There are complaints about the effectiveness of the guidelines.

17.2. Lockout/Tagout Guidelines Review

17.2.1. Within one (1) year from the date this guideline is implemented and annually thereafter, CHES will review the Lockout/Tagout Guidelines to ensure that employees are protected from hazards presented by sources of hazardous energy.

18. OTHER POLICIES AND PROCEDURES AFFECTED

HS 1.13	Hazard Communication
HS 1.17	Excavation Safety
HS 1.20	Confined Space Entry
HS 1.21	Hot Work
HS 1.23	Underground Storage Tank (UST) Removal

APPENDIX 1: Lockout/Tagout Program Implementation Procedure

The following guideline should be used to implement a Lockout/Tagout Procedure. Each step within the procedure references explanatory information contained in the Lockout/Tagout Guidelines. The Safety Department should be contacted for guidance if situations not addressed in the procedure or program arise.

1. Supervisor assumes role of Authorized Person in charge of Lockout/Tagout operations or delegates assignment to member of crew. (4.0 - See definition of Authorized Person in definition section.)

2. Authorized Person conducts equipment/system survey to determine if hazardous energy is present.

3. Supervisor conducts Pre-Work safety meeting to discuss nature of hazardous energy and how it will be controlled.

4 Note that the intent of this procedure is that each authorized employee must have control over each energy isolation device and associated lockout device. Where multiple numbers of lockout devices must be applied, a lockbox procedure can be used. See section 8.3 and 8.4 for the details on this procedure.

5. Lockout Permit is used to record the following information:

   A. Equipment/system identity.
   B. Hazard identity.
   C. Energy source(s)
   D. Energy source controls and location.
   E. Equipment/system shutdown.
   F. Energy controls to be locked/tagged out.
   G. Residual energy sources.
   H. Residual energy controls.
   I. Energy control verification.

6. Lockout/Tagout Permit is used to record the following actions taken to return the equipment/system being serviced to work.

   A. Clear equipment/system of people and tools.
   B. Account for all personnel.
   C. Remove energy control devices.
   D. Test equipment/system for proper operation.
   E. Return equipment/system to service.

7. File Lockout/Tagout Permit in permanent file.

APPENDIX 2: Lockout/Tagout Permit

See Following Pages.

CleanHarbors®

HAZARDOUS WORK PERMIT

HAZARDOUS WORK ☐ **HOT WORK** ☐ **LINE/EQUIP OPENING** ☐ **LOCKOUT/TAGOUT** ☐ **(Check all that apply)**

Permit authorization and permit termination for each type of permit must be completed on the last page of this permit

Start Time/Date: /	Expires: /	Completion Time:

Client:	Client Contact:	Client Phone #:	Dig Safe #:
CHES Job #:	CHES Location:	CHES Phone #:	H&S Rep:

Job Location:

Scope of Work -	Task 1:	Task 4:
	Task 2:	Task 5:
	Task 3:	Task 6:

Special Conditions:

EMERGENCY TELEPHONE NUMBERS - Fire: Police: Ambulance/Rescue:

Emergency Assembly Area: primary secondary

Hospital Name & Location:

HAZARD IDENTIFICATION

(circle task number) **(List specific substances in air monitoring section)**

CHEMICAL/BIOLOGICAL	$^{1\,2\,3}_{4\,5\,6}$ Toxic:	$^{1\,2\,3}_{4\,5\,6}$ Corrosive:	$^{1\,2\,3}_{4\,5\,6}$ Flammable:	$^{1\,2\,3}_{4\,5\,6}$ Combustible: $^{1\,2\,3}_{4\,5\,6}$ Reactive:
$^{1\,2\,3}_{4\,5\,6}$ Shock Sensitive	$^{1\,2\,3}_{4\,5\,6}$ Path Waste	$^{1\,2\,3}_{4\,5\,6}$ Oxygen Deficiency		
PHYSICAL				
$^{1\,2\,3}_{4\,5\,6}$ Abrasive Blasting	$^{1\,2\,3}_{4\,5\,6}$ Extreme Cold/Heat	$^{1\,2\,3}_{4\,5\,6}$ Lighting	$^{1\,2\,3}_{4\,5\,6}$ Sharp Objects	$^{1\,2\,3}_{4\,5\,6}$ Underground Utilities
$^{1\,2\,3}_{4\,5\,6}$ Drum Sumps	$^{1\,2\,3}_{4\,5\,6}$ Floor Holes	$^{1\,2\,3}_{4\,5\,6}$ Live Electrical Circuits	$^{1\,2\,3}_{4\,5\,6}$ Slips/Trips/Falls	$^{1\,2\,3}_{4\,5\,6}$ Vactor/Cusco
$^{1\,2\,3}_{4\,5\,6}$ Drilling In Soil	$^{1\,2\,3}_{4\,5\,6}$ Hot Work	$^{1\,2\,3}_{4\,5\,6}$ Manlifts/Highlifts	$^{1\,2\,3}_{4\,5\,6}$ Soil Excavation	$^{1\,2\,3}_{4\,5\,6}$ Vehicle Traffic
$^{1\,2\,3}_{4\,5\,6}$ Drum Handling	$^{1\,2\,3}_{4\,5\,6}$ Hotsy	$^{1\,2\,3}_{4\,5\,6}$ Noise	$^{1\,2\,3}_{4\,5\,6}$ Tank Excavation	$^{1\,2\,3}_{4\,5\,6}$ Waterblaster
$^{1\,2\,3}_{4\,5\,6}$ Elevated Work Area	$^{1\,2\,3}_{4\,5\,6}$ Ladders	$^{1\,2\,3}_{4\,5\,6}$ Overhead Utilities	$^{1\,2\,3}_{4\,5\,6}$ Trenching	$^{1\,2\,3}_{4\,5\,6}$ Work On/Near Water
$^{1\,2\,3}_{4\,5\,6}$ Excavation/Trench	$^{1\,2\,3}_{4\,5\,6}$ Lifting	$^{1\,2\,3}_{4\,5\,6}$ Pneumatic Tools	$^{1\,2\,3}_{4\,5\,6}$ Uncontrolled Work Area	

PERSONAL PROTECTIVE/SAFETY EQUIPMENT

(Review requirements with H&S)(Line opening; minimum level C)

__ SCBA	__ Supplied Air Resp.	__ SAR w/Egress Bottle	__ Air Purifying Respirator/Cartridge: ____________	
__ Protective Coverall Type: ________________	__ Outer Gloves Type: ________________	__ Inner Gloves Type: ________________	__ Fully Encapsulating Suit Type: ________________	Cartridge Use Time: __________
__ Barrier Cream	__ Evacuation Plans	__ GFCI Required	__ Nomex Coveralls	__ Safety Shower
__ Bonding/Grounding	__ Explosion Proof Equip	__ Hardhats	__ Non-Sparking Tools	__ Ventilation
__ Chemical Goggles	__ Eye Wash	__ Harness/Lanyard	__ Over Boots	Type: _____________
__ Communications	__ Face Shield	__ Hearing Protection	__ PFD's	__ Welding/Cutting
__ Cylinders Secured	__ Flashback Prev. Device	__ Hearing Prot.; Double	__ Reflective Vests	Shaded Lenses
__ Eliminate Ignit. Source	__ Flash Suit	__ MSDS's Reviewed	__ Safety Glasses	

EQUIPMENT INSPECTIONS – Foreman must initial to verify equipment has been inspected and is safe to use/operate.

________ D/D Pump (pressure relief valve)
________ Fall Protection (harness, lanyard
Anchor points support > 5000 lbs)
________ Fire Extinguisher(s)
________ Forklift

________ Hoses/Hose Connections
________ Ladder(s)
________ Retrieval Device
________ SAR/SCBA
________ Scaffold

________ Shower/Eyewash
________ Vactor Butterfly
________ Wire Rope/Sling
OTHER ________ ______________________________
________ ______________________________

LINE/EQUIPMENT OPENING PREPARATION

(Line opening portion is required for breaking process chemical or waste chemical lines, pumps, or associated valves)

☐ Locked Out (verified) ☐ Line/Equipment Drained ☐ Bleeder/Vent Open/Pressure Released ☐ Line/Equipment Steamed
☐ Line/Equipment Flushed with: ☐ Water ☐ Other media ___________________________________
☐ Line/Equipment Purged/Inerted with: ☐ N_2 ☐ CO_2 ☐ Other media ________________________

HOT WORK

ATTENTION: The Fire Safety Supervisor or appointee shall inspect the work area and confirm that precautions have been taken to prevent fire prior to approving the hot work permit. Local Fire Department notification may be required for hot work or fire system de-activation.

RESTRICTIONS: DO NOT perform hot work if any the following conditions exist- CONTACT HEALTH AND SAFETY:

- Oxygen level exceeds 22%
- Lower explosive limit exceeds 0%
- Organic vapor levels exceed 10ppm
- If fire hazards cannot be moved or guarded from the hot work

WORK ON WALLS OR CEILINGS:

☐ Ensure heat transfer through conductive material is prevented.
☐ Ensure that material is noncombustible and without combustible covering (i.e. insulation, etc).
☐ Combustibles moved away from opposite side of wall (May require an additional fire watch on the blind side of the wall if all potential hazards cannot be eliminated.)

PRECAUTIONS

☐ Sprinklers must be in service if present.
☐ Cutting/welding and all other equipment must be in good repair.
☐ Shut down ducts or conveyor systems that may convey sparks to distant combustibles.
☐ Combustible Gas Meter/LEL required for the duration of the process.
☐ General/Local ventilation must be adequate to provide control of smoke, fumes or toxic vapors.
☐ Flammable liquids / combustible materials within 35 feet must be moved or protected with covers, guards, or metal shields if not removable.
☐ No open-container work (sampling, pumping, or consolidating of flammable/combustible liquids) within 50 feet.
☐ Use fire blankets to secure all openings, cracks, and holes where sparks may migrate to potential fire hazards.
☐ Atmospheric monitoring conducted. (Document in Air Monitoring section)
☐ Evaluate any product pipelines in the area for potential fire hazards.
☐ Remove all paint coatings and residual contamination from the surface and clean down to the bare metal or similar.
☐ Combustible floor wetted down, covered with damp sand, or shielded.
☐ Signs and barriers posted (if publicly accessible).
☐ Welding curtains used where applicable
☐ Type ABC fire extinguisher required Number _______ Size ___________

FIRE WATCH:

☐ Required (Present for duration of work and for 30 minutes after the operation)
☐ Supplied with fire extinguisher / hose
☐ Trained in use of equipment and alarms

CONTACT HEALTH & SAFETY *<u>FOR APPROVAL PRIOR</u>* TO PERFORMING HOT WORK ON ENCLOSED EQUIPMENT/SYSTEMS

☐ Containers must be cleaned of all combustibles/flammables.
☐ Containers/product lines must be drained and purged of vapors with water and/or inert gas.

LOCKOUT/TAGOUT

DIAGRAM OF SYSTEM (OPTIONAL)

LOCKOUT/TAGOUT

DESCRIPTION OF WORK TO BE PERFORMED

METHOD TO VERIFY ISOLATION

LOCKBOX EQUIPMENT TO BE USED ☐Y ☐N

(All isolating devices, blinds, locks, etc., must be identified and have a tag attached and listed on this form.)

TAG NUMBER*	DEVICE BEING ISOLATED	ISOLATION METHOD	DEVICE LOCATION

ENERGY RESTORATION:

	YES
ALL PERSONNEL ACCOUNTED FOR AND IN THE CLEAR	☐
EQUIPMENT FREE OF TOOLS AND DEBRIS	☐
LOCKOUT/TAGOUT HARDWARE REMOVED	☐
PROPER EQUIPMENT OPERATION VERIFIED	☐
LOCKOUT/TAGOUT TERMINATED	☐

OR

CLIENT ASSUMES RESPONSIBILITY FOR ENERGY RESTORATION ☐

If Client assumes responsibility, supervisor must attempt to obtain the client contact information in the termination section

*Required for multiple LO/TO permits on one project.

ATMOSPHERIC MONITORING LOG

Instrument Type/ Manufacturer ________________________________ **DATE LAST CALIBRATED** ____________________________

Instrument Type/ Manufacturer ______________________ **DATE LAST CALIBRATED** ____________________
Instrument Type/ Manufacturer ______________________ **DATE LAST CALIBRATED** ____________________

ENVIRONMENTAL CONDITIONS: (weather, temp, wind, etc.) ____

		ACTION LEVELS	
SUBSTANCE	**LEVEL B MAX.**	**LEVEL C MAX.**	**LEVEL D MAX.**

ATMOSPHERIC MONITORING LOG Continued

ADDITIONAL COMMENTS: ____

PERMIT AUTHORIZATION
PERMIT TERMINATION

Haz. Work Termination	**Line Opening Termination**	**Hot Work Termination**	**LO/TO Termination**
☐ Decontamination of personnel and equipment is complete. ☐ All waste is labeled and staged for proper disposal. ☐ All postings/notifications removed. ☐ Work completed and accepted.	☐ Work completed and accepted.	☐ The work area and all adjacent areas to which sparks and heat may have spread (including floors above and below and on opposite sides of walls) were inspected 30 minutes after the work was completed and were found fire safe. ☐ All fire systems are re-activated. ☐ Work completed and accepted.	☐ All Lockout and Tagout Devices have been removed. ☐ Verified that equipment is back to normal operating conditions. ☐ All affected personnel notified that system is back in service. ☐ Work completed and accepted. ☐ Client signature obtained for release to restore energy.
Date:	**Date:**	**Date:**	**Date:**
Time:	**Time:**	**Time:**	**Time:**
Signature:	**Signature:**	**Signature:**	**Signature:**

CLIENT CONTACT ________________/____________________ ________/_______
PRINT/SIGN(If Available) DATE/TIME

IN THE EVENT OF AN EMERGENCY EVACUATION, ALL PERMITS ARE CANCELLED.

APPENDIX 3: Lockout/Tagout Absent Employee Notification

UPON COMPLETION OF WORK PERFORMED UNDER LOCKOUT CONDITIONS THE EMPLOYEE(S) LISTED BELOW WERE UNABLE TO BE LOCATED OR ACCOUNTED FOR:

ALL ATTEMPTS HAVE BEEN MADE TO LOCATE THE EMPLOYEE(S) AT THE FACILITY/JOB SITE AND AT HOME. IT HAS BEEN VERIFIED THAT THE ABSENT EMPLOYEE(S) IS/ARE NOT IN THE VICINITY OF THE HAZARDOUS ENERGY SOURCE(S) AND WILL NOT BE AFFECTED BY THE START UP OF EQUIPMENT WHICH WAS UNDER LOCKOUT CONDITIONS.

SIGNATURE, AUTHORIZED PERSON IN CHARGE ____ DATE ____ TIME ____

APPENDIX 4: Lockout/Tagout Audit Checklist

CLEAN HARBORS ENVIRONMENTAL SERVICES

LOCK OUT/TAG OUT AUDIT CHECKLIST

(FOR CLEAN HARBORS' USE ONLY, DO NOT DISTRIBUTE)

****************CONFIDENTIAL*****************

FACILITY NAME: ______________________ **DATE OF AUDIT:** ______________________

In accordance with Code of Federal Title 29 Section 1910.147 Clean Harbors conducts periodic audits of Lock Out /Tag Out procedures being performed at CHES locations. These audits shall identify the machinery or equipment on which the energy control procedures are being utilized, the date of the audit, identification of the employees involved in the inspection and the person performing the inspection.

DOCUMENTATION REVIEW: Pull the existing completed LO/TO permits, training records, associated documentation and review them for content and accuracy.

YES	NO	ITEM	COMMENTS
		Are "authorized employees" identified in writing?	
		Have authorized employees received documented training in the recognition of hazardous energy sources, the type and magnitude of the energy available and methods and means necessary for energy isolation and control?	
		Have "affected employees" received documented training on this procedure and regarding the prohibition relating to attempts to restart or reenergize equipment that is locked or tagged out?	
		Are completed permits maintained on file? If so, where (comments)?	
		Are all permits on file closed and signed off on prior to filing?	
		Are control points identified on the permits?	
		Have all permits been signed by all affected personnel?	
		Have all personnel potentially exposed to electrical hazards received documented safety training in accordance with 1910.331-335?	

INTERVIEWS: Conduct interviews of the Maintenance Manager, Operations Managers, Operations Foremen/Supervisor, and at least one maintenance employee and one facility tech that is identified as being an authorized or affected employee.

YES	NO	ITEM	COMMENTS
		Do authorized employees recognize hazardous energy sources, types, the magnitude of the energy available and methods and means necessary for energy isolation and control?	
		Have affected employees been provided the opportunity to review and understand the CHES Lock Out/Tag Out Program?	
		Do all employees understand where to find designated lock out/tag out equipment?	
		Do all "affected personnel" potentially exposed to hazardous energy sources understand that they may not share keys for individual locks under any circumstances?	

		Where tags are permitted, do personnel understand that tags are only warning devices and do not physically prevent the operation of the equipment?	
		Do personnel understand that LO/TO locks and tags are not to be removed without authorization?	
		Do personnel understand that LO/TO locks and tags are never to be by-passed, ignored, or otherwise defeated?	
		Does each authorized and affected employee understand that they must have individual control over a lock out situation?	

LOCK OUT/TAG OUT EQUIPMENT INVENTORY: Conduct an inventory of the available LO/TO equipment available on site and verify the presence of adequate LO/TO devices (to include a group lock out box and circuit breaker covers).

Equipment	Where is it Used?	Name of the Department using the item
Group Lock Box		
Padlocks		
Tags (Do Not Operate, Danger, etc;)		
Chains		
Wedges		
Key Blocks		
Adaptor Pins		
Self-Locking Fasteners		
Breaker Blocks		
Circuit Breaker Covers		

PHYSICAL PLANT INSPECTION & ENERGIZED EQUIPMENT INVENTORY: Conduct a physical plant inspection to identify the pieces of equipment that require documented LO/TO and the specific points that require LO/TO within the facility.

NOTE: [EXCEPTION (IAW 29 CFR 1910.147(c)(4)] CHES need not document the required procedure for a particular machine or equipment when <u>**ALL**</u> of the following elements exist:

1. The machine or equipment does not have the potential for stored or residual energy or reaccumulation of stored energy after shut down which could endanger employees?
2. The machinery or equipment has a single source of energy that can be readily identified and isolated?
3. The isolation and locking out of that energy source will completely deenergize and deactivate the machine or equipment?
4. The machine or equipment is isolated from the energy source and locked out during servicing or maintenance?
5. A single lockout device achieves a locked-out condition?
6. The lockout device is under the **exclusive control** of the authorized employee performing the servicing or maintenance?
7. The servicing or maintenance does not create hazards for other employees?
8. There have not been any previous accidents or near misses involving the unexpected activation or regeneration of the machine or equipment during operations, servicing or maintenance?

Equipment	**Location**	**Multiple or Single Energy Source**	**Hazard Severity**	**Number of LO/TO Points**	**Estimated Frequency of LO/TO**	**Existing Hazard Signs**
EXAMPLE Pegasus DPU	Building #43	Hydraulic & Electric	Severe	26	Monthly	Confined Space

TABLE KEY:
Equipment: Identify the equipment that is locked and/or tagged out.
Location: Identify the equipments specific location within the facility.
Energy Source: Identify whether the piece of equipment has a single source of energy, such as electrical, or multiple sources, such as hydraulic and electric.
Hazard Severity: Severe = Hazardous to Life and Limb, Moderate = May result in serious lacerations, contusions, debridement, etc, Negligible = May result in minor injuries.
Number of LO/TO Points: Identify the number of points that require some type of LO/TO to discern the complexity of the process.
Estimated Frequency of LO/TO: Estimate the frequency in which that particular piece of equipment is locked and/or tagged out (i.e. Daily, Weekly, Monthly, Quarterly, etc).
Existing Hazard Signs: Identify any existing signs that are currently utilized to warn employees of the potential hazards associated with the piece of equipment.

Tag Out Usage

YES	NO	ITEM	COMMENTS
		Where tags are used, are the tags legible and understandable by all employees?	
		Are the tags made of material that will withstand the environmental conditions encountered in the workplace?	
		Are tags securely attached to the energy-isolating device?	
		Can the unit be locked out?	

OTHER THINGS TO CONSIDER

Machine Guarding (29 CFR l910.212)

YES	NO	ITEM	COMMENTS
		Is the point of operation, nip flying objects, chips, sparks, etc. contained?	
		Are employees protected from flying objects, chips, sparks, etc.?	
		Are guards in place that are designed to prevent employee from having body in danger zone during the operation cycle?	
		Is the machine securely anchored to prevent walking or moving?	

I certify that the above audit was performed in accordance with 29 CFR 1910.147.

REPORT PREPARED BY:
NAME: ______________________ SIGNATURE ______________________ DATE: ______________

REVIEW:
NAME: ______________________ SIGNATURE ______________________ DATE: ______________

HS 1.82 MOBILE CRANES GUIDELINES

HS 1.82 MOBILE CRANES GUIDELINES

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HS 1.82 MOBILE CRANES GUIDELINES

1. PURPOSE

This procedure has been developed to ensure the safety of all employees that are required to operate mobile cranes as part of their job responsibilities. By following these policies and guidelines, the risk of injury will be minimized.

2. DESCRIPTION

This procedure specifies the requirements for the safe operation of mobile cranes. These requirements apply to all employees operating mobile cranes at Clean Harbors locations and at client sites.

Note: Please note that there might be STATE licensure requirements. Please research and determine if this is applicable to your state.

3. DEFINITIONS

Accessory - A secondary part or assembly of parts that contributes to the overall function and usefulness of a machine.

Appointed - Assigned specific responsibilities by the employer or the employer's representative.

Approved - Acceptance and approval for use in Canada or the United States of America by the authority having jurisdiction.

Angle Indicator (boom) - An accessory that measures the angle of the boom base section to the horizontal.

Auxiliary hoist (see whipline.)

Axis of rotation - The vertical axis around which the crane superstructure rotates.

Axle – The shaft or spindle with which, or about which, a wheel rotates. On truck and wheel mounted cranes it refers to an automotive type of axle assembly including housings, gearing, differential bearings, and mounting appurtenances.

Axle (bogie) - Two or more automotive type axles mounted in tandem in a frame so as to divide the load between the axles and permit vertical oscillation of the wheels.

Backward stability - The ability of a crane to resist overturning in the backward direction while in the unloaded condition. The degree of resistance to backward overturning is reflected in the margin of backward stability.

Base (mounting) - The traveling base or carrier on which the rotating superstructure is mounted such as a crawler or wheel platform.

Boom (crane) - A member hinged to the rotating superstructure and used for supporting the hoisting tackle.

Boom angle - The angle above or below the horizontal of the longitudinal axis of the base boom sections.

Boom hoist - A device for controlling the boom angle.

Boom stop - A device used to limit the angle of the boom at the highest recommended position.

Brake - A device used for retarding or stopping motion by friction or power means.

Cab - A housing that covers the rotating superstructure, machinery and/or operator's station. On truck-crane carriers a separate cab covers the driver's station.

Clutch - A friction, electromagnetic, hydraulic, pneumatic, or positive mechanical device for engagement or disengagement of power.

Counterweight - Weight used to supplement the weight of the machine in providing stability for lifting working loads.

Designated - Selected or assigned by the employer or the employer's representative as being qualified to perform specific duties.

Drum - The cylindrical members around which ropes are wound for raising and lowering the load or boom.

Dynamic (loading) - Loads introduced into the machine or its components by forces in motion.

Gantry (A-frame) - A structural frame, extending above the superstructure, to which the boom support ropes are reeved.

Jib - An extension attached to the boom point to provide added boom length for lifting specified loads. The jib may be in line with the boom or offset to various angles.

Load (working) - The external load, in pounds, applied to the crane, including the weight of load-attaching equipment such as load blocks, shackles, and slings.

Load block (upper) - The assembly of hook or shackle, swivel, sheaves, pins, and frame suspended from the boom point.

Load block (lower) - The assembly of hook or shackle, swivel, sheaves, pins, and frame suspended by the hoisting ropes.

Load hoist - A hoist drum and rope reeving system used for hoisting and lowering loads.

Load ratings - Crane ratings in pounds established by the manufacturer.

Outriggers - Extendable or fixed metal arms, attached to the mounting base, which rest on supports at the outer ends.

Pawl (dog) - A device for positively holding a drum against rotating in the lowering direction.

Reeving - A rope system in which the rope travels around drums and sheaves.

Rope - Refers to wire rope unless otherwise specified.

Side loading - A horizontal force resulting from a load applied at an angle to the vertical plane of the boom from the boom point or head.

Standby crane - A crane which is not in regular service but which is used occasionally or intermittently as required.

Standing (guy) rope - A supporting rope which maintains a constant distance between the points of attachment to the two components connected by the rope.

Structural competence - The ability of the machine and its components to withstand the stresses imposed by applied loads.

Superstructure - The rotating upper frame structure of the machine and the operating machinery mounted thereon.

Swing - Rotation of the superstructure for movement of loads in a horizontal direction about the axis of rotation.

Swing mechanism - The machinery involved in providing rotation of the superstructure.

Tackle - An assembly of ropes and sheaves arranged for hoisting, lowering, and pulling.

Telescoping boom - A boom that consists of a base boom from which one or more boom sections are telescoped for additional length.

Transit - The moving or transporting of a crane from one job site to another.

Travel - The function of the machine moving from one location to another, on a job site.

Travel mechanism - The machinery involved in providing travel.

Two blocking - The condition when the lower load block comes in contact with the upper load block or boom point.

Wheelbase - Distance between centers of front and rear axles. For a multiple axle assembly, the axle center for wheel base measurement is taken as the mid-point of the assembly.

Whipline (auxiliary hoist) - A separate hoist rope system of lighter load capacity and higher speed than provided by the main hoist.

Winch head - A power driven spool for handling of loads by means of friction between fiber or wire rope and spool.

4. PRE-USE PROCEDURES

4.1. Introduction

The safe operation of mobile cranes requires the integration of proper equipment selection, facility design, maintenance, operating procedures, and training. Clean Harbors is committed to ensuring safe work environment for our employees. To accomplish this, we have developed Mobile Crane Guidelines to ensure that the equipment is complete, functional, and used in compliance with regulatory standards. All cranes in use shall meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in the ANSI B30.5-1968.

4.2. Rental Agreement

Please notify the equipment rental, leasing company, or equipment owner of the following information when arranging for the equipment use. Clean Harbors considers the equipment incomplete if defects, malfunctions, etc. are found during the pre-start inspection performed by Clean Harbors. We will also consider the equipment incomplete if an up-to-date Operations Manual does not accompany the equipment.

4.3. Receipt of Equipment

4.3.1. Prior to operation of the equipment, the designated operator will ensure that the items specified below are satisfied. If they are not satisfied, the equipment cannot be used.

4.3.2. Operations Manual - Verify that the Operations Manual accompanies the equipment. Review the manufacturer's operating instructions, user safety rules, and other pertinent information provided.

4.3.3. Crane Log - Verify that a copy of the Crane Log accompanies the equipment. Review the Log for information pertaining to previous maintenance and issues with the equipment.

4.3.4. Inspection - Inspect the unit to ensure the equipment is sound and fully functional. See section 4.5 for items to evaluate.

4.3.5. Application - Verify that the equipment will be used within the intended application or specifications, ratings, or limitations specified by the manufacturer.

4.4. Transportation

4.4.1. Mobile cranes that will be driven on public roadways will be driven by individuals who posses the appropriate Commercial Drivers License (CDL) classification.

4.4.2. Mobile cranes that will be transported on a trailer on public roadways will be transported by individuals who possess the appropriate Commercial Drivers License (CDL) classification.

4.4.3. Prior to transportation, verification must be made that the locking devices for the boom are secured and/or that the crane is properly secured for transportation.

4.4.4. Loading and unloading of the crane from a trailer must be accomplished by staying within the slope capabilities of the crane to avoid tipping of the crane.

4.5. Pre-Start Inspections

4.5.1. Before each use (by shift or operator), the authorized operator will conduct a visual and/or functional test of the items listed below. Pre-use inspections will be conducted in accordance with the contents of section 4.5 and manufacturer's recommendations.

4.5.2. Load Rating Chart is present and legible. The information on this chart shall include the following:

A. Load ratings for the main boom;

B. Crane model number, serial number, and year of original saleby the manufacturer;

C. Adequate warning that no allowance is made for such factors as effects of swinging loads, tackle weight, wind, degree of machine level, ground conditions, inflation of tires and operating speeds;

D. Information on any limitations in boom length or boom angle for specified conditions of outriggers, direction of boom or other requirements which might affect the forward stability (in the direction of the boom);

E. Any restrictions as to operating in low temperatures.

F. All manufacture placed warning signs, work limits, etc are visible and legible to the operator.

4.5.3. Operations Manual is present. The following information shall be provided in a manual that shall be kept in the operator's cab.

A. A full and complete range of manufacturer's approved crane load ratings for the boom and jib at all stated operating radii and boom angles, and for all permissible boom lengths, jib lengths, and angles;

B. Work areas, in accordance with Figure 1, for which capacities are listed in the capacity chart. The manufacturer may, at his option, list capacities for one or more of these working areas or may list capacities for any combination of working areas so long as such areas or combinations of areas are identified on the capacity chart and/or in the instructions;

C. Alternate load ratings for use and non-use of optional equipment on the crane, such as outriggers, gantry positions, and extra counterweights that affect ratings. It shall be clearly indicated that outrigger rating apply only when outrigger beams are fully extended and the crane's wheels are clear of the ground;

D. Where load ratings are limited by structural competence, such ratings shall be clearly shown and emphasized by drawing a line to separate ratings with structural limits from rating with stability limits;

E. If the specification for a crane with a non-symmetrical mounting includes additional ratings for directions other than the least stable, the directional range shall be indicated;

F. Recommended parts of hoist reeving, size, and type of rope for various crane loads;

G. Essential precautionary or warning notes relative to limitations on equipment and operating procedures;
H. Drum data, permissible line pull, line speeds and rope spooling capacity;

I. Tire pressures where applicable.

4.5.4. Ensure all rope reeving, including load lines, jib suspension, boom hoist, and mid-point suspension (center hitch) are in compliance with the crane manufacturer's recommendations.

4.5.5. Check and ensure the following control mechanisms are functioning properly prior to operation. NOTE: Ice, rain, and other climatic conditions can have serious adverse effects on the functioning of control mechanisms.

A. All safety devices, daily;

B. Deterioration or leakage in air, hydraulic, lubricating, and cooling systems, daily;

C. Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, icing, and moisture accumulation, daily;

D. Crane hooks and blocks for deformation or cracks and stamped load rating and weight present, daily;

E. Freedom of rotation of all swivels, daily;

F. Deformed or corroded members, and cracked members or welds, in the crane structure and boom, at least monthly;

G. Loose bolts or rivets, at least monthly;

H. Cracked, worn, or deformed sheaves and drums, at least monthly;

I. Guards for sheaves, drums, and power plants for presence, position, and condition, daily;

J. Worn, cracked or distorted parts such as pins, bearings, shafts, gears, rollers, and locking devices, at least monthly;

K. Wear on brake and clutch system parts, linings, pawls, and ratchets, at least monthly;

L. Load, boom angle and other indicators over their full range, for significant inaccuracies, at least monthly;

M. Gasoline, diesel, electric or other power plants for improper performance or noncompliance with safety requirements, at least monthly;

N. Wear of chain drive sprockets and chain stretch, at least monthly;

O. All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter, at least monthly;

P. Travel steering and braking systems for malfunction, at least monthy;

Q. Worn or damaged tires and crawler undercarriage, at least monthly;

R. Cab doors and windows for presence, condition, proper function, and visibility, daily;

S. Cab is free of debris and personal belongs that may interfere with the operations of the equipment controls, at least daily;

T. All lights, markers, signals are operational, daily;

U. Fire extinguisher, minimum A-5: B-C dry chemical, for presence at the cab, charge, and condition, daily;

V. Any defects found will be corrected prior to operations of the crane.

W. Absolutely no modifications will be made to any crane without express written approval from the manufacturer.

X. Standby cranes will receive a complete inspectrion every use or at least every six months.

4.5.6. Rope Inspection

A. All newly received cranes and cranes that have been idle will have a complete rope inspection.

B. Monthly complete rope inspections will be made for in use cranes.

C. All complete rope inspections will be documented on the Crane Log indicating condition of ropes.

D. Wire conditions to be inspected for:

1. Broken wires.

2. Running wire ropes shall be considered unserviceable and removed from service of six (6) randomly distributed wires are broken in one rope lay, or three (or more) wires are broken in one strand in any one rope lay

3. Standing ropes shall be considered unserviceable and removed from service if there are three (3) or more broken wires in one lay, in sections between end connectors, or more than one (1) broken wire at an end connector.

4. Wear exceeds one-third of the original diameter of outside individual wires.

5. There is evidence of kinking, bird caging, or any other damage resulting in distortion of the rope structure.

6. There are reductions from nominal rope diameter, from any cause, in excess of:

    a. 3/64-inch for diameters to and including 3/4-inch; or

    b. 1/16-inch for diameters 7/8-inch to 1-1/8-inch inclusive; or

    c. 3/32-inch for diameters 1-1/4-inch to 1-1/2-inch inclusive.

7. Any deterioration, including corrosion, resulting in appreciable loss of original strength, shall be carefully noted and determination made if further use of the rope would constitute a hazard.

4.5.7. Defect/Malfunction Noted - If a defect, malfunction, or other problem is noted during the pre-start inspection, DO NOT OPERATE the equipment. Repairs must be made prior to continuing use of the equipment.

4.5.8. Adjustments/Repairs - Only trained and authorized Clean Harbors employees are permitted to adjust or repair equipment.

4.5.9. All major structural repair or replacement should be performed by the manufacturer or a manufacturer’s representative. Absolutely no modifications will be made to a crane without express written approval from the manufacturer.

4.5.10. An annual inspection will be performed by the manufacturer or a manufacturer’s representative.

4.5.11. All maintenance, repair, certification must be documented on the Crane Log. A copy of the Crane log must be with the crane. The main copy of the Crane Log will be kept by the General Manager or Operations Manager.

4.5.12. All lubrication of equipment, ropes, etc will be done in compliance with the manufacturer’s recommendations.

5. CRANE OPERATIONS

5.1. Introduction

Only trained and authorized employees may operate mobile cranes. Where applicable, the employee will also have to have appropriate training and/or license to operate a crane based upon state or provincial requirements. Additionally, training records and operations logs will need to be readily available. The crane must be operated within the manufacturer’s recommended limits and capacities. It is required that all crane operators use an authorized/licensed/bonded instructional course, e.g., Crane Safety Institute. All operators must meet the physical qualifications, pass a physical, a written examination, understand and be able to use a load chart as well as calculate loads for the crane type.

5.2. Required observations

When operating a crane, the following must be observed:

5.2.1. The operator will familiarize himself with the equipment and its proper care, before putting any crane into operation;

5.2.2. The operator will ensure that all guards, controls, clutches, brakes, gears, pawl locks and the like are properly set and that putting the equipment into operation will not endanger property, the public, or personnel;

5.2.3. The operator will test all controls at the start of each shift. If any functions do not operate properly, they shall be adjusted or repaired before operations are begun;

5.2.4. The operator will notify the next operator of any defects upon changing shifts;

5.2.5. The operator will not operate a crane until safety has been assured;

5.2.6. The operator will ensure that the crane has been positioned properly;

5.2.7. Operating and maximum swing radii are free of obstruction to the extent feasible;

5.2.8. Ground elevations, slopes, trenches, excavations are not at a depth that would exceed the length of the rope or not allow there to be less than three (3) full wraps on the sheave;

5.2.9. Overhead power and telephone lines are at an appropriate distance as discussed in Section 5.4.8;

5.2.10. Operations will not affect other cranes, hoists, structures and buildings, and other pertinent site features;

5.2.11. Soil stability and bearing capacity whenever the unit is either ground supported or mounted on a temporary base such as cribs or mats will not be exceeded under any conditions;

5.2.12. Structural stability and bearing capacity whenever the unit is supported on or by any structure will be such that the stability and strength of the structure will not be exceeded under any conditions.

5.2.13. The operator will have unobstructed view of hazards, personnel, and other equipment.

5.2.14. The area in which the crane is operated is free of hazardous atmospheres or the hazardous build up of exhaust by products.

5.2.15. Atmosphere monitoring and/or respiratory protection may be required based upon the Respiratory Protection program or the direction of a Health and Safety Manager.

5.2.16. The operator will check that the machine is level with installed levels or auxiliary construction level.

5.2.17. The unit will be level within 1 degree, or 5/8” rise over a 36” span.

5.2.18. The operator will ensure that, whenever possible, the machine is operated in its most stable position and in the area of highest capacity.

5.2.19. The operator will know that the weight of the load to be lifted is within the capacity of the machine.

5.2.20. The operator will maintain focus on the task at hand and not engage in any practice which would divert attention from the operation of the machine.

5.2.21. The operator will have a clear and unrestricted view of the load and the operational area or will act upon the instruction of the appointed signalman before operating any crane.

5.2.22. The operator shall respond to signals only from the appointed signalman but shall obey a stop signal at any time no matter who gives it.

5.2.23. The operator will ensure that weather conditions do not interfere with the operations of the crane. This may include visibility issues with rain, snow, fog, frost, etc. or crane limitations based upon temperature and the manufacturer's recommendations.

5.2.24. The operator will avoid sudden starts and stops when lifting, slewing, or rotating the machine and load.

5.2.25. The operator will use the slowest rotational speeds such that the load does not swing out beyond the radius at which it can be controlled.

5.2.26. The operator will not leave the controls unattended while a load is suspended.

5.2.27. The operator of machines having rope suspended booms will use the controlled boom lowering mechanism whenever lowering the boom.

5.2.28. The revolving portion of the superstructure of the crane will be level and, where necessary, the crane will be properly blocked.

5.2.29. The operator will ensure that the hoist rope is not wrapped around the load.

5.2.30. The operator will ensure that the hoist rope(s) are not kinked.

5.2.31. The operator will ensure that multiple part lines are not twisted around each other which would cause load rotation upon lifting.

5.2.32. The operator will place the load line over the center of gravity of the load so as to prevent it from swinging.

5.2.33. The operator will observe and ensure that all loads are properly rigged to prevent the dislodgement of any part.

5.2.34. Tag lines or guide ropes will be attached to the load if there is anticipation of any uncontrolled movements of the load prior to lifting.

5.2.35. Working with the assistant or signalman, the operator will ensure the load is properly blocked before unhooking and unslinging.

5.2.36. The operator in conjunction with the signalman will ensure that the work area and carriage rotation area are not accessible to the public and no one is permitted to walk under a raised load. Barricades will be used to prevent access to the area.

5.2.37. Traveling a load with a crane may at times be necessary. The operator must ensure that:

A. The traveling procedures are in accordance with the manufacturer's recommendations;

B. The hook load will be reduced to protect equipment from shock loads caused by ground irregularities;

C. Operating on slopes while traveling with suspended loads will be avoided;

D. The boom will be carried in line with the direction of motion;

E. Where permitted by the design, the crane operator will remain in the crane cab to control the load and a second operator will be used to drive the vehicle. The signalman will coordinate the operation, walk ahead of the load, and warn of hazards;

F. Specified tire pressures are maintained;

G. Sudden starts and stops are avoided;

H. Tag or restraint lines are provided to control swinging of the load;

I. The load is kept as close to the ground as possible so that the length of hoisting cable between the boom point and load is as great as possible;

J. The boom is not carried at such a high angle as to allow any possibility of it bouncing back over the cab.

5.3. Unattended Cranes

5.3.1. When the crane is to be left unattended, the operator will ensure the following;

A. Land any attached load;

B. Set all brakes and locking devices;

C. Secure the unit against accidental travel and inadvertent movement;

D. Secure the unit, booms, etc. from inclement weather conditions.

E. Lock doors to prevent unauthorized access.

5.4. Signalman

5.4.1. The signalman will be familiar with the operations of the crane in use.

5.4.2. The signalman and operator will coordinate communications prior to operations.

5.4.3. Appendix B contains a list of standard signals. This list is to be posted at all job sites when cranes are in use.

5.4.4. The signalman will stay clear of all loads.

5.4.5. The signalman will stay within line of sight of the operator at all times.

5.4.6. The signalman will wear a reflective vest or other bright colored clothing to ensure high visibility by the operator.

5.4.7. The signalman will not perform any duties that would interfere with the ability to spot the load or signal the operator.

5.4.8. Operating near overhead electrical wires. The following is a listing of the minimum safe distance from an energized overhead line based upon known voltage. Voltages greater than 50kV will have 4.0 inches added for every 10kV of voltage.

Voltage (volts) Up to:	**Distance (feet)**
50,000	10
80,000	11
110,000	12
200,000	15
350,000	20

5.4.9. A qualified signalman will assist with the operation and estimate the distances from electrical lines of the boom, ropes, and load to ensure they stay at the safe distances;

5.4.10. Advance notification to the electrical authority to request for insulation or isolation and grounding of the line or lines will be made if encroachment on the lines is expected;

5.4.11. Distances will be affected by high winds due to the lines moving in the wind or the load swinging due to the wind.

5.4.12. Traveling with a raised load under power lines should be avoided. If this is necessary, prior approval must be obtained from the Health and Safety Department.

5.4.13 Report every incident involving contact with a live line to the electrical authority so that inspections and repairs can be made to prevent damaged live lines from falling at a later date.

5.4.14. Completely inspect the machine for possible damage caused by the electrical contact.

5.4.15. In the event the crane or load makes contact with an energized circuit the operator must, if possible:

A. Remain inside the cab;

B. Instruct all other personnel to keep away from the machine rope and load;

C. Try, unaided, and without anyone approaching the machine, to back off the crane until it is well clear of the power line;

D. If the machine cannot be self-propelled away or disentangled from the line, remain inside the machine until the electrical authorities de-energized the circuit and confirm that conditions are safe.

5.4.16. In the event the crane or load makes contact with an energized circuit and the operator must leave the equipment, the operator must:

A. Jump clear of the unit with both feet together and landing perpendicular from the unit.

B. DO NOT STEP OFF OF THE UNIT as this may cause electrocution due to different electrical potentials at the unit and the ground.

C. DO NOT WALK AWAY FROM THE UNIT. Either shuffle with feet very close together, or jump with feet together and hop away. Electrocution may occur due to different "rings of potential" that emanate from the unit at its point of ground. Stepping can cause each foot to be in a different electrical potential causing electrical discharge from one foot to the other.

6. APPENDICES

Appendix 1 – Work Areas
Appendix 2 – Hand Signals
Appendix 3 – Crane Log

APPENDIX 1: WORK AREAS

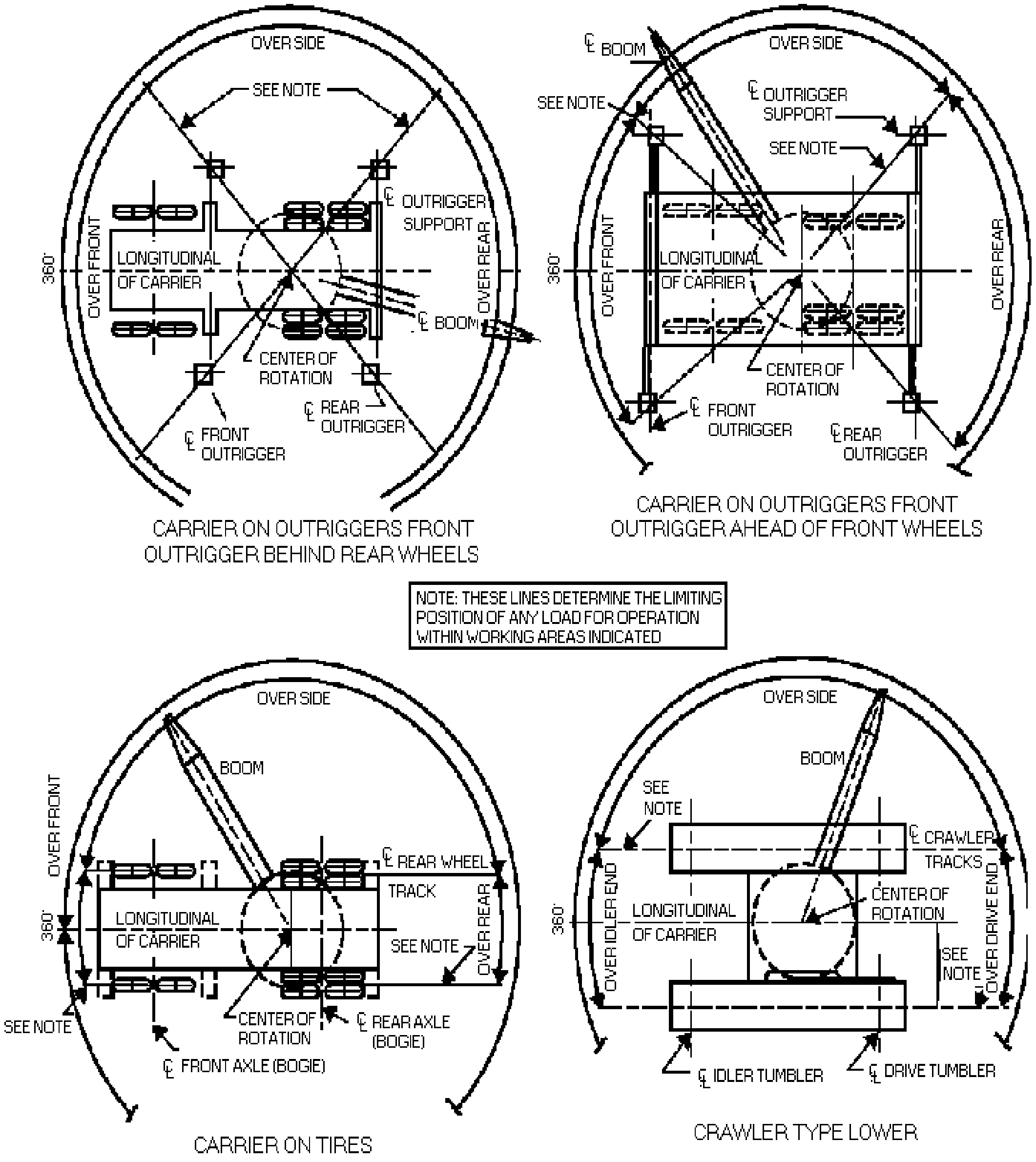
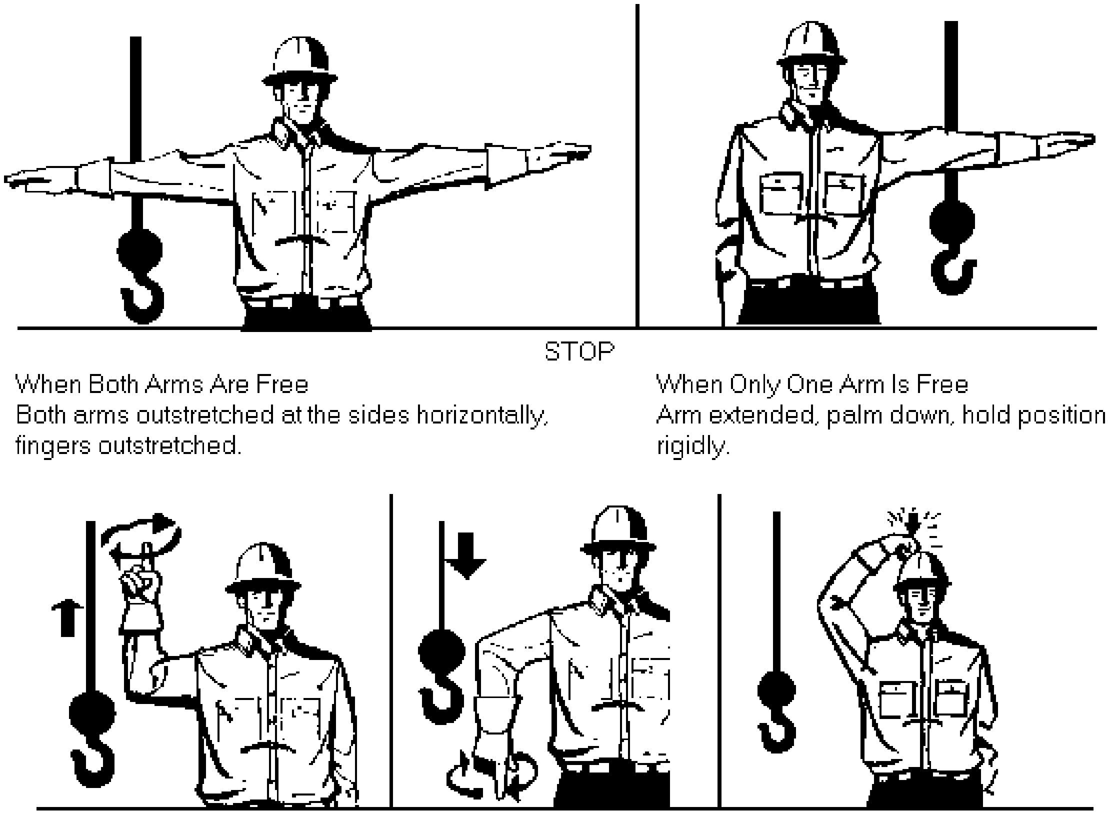


Figure 1
Work Areas

APPENDIX 2: HAND SIGNALS



STOP

When Both Arms Are Free
Both arms outstretched at the sides horizontally, fingers outstretched.

When Only One Arm Is Free
Arm extended, palm down, hold position rigidly.

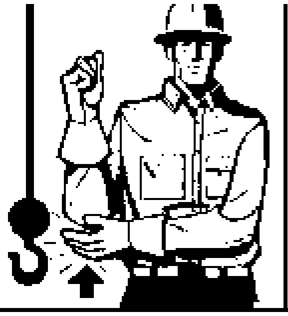
HOIST – With forearm vertical, forefinger pointing up, move hand in small horizontal circles.

LOWER – With arm extended downward, forefinger pointing down, move hand in small horizontal circles.

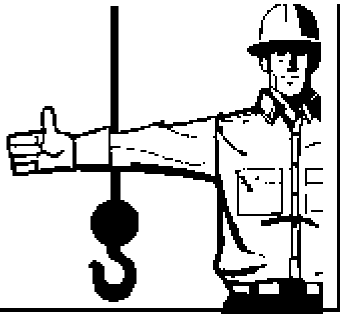
USE MAIN HOIST – Tap fist on head, then use regular signals.

Figure 2
Hand Signals for Controlling Crane Operations

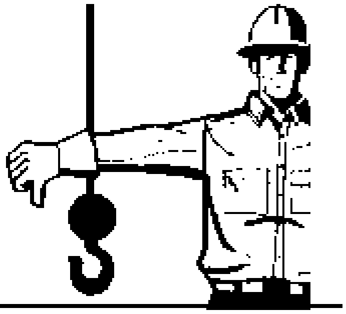
Appendix 2: Hand Signals cont'd



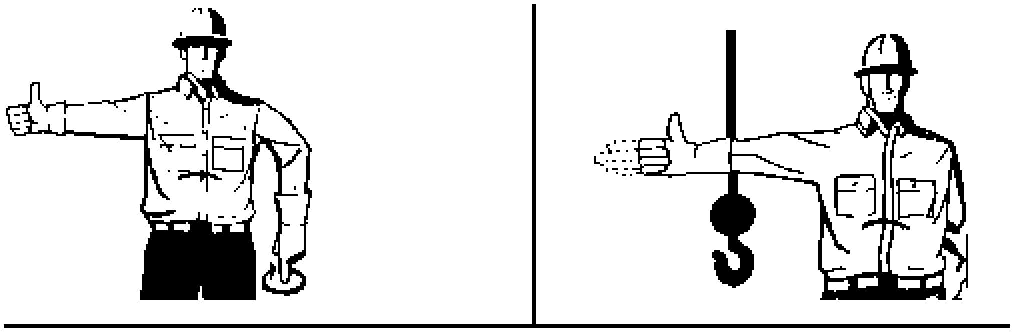
USE WHIPLINE – (Auxiliary hoist) Tap elbow with one hand, then use regular signals.



RAISE BOOM – Arm extended, fingers closed, thumb pointing upward.



LOWER BOOM – Arm extended, fingers closed, thumb pointing downward.



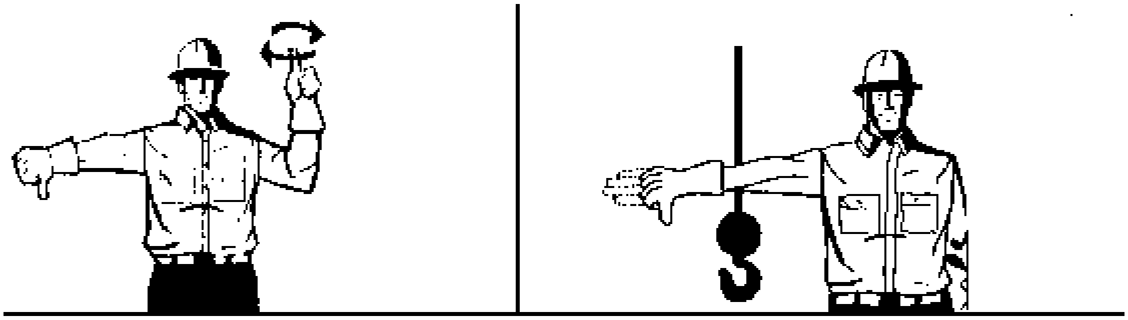
RAISE THE BOOM AND LOWER THE LOAD

When Both Arms Are Free
Arm extended, fingers closed, thumb pointing upward, other arm bent slightly with forefinger pointing down and rotate hand in horizontal circles.

When Only One Arm Is Free
With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.

Figure 2 (continued)

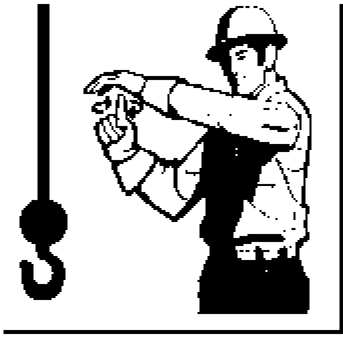
Appendix 2: Hand Signals cont'd



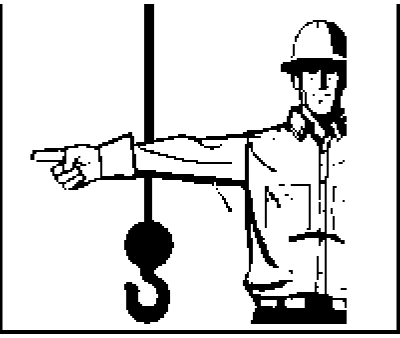
LOWER THE BOOM AND RAISE THE LOAD

When Both Arms Are Free
Arm extended, fingers closed, thumb pointing downward, other arm vertical, forefinger pointing upward and rotate hand in horizontal circles.

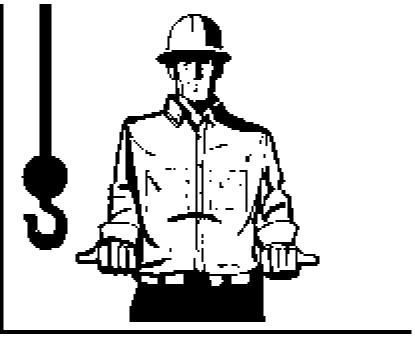
When Only One Arm Is Free
With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.



MOVE SLOWLY – Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)



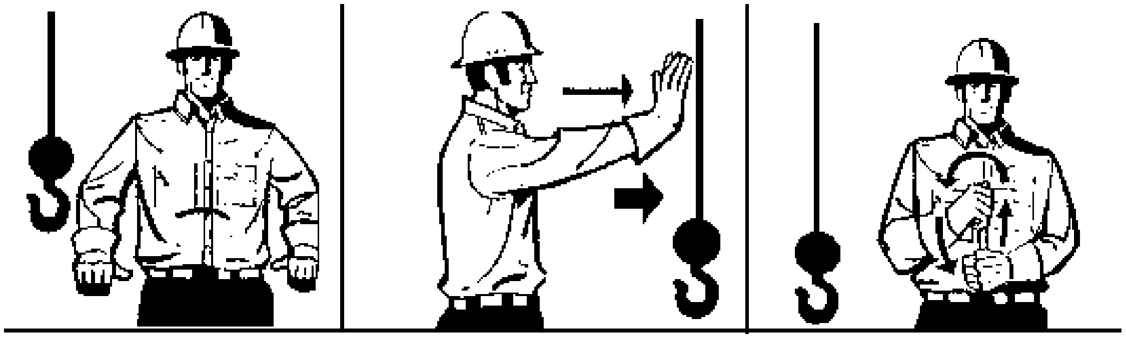
SWING – Arm extended, point with finger in direction of swing of boom.



EXTEND BOOM – (Telescoping booms) Both fists in front of body with thumbs pointing outward.

Figure 2 (continued)

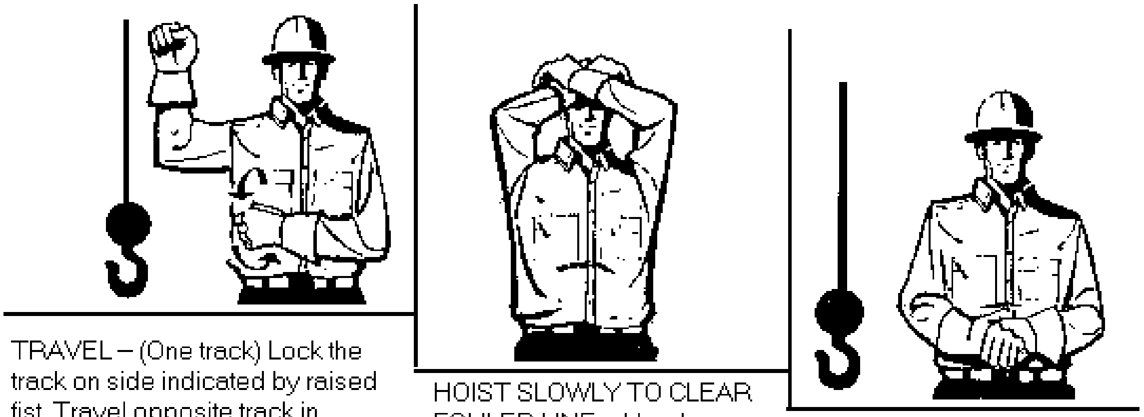
Appendix 2: Hand Signals cont'd



RETRACT BOOM – (Telescoping booms) Both fists in front of body with thumbs pointing toward each other.

TRAVEL – Arm extending forward, hand open and slightly raised, make pushing motion in direction of travel.

TRAVEL – (Both tracks) Use both fists in front of body, making a circular motion about each other, indicating direction of travel; forward or backward. (For crawler cranes only)



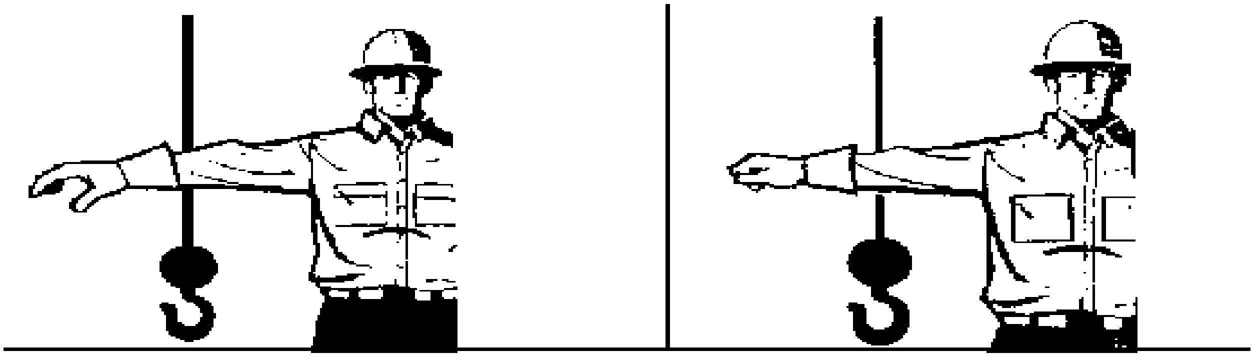
TRAVEL – (One track) Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For crawler cranes only)

HOIST SLOWLY TO CLEAR FOULED LINE – Hands crossed in front, above shoulders, fingers relaxed.

DOG EVERYTHING – Clasp hands in front of body.

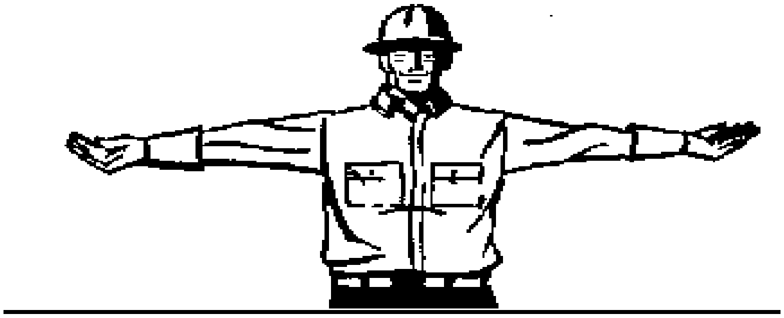
Figure 2 (continued)

Appendix 2: Hand Signals cont'd



OPEN CLAM SHELL BUCKET – Arm extended, palm down, open hand.

CLOSE CLAM SHELL BUCKET – Arm extended, palm down, close hand.



MAGNET IS DISCONNECTED – Crane operator spreads both hands apart – palms up.

Figure 2

APPENDIX 3: CRANE LOGS

CRANE LOG						
Date:						**Condition** Check **OK** under date or fill in comments
	OK	OK	OK	OK	OK	**Comments**
Load Chart *Present, legible, reviewed*						
Operations Manual *Present, legible, reviewed*						
Rope Reevings *Load line, jib suspension, boom hoist*						
Control Mechanisms *Wear, contamination, dirty*						
Safety Devices *Present, damage*						
Hydraulic, Lubricating, and Cooling Systems *Leaks, deterioration, damage*						
Electrical Equipment *Wet, damage, function*						
Boom and Crane Structure *Cracks, bad welds, deterioration, bent, loose bolts*						
Sheaves and Drums *Cracked, worn, deformed*						
Brakes and Clutch Systems *Worn, damage*						
Indicators (Load angle, Boom angle) *Present, damage, function*						
Power Plant *Properly fueled, function*						
Wheels/Tracks *Worn, Damaged, Proper Pressure*						
Fire Extinguisher *Present, Condition, Charge*						
Rope *Broken Wires, 6 randomly distributed wires in all lays, 3 in a single lay, Wear,1/3 original diameter, kinking, bird cage, corrosion, deterioration*						

HS 1.6 PERSONAL PROTECTIVE EQUIPMENT GUIDELINES

HS 1.6 PERSONAL PROTECTIVE EQUIPMENT GUIDELINES

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HS 1.6 PERSONAL PROTECTIVE EQUIPMENT GUIDELINES

1. PURPOSE

To provide guidelines that will assist Clean Harbors employees in the proper selection and use of protective equipment, and provide guidance on its care, maintenance, and limitations.

Preventing exposure to toxic chemicals is a principle concern at hazardous waste sites and emergency response operations. To control and/or eliminate these exposures, engineering controls and work practices must be carefully evaluated and properly implemented. However, under some circumstances these primary control methods may prove to be inadequate, not feasible, or may compromise site integrity. Under these conditions, Personal Protective Equipment (PPE) may be used either alone or in combination with other control methods to ensure on-site personnel are adequately protected from chemical and physical hazards.

2. SCOPE

This program, used in combination with Clean Harbors' Respiratory Protection Program and Hearing Conservation Program, is designed to meet all OSHA requirements for a written personal protective equipment program (29 CFR 1910.120 and 1910 Subpart I, Personal Protective Equipment). This program applies to all Clean Harbors personnel who may be required to wear personal protective equipment during the course of their duties. This includes, but is not limited to: facility personnel, service center personnel, laboratory personnel, sales and customer service, transportation and management as well as in plant Apollo sites, on site services, and customer sites in the petrochemical, chemical, and oil refineries, technical and remediation services.

2.1. Related Clean Harbors Guidelines

- 2.1.1. Respiratory Protection Guidelines
- 2.1.2. Medical Surveillance Guidelines
- 2.1.3. Hearing Conservation Program
- 2.1.4. Heat Stress Guidelines
- 2.1.5. Cold Stress Guidelines

2.2. OSHA Requirements for Personal Protective Equipment (PPE) Program

The Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) requires a written personal protective equipment program, which is part of the employer's safety and health program, and also a part of the site specific safety and health plan. This program is designed to satisfy both the Personal Protective Equipment standard (29 CFR 1910 Subpart I) and the written requirements of 29 CFR 1910.120.

2.2.1. The program addresses the elements listed below:

- A. PPE selection based upon site hazards;
- B. PPE use and limitations of the equipment;
- C. Work mission duration;

D. PPE maintenance and storage;

E. PPE decontamination and disposal;

F. PPE training and proper fitting;

G. PPE donning and doffing procedures;

H. PPE inspection procedures prior to, during, and after use;

I. Evaluation of the effectiveness of the program;

J. Limitations during temperature extremes, heat stress, and other appropriate medical conditions; and

K. Communication of selection decisions to affected employees.

3. RESPONSIBILITIES

3.1. Health and Safety Department

3.1.1. Conducts a hazard assessment for PPE selection for tasks conducted within the company.

3.1.2. Provides guidance for the selection of appropriate PPE to control chemical and physical hazards associated with workers' tasks.

3.1.3. Communicates selection to supervisors and foremen.

3.1.4. Notifies employees of changes to PPE selection.

3.1.5. Audits work sites, which involve unusual tasks or materials to determine compliance with procedures.

3.1.6. Inspects employee-owned PPE for compliance with Clean Harbors' specifications for that work area.

3.2. Training Department

3.2.1. Develops and provides PPE training module to Clean Harbors facility and field service centers.

3.2.2. Provides training on PPE hazard assessment and selection criteria.

3.2.3. Confirms workers' understanding of training material.

3.2.4. Maintains training records.

3.3. General Manager

3.3.1. Maintains a safe work environment by evaluating the use of engineering and work practice controls before reliance on PPE for protection against hazards.

3.3.2. Provides appropriate PPE in correct sizes for affected workers.

3.3.3. Prevents use of damaged, defective or modified PPE.

3.3.4. Provides resources to support the proper use, maintenance, decontamination and storage of PPE.

3.4. Foreman/Supervisor

3.4.1. Maintains a safe work environment by utilizing engineering or work practice controls before reliance on PPE for protection against hazards.

3.4.2. Enforces the proper use of appropriate PPE based on a hazard assessment of work activities and site conditions after consulting with the H&S Manager. There are to be no changes from established guidelines without the H&S Manager's approval.

3.4.3. Communicates the selection of PPE to workers in each work area managed by the Foreman/Supervisor.

3.4.4. Provides and enforces proper use, maintenance, decontamination and storage of PPE.

3.4.5. Prevents use of damaged, defective or modified PPE.

3.4.6. Provides PPE in sizes appropriate for worker comfort.

3.4.7. Inspects employee-owned PPE for compliance with Clean Harbors' specifications for that work area.

3.4.8. Ensures resources are available to decontaminate, sanitize and store PPE.

3.4.9. Schedules additional PPE training if a worker demonstrates inadequate knowledge of PPE selection, use or maintenance of PPE.

3.4.10. Documents the PPE selection once the hazard assessment has been conducted for each project, task or activity. (Please see Section 5.6 for the specific document references).

3.5. Employees

3.5.1. Maintain a safe work environment by utilizing engineering or work practice controls as specified by site supervisor, foreman or Health & Safety before reliance on PPE for protection.

3.5.2. Review and comply with the procedures and requirements of this program.

3.5.3. Demonstrate competence in selection, use, limitations, maintenance, decontamination and storage of PPE.

3.5.4. Consistently use and wear the PPE specified for each task and each work site.

3.5.5. Inspect PPE before, during and after use.

3.5.6. Do not modify PPE without review from Health and Safety. Never alter manufacturer's original design or function of PPE (i.e. remove booties, etc.).

3.5.7. Notify supervisor and co-workers of deficiencies, defects or damage to PPE.

3.5.8. Notify supervisor when work site hazards change which warrant reevaluation of PPE selection.

3.5.9. Keep PPE in clean, undamaged condition.

3.5.10. Properly decontaminate and store PPE between each use.

3.5.11. Provide equipment that meets Clean Harbors selection criteria and ANSI standards when PPE is supplied by the employee (i.e. footwear). (See Appendix 1 for ANSI references.)

4. SELECTION OF PERSONAL PROTECTIVE EQUIPMENT

4.1. General Requirements

Personal protective equipment will be selected for each work area or task depending upon the chemical and physical hazards associated with that activity. This selection is based upon a work site hazard assessment and evaluation of PPE function and limitations. **NOTE**: OSHA does not require the use of PPE items (i.e. hard hat, safety shoes) if these hazards do not exist at the site. However, Clean Harbors may still require this PPE as part of a standard PPE ensemble. Failure to use this PPE will be a violation of company policy, but will not violate OSHA requirements if those hazards are not present at the site.

4.2. Hazard Assessment

Conduct an assessment of the work site to determine if hazards are present or likely to be present, which necessitate the use of PPE. This assessment examines work site activities, location, equipment, and machinery for sources of hazards. (Please see Appendix 2 – Hazard Assessment and Selection Guide and Appendix 3 – Operations Safety Evaluation Checklist, for documents that can be used for this purpose.) Also, please see Section 5 - Hazard Assessment.

4.3. Design and Performance of Equipment

Select and use PPE that is designed and constructed to provide protection from the hazards associated with their tasks. PPE must conform to specific ANSI standards for eye and face, head and foot protection. (See Appendix 1.)

4.4. PPE Limitations

Evaluate equipment limitations in the selection of appropriate PPE. Distinctions between different tasks in the same work area will be made when equipment limitations prevent its universal use for all site activities.

4.5. Equipment Sizes

Select personal protective equipment that properly fits each affected employee. Employees may not alter equipment to accommodate their size if such modification interferes with the design, purpose, function or adequacy of protection of the PPE, such as impact resistance or chemical permeation.

4.6. Employee-Owned Equipment

Where employees provide their own protective equipment such as safety shoes, Clean Harbors is responsible for assuring its adequacy including proper maintenance, sanitation and effectiveness. Damaged equipment must be replaced. See Clean Harbors' safety shoe and prescription eyewear reimbursement policies.

4.7. Defective and Damaged Equipment

Defective or damaged personal protective equipment shall not be used. In addition, employees shall not modify PPE in any way that interferes with its design or function.

4.8. Prescription Eyewear

4.8.1. Employees who require prescription lenses should wear safety glasses with side shields that incorporate the prescription in its design. **NOTE**: Site visitors, and employees waiting for prescription eyewear to be filled, can wear safety glasses with side shields over their prescription eyeglasses as long as the proper position of the prescription lenses or the protective safety lenses are not disturbed. Refer to Clean Harbors eyewear reimbursement policy and Section 9.1 -Eye and Face Protection.

4.8.2. Contact lenses should not be worn at Clean Harbors worksites where chemical or physical hazards are present. Such worksites include facilities, service center projects, laboratories, CleanPack sites, and transportation projects.

4.9. Project Duration

The length of a project will be included in the evaluation and selection of respirators and chemical protective clothing, since time is a component in evaluating permeation rates and exposure time.

4.10. Company PPE Policies

4.10.1. Clean Harbors' policy may require the use of PPE such as eyewear, hard hats, safety shoes, even if these hazards are not present at the work site. Failure to use this PPE will be a violation of company policy, but will not violate OSHA requirements if those hazards are not present at the site.

4.10.2. In addition, Health and Safety may modify company PPE requirements on a case-by-case basis if the use of a particular PPE item is not required by the presence of physical hazards, and the use of this PPE may cause additional health hazards (i.e. if no overhead hazards exist, the hard hat requirement may be waived if use of the hard hat may contribute to heat stress). Consult Health & Safety.

4.11. Communication of PPE Selection

4.11.1. Communication of PPE selection should be provided by site foreman or supervisor to affected employees. Frequency of communication will depend upon the nature of tasks, repetition of tasks, and experience of employees. Service Center employees may conduct several tasks in one day and will need instruction on PPE selection for each task. Facility employees may conduct the same task over several weeks and may not require daily PPE instruction.

4.11.2. The following methods can be used to provide effective communication.

A. Task Standard Operation Procedures (SOP)

B. Project Work Plan

C. Project Site Plan

D. Project Operations Safety Evaluation (OSE) Checklist

E. Project Hazardous Work Permit

F. Confined Space Entry Permit

G. Transportation Detail Sheet

H. Site "Tailgate" or "Toolbox" Safety Meetings

5. HAZARD ASSESSMENT FOR PPE SELECTION

A site audit will be conducted to identify present or potential hazards associated with each task and worksite. A Health & Safety Manager, Health & Safety Representative, or Health & Safety Associate will conduct this assessment.

5.1. Hazard Assessment Guidelines

The purpose of the hazard assessment is to identify sources of potential and present hazards to workers so that appropriate PPE can be selected.

A list of hazard sources are listed below, with the type of protection required when working with these hazards. Examples of each hazard are provided; (this list is not inclusive). Reference: 29 CFR 1910.140, Appendix B to Subpart I.

5.2. List of Hazard Sources

TYPES OF HAZARDS	PPE SELECTION
Sources of Motion: Machinery Movement of machine elements Movement of tools Collision with stationary objects	Head, Hand, Feet, Eyes
Sources of Dust/Chemical Exposure: Handling open containers Collecting samples Pumping, unloading	Eyes, Face, Hand, Body, Feed, Respiratory
Sources of Falling Objects: Handling tools or equipment Work below platforms Work below other workers	Eyes, Face, Head, Feet

List continued on next page.

TYPES OF HAZARDS	PPE SELECTION
Sources of Flying Objects: Welding, cutting Grinding, sawing Objects under pressure (bungee cord) Abrasive blasting	Eyes, Face, Head
Sources of Rolling/Pinching Objects: Handling tools, equipment Drum handling Filter press operation Use manual hand trucks Vehicles	Hand, Feet
Sources of Sharp Objects: Tools, saws Deheaded drums Pathological Waste Nails, wires underfoot	Hand, Feet
Layout of Work Area: Poor lighting Work at Elevation	Hand, Eyes, Face, Feet, Body Confined Space
Sources of Temperature Extremes: Ovens, furnaces, boilers Steam or process lines Cryogenic cylinders	Hand, Eyes, Face, Body
Sources of Light Radiation: Welding, Cutting, Brazing Lab Instruments Furnaces	Eyes, Face, Body
Sources of Electrical Hazards: Exposed electrical conductors Manholes with energized electrical Overhead power lines Underground power lines Power tools	Eyes, Face, Feet, Head, Body
Sources of Radiation: Lab Instruments Waste	Eyes, Face, Feet, Hand, Body, Respiratory

5.3. Reassessment of Hazards

Project operations and work sites will be re-evaluated periodically. Reassessment will include identification and evaluation of new equipment and processes, review of accident records, and reevaluation of the performance of previously selected PPE. Please note that a reassessment of hazards must be conducted whenever a task, job or process changes.

5.4. Evaluation of Hazard Assessment Data

The Hazard Assessment data observed during the site walk-through will be evaluated to determine the correct PPE ensemble for each activity. This evaluation will include:

5.4.1. The performance characteristics of the PPE;

5.4.2. Task specific conditions and duration of operations;

5.4.3. The type(s) of chemicals handled and the potential for chemical exposure;

5.4.4. The chemical, physical and toxicological properties of the materials on site;

5.4.5. The potential of encountering hazardous atmospheres; and

5.4.6. The most probable route(s) of entry into the body.

5.5. Hazard Assessment Certification

A written record will be maintained to verify that a hazard assessment for PPE selection has been performed. This certification will include: workplace identification; date of assessment; person who conducted the evaluation; and a statement identifying the document as a certification of hazard assessment.

5.6. Certification Documents

A hazard assessment is conducted for each project prior to its start. PPE selection is documented on one or more of the following documents:

WORK LOCATION	CERTIFICATION DOCUMENT
CHES Facilities:	Operational SOP; or Project Work Plan; or PPE Hazard Assessment & Selection Guide (Appendix 2)
Service Center Projects:	Hazardous Work Permit; or Operations Safety Evaluation (OSE) Checklist; (Appendix 4); or Confined Space Entry Permit; or Site Plan
Cleanpack Projects:	Hazardous Work Permit; Operations Safety Evaluation (OSE) Checklist; (Appendix 4); or Site Plan
Laboratory:	PPE Hazard Assessment & Selection Guide (Appendix 2)
Transportation:	Transportation Work Sheet Transportation Pick-up Sheet, or PPE Hazard Assessment & Selection Guide (Appendix 2)

6. LEVELS OF PROTECTION AND PERFORMANCE CRITERIA

6.1. System for Protection

6.1.1. Clean Harbors uses a four level system for the protection of personnel from the chemical, physical, and biological hazards that may be encountered at hazardous waste sites and facilities. These levels of protection (Level A, Level B, Level C, and Level D), are designed to provide protection to the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing of site personnel.

6.1.2. In certain instances, site specific tasks or environmental conditions may make it necessary to modify or alter these levels of protection. These minor alterations will be made by the Health and Safety Representative as required.

6.1.3. The following generally describes these levels of protection.

6.2. Level A

Level A protection affords the highest level of respiratory, skin, and eye protection. The Level A suit is vapor tight to prevent skin absorption or skin irritation by gases or vapors which can penetrate the seams and openings of ordinary suits.

6.3. Minimum Level A equipment

6.3.1. Totally encapsulating chemical protective suit

6.3.2. Full-face piece pressure-demand self contained breathing apparatus (SCBA) or pressure-demand supplied air respirator with escape SCBA

6.3.3. Gloves outer chemical-resistant

6.3.4. Gloves inner chemical-resistant

6.3.5. Boots, chemical-resistant, steel toe and shank

6.3.6. and hard hat, FRC's, or nomex when applicable.

6.4. Optional Level A equipment

6.4.1. Coveralls (FRC's or nomex where applicable)

6.4.2. Long Underwear

6.4.3. Hard Hat (under suit)

6.4.4. Disposable Protective suit, gloves, and boots over the totally encapsulating suit

6.4.5. Cooling Garment

6.4.6. Communications

6.4.7. Hearing Protection

6.5. Level B

6.5.1. Level B protection provides the same level of respiratory protection as Level A, but provides a lower level of skin protection. The Level B suit is designed to protect against liquid contact and dusts, but is not vapor tight.

6.5.2. The following PPE will be used as a minimum for level B protection.

A. Pressure-demand, full-face piece self contained breathing apparatus (SCBA), or pressure-demand supplied air respirator with escape SCBA, or pressure-demand supplied air respirator (Ensemble can only be used in non-IDLH conditions if an escape bottle is not provided.)

B. Chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls)

C. Gloves, outer, chemical-resistant

D. Gloves, inner, chemical-resistant

E. Boots/Boot covers, outer, chemical-resistant

F. Steel toe boots/work shoes (CHES-H&S approval must be obtained for all other styles/types;)

G. Taped at all opened seams and stress points

H. FRC's or Nomex required at all times when inside of Petrochemical, Chemical and Oil refineries

6.6. Optional Level B equipment

6.6.1. Hard Hat

6.6.2. Face shield

6.6.3. Hearing Protection

6.7. Level C

6.7.1. Level C protection provides the same level of skin protection as Level B, but provides a lower level of respiratory protection.

6.7.2. The following PPE will be used as a minimum for Clean Harbors' Level C Protection:

A. Full-face, air purifying respirator with appropriate chemical/mechanical cartridges OR

B. Half-face, air purifying respirator with appropriate chemical/mechanical cartridges and appropriate eye protection consistent with materials handled and the task;

C. Chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls);

D. Gloves, outer, chemical-resistant;

E. Gloves, Inner, chemical-resistant;F. Steel toe boot/work shoe; (CHES-H&S approval must be obtained for all other styles/types.)

G. Boots/Boot-covers, outer, chemical-resistant.

6.8. Optional Level C equipment

6.8.1. Hard Hat

6.8.2. Face shield

6.8.3. Safety Glasses

6.8.4. Chemical protective goggles

6.8.5. Hearing protection

6.8.6. FRC's or Nomex required at all times when inside of Petrochemical, Chemical and Oil refineries

6.9. Level D

6.9.1. Level D protection does not provide respiratory protection and affords only minimal skin protection.

6.9.2. The following PPE will be used as a minimum for Clean Harbors' Level D protection.

A. Coveralls/CHES field uniform (FRC's or nomex when required)

B. Steel toe boots (CHES-H&S approval must be obtained for all other styles/types;)

6.10. Optional Level D equipment

6.10.1. Gloves

6.10.2. Boots/Boot covers, outer, chemical-resistant

6.10.3. Safety Glasses or chemical splash goggles

6.10.4. Hard Hat

6.10.5. Face Shield

6.10.6. Hearing protection

6.10.7. FRC's or Nomex required at all times when inside of Petrochemical, Chemical and Oil refineries

6.11. Reasons to Upgrade Levels of Protection

6.11.1. The following factors should be evaluated and may indicate that Levels of Protection should be upgraded:

A. Known or suspected presence of skin hazards.

B. Occurrence or likely occurrence of gas or vapor emission.

C. Change in work task that will increase contact or potential contact with hazardous materials.

D. Failure of current PPE ensemble: respirator breakthrough, suit permeation, etc.

E. Others.

6.12. Reasons to Downgrade Levels of Protection

6.12.1. The following factors should be evaluated and may indicate that Levels of Protection should be downgraded:

A. New information (i.e. air monitoring data, material composition) indicates that site conditions are less hazardous and within design parameters of a lower level of protection.

B. Change in site conditions that decrease hazards.

C. Change in work task that will reduce contact or reduce air concentrations.

7. SELECTING LEVELS OF PROTECTION (Levels A, B, C, D)

Selection of the specific level of protection is the first step in determining the proper ensemble to be used at a specific site. Utilize the following criteria to select the proper level of protection, (i.e. Level A, B, C, or D).

7.1. Level A

Please note that the Health and Safety Manager must be involved in all Level A protection determinations.

7.1.1. Level A protection shall be utilized if ANY of the following site conditions exist:

A. The chemical substances are UNKNOWN and little or no information is available to indicate that the materials do not pose a substantial skin, eye, or respiratory hazard;

B. The chemical substances are KNOWN and require the highest level of protection for skin, eyes, and the respiratory system based on either:

1. the measured, (or potential for) high concentration of atmospheric vapors, gases, or particulates; or

2. site operations and work functions involve a high potential for splash, immersion, or exposure to vapors, gases, or particulates of materials that are harmful to the skin or capable of being absorbed through the skin;

C. Operations must be conducted in confined, poorly ventilated areas and the absence of conditions requiring Level A protection has not yet been determined; or

D. The chemical substances on site, (known or unknown), may result in a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.

7.2. Level B

7.2.1. Level B protection shall be utilized if ANY of the following site conditions exist:

A. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection but less skin protection than Level A;

B. The atmosphere contains less than 19.5% oxygen (IDLH-escape bottle is required);

C. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors or gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin;

D. Airborne concentrations of suspected or known site contaminants can not be accurately/effectively monitored with direct reading instrumentation; or

E. Site contaminants possess properties that prevent their effective removal with available air purifying respirators, (i.e., materials possess poor warning properties, chemical cartridges will not effectively remove material or are unavailable, etc.).

7.3. Level C

7.3.1. Level C protection shall be utilized if ALL of the following site conditions exist:

A. Oxygen content is between 19.5% and 22.0%;

B. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;

C. The types of air contaminants have been identified, concentrations measured, and an appropriate air-purifying respirator is available that can remove the contaminants; and

D. All the criteria for the use of air-purifying respirators are met. (See Clean Harbors' Respiratory Protection Program.)

7.4. Level D

7.4.1. Level D protection may be only utilized if all of the following site conditions exist:

A. There exists no atmospheric hazards from site contaminants. This includes the following:

1. Oxygen content is between 19.5% and 22.0%;

2. Combustible Gas reading is 0% LEL;

3. Concentrations of each on-site contaminant is less than 1/2 of their respective TLV or PEL, (which ever is the lower value);

B. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemical;

8. LIMITATIONS OF PPE ENSEMBLES - (Levels A, B, C, D)

There are several limitations associated with each level of protection. These include, but are not limited to, the following:

8.1. Level A

8.1.1. Fully encapsulating suit material must be compatible with the substances involved.

8.1.2. Level A protection and use of the fully-encapsulating suit:

A. reduces wearer's field of vision;

B. produces difficulties in communication;

C. restricts wearer's movement;

D. increases the possibility of heat stress;

E. provides no protection from fire, heat, radiation or explosives.

8.2. Level B

8.2.1. Should only be used when the vapor or gases present are not suspected of containing high concentrations of chemicals that are harmful to skin or capable of being absorbed through intact skin.

8.2.2. Should only be used when it is highly unlikely that the work being done will generate either high concentrations of vapors, gases, or particulates or splashes of material that will affect exposed skin.

8.2.3. An SCBA or supplied air respirator with an escape bottle must be used if IDLH conditions are suspected.

8.2.4. Chemical protective clothing and gloves must be compatible with the substances involved.

8.2.5. Chemical protective clothing may only provide limited duration protection based on degradation and permeation rates.

8.2.6. Chemical protective clothing and gloves may not protect wearer from physical hazards such as cuts and laceration.

8.2.7. Level B protection:

A. reduces wearer's field of vision;

B. produces difficulties in communication;

C. restricts wearer's movement;

D. increases the possibility of heat stress;

E. provides no protection from fire, heat, radiation or explosives.

8.3. Level C

8.3.1. Atmospheric concentrations must be within CHES' Respiratory Protection requirements and may not exceed IDLH levels.

8.3.2. The atmosphere must contain at least 19.5 percent oxygen and no greater than 22.0 percent oxygen.

8.3.3. Cartridge selection must be compatible with chemicals present. There are many chemicals for which there is no Level C cartridge.

8.3.4. Chemical protective clothing and gloves must be compatible with the substances involved.

8.3.5. Chemical protective clothing may only provide limited duration protection based on degradation and permeation rates.

8.3.6. Chemical protective clothing and gloves may not protect wearer from physical hazards such as cuts and laceration.

8.3.7. Level C protection:

A. reduces wearer's field of vision;

B. produces difficulties in communication;

C. restricts wearer's movement;

D. increases the possibility of heat stress;

E. provides no protection from fire, heat, radiation or explosives.

8.4. Level D

8.4.1. Cannot be worn in exclusion (hot) zone.

8.4.2. The atmosphere must contain at least 19.5 percent oxygen and no greater than 22.0 percent oxygen.

8.4.3. Airborne chemical concentrations must not exceed 1/2 the TLV or PEL, 8 hour time-weighted average, (which ever concentration is lower).

8.4.4. The standard work uniform may not protect wearer from physical hazards such as cuts and laceration.

8.5. General Limitations

8.5.1. Medical Condition

Most personal protective equipment (hard hat, safety glasses, safety shoes) can be worn without causing worker discomfort. However, the use of respirators and chemical protective clothing can place a physical burden on the workers' body. Completion of an occupational medical exam, described in Clean Harbors' Medical Surveillance Guidelines, is required before use of this equipment.

8.5.2. Heat Stress

Chemical protective clothing traps moisture inside the suit and interferes with the body's natural mechanism to dissipate heat. Clean Harbors' Heat Stress Guidelines should be followed when ambient temperature exceeds 80 degrees Fahrenheit.

9. TYPES OF PERSONAL PROTECTIVE EQUIPMENT

9.1. Eye and Face Protection

9.1.1. Clean Harbors policy requires the wearing of eye protection at all Clean Harbors field, facility, transportation and laboratory work sites.

9.1.2. Types of Eye Protection

A. Safety Glasses with Side Shield:

Safety Glasses are designed to protect the wearer's eyes from frontal and side impact from flying particles. Limitations: Safety glasses do not provide protection from liquid splashes, chemical vapors, light radiation, or dusts. Prescription Eyewear: Employees who require prescription lenses should wear safety glasses, which incorporate the prescription in its design. Site visitors, and employees waiting for a prescription to be filled can wear safety glasses over their prescription eyeglasses as long as the proper position of the safety glasses is not disturbed. See Clean Harbors reimbursement policy. **NOTE**: thin plastic side shields, which slide over prescription eyewear temples, do not meet ANSI Z87.1-1989. Temporary side shields should not be worn. Use prescription safety glasses with permanently attached side shields.

B. Splash-Proof Goggles:

Goggles are a primary protective device designed to fit the face immediately surrounding the eyes. Goggles are usually ventilated to minimize fogging. Splash-proof goggles are ventilated by covered indirect ventilation ports. Limitations: Goggles do not provide full-face protection. Prescription Eyewear: goggles can be worn over prescription eyewear.

C. Face shield:

A face shield is designed to shield the wearer's face in addition to the eyes, from certain hazards. **NOTE**: FACESHIELDS ARE SECONDARY PROTECTORS, AND SHOULD BE USED ONLY WITH PRIMARY PROTECTORS SUCH AS SAFETY GLASSES OR GOGGLES. Limitations: Face shields do not provide primary eye protection.

D. Welding Helmet:

A welding helmet is designed to shield the eyes and face from optical radiation and impact from flying particles or sparks. Filter lenses must be appropriate shade for the light intensity generated by the operation. Limitations: Welding shields should be removed after welding so that normal vision is not obscured.

9.1.3. Selection of Eye Protection

Eye protection is selected based on the type and severity of chemical and physical hazards associated with each task or work site:

HAZARD DESCRIPTION	PPE SELECTION
Flying objects: fragments, chips, dirt, etc.	Glasses w/ side shields
Chemicals, Dust:	
Handling closed containers	Glasses w/ side shields
Handling open containers	Splash-proof goggles
Splash potential from corrosive materials (acid/base)	Face shield with splash proof goggles; or full-face respirator
Welding:	Welding shield with safety glasses:
Electric Arc	Shade 10-14
Gas	Shade 4-8
Cutting/Torch soldering	Shade 1.5-3

9.1.4. Inspection

Eye protectors should be inspected prior to each use. Protectors should be examined for worn or damaged parts including lenses, ventilation caps, side shields. Pitted or scratched lenses should be replaced since they may reduce impact protection.

9.1.5. Maintenance and Storage

Eye protectors should be cleaned whenever they have become soiled so as not to obstruct vision or corrode components. Store protectors in a clean, dry location.

9.1.6. ANSI Requirements:

A. All eye and face protection equipment purchased after July 5, 1994 must comply with the American National Standards Institute (ANSI) Standard Z87.1-1989, "Practice for Occupational and Educational Eye and Face Protection."

B. Labeling: Eye and face protection conforming to this ANSI standard will be marked with the manufacturer's trademark and the code Z87.

9.2. Head Protection

Clean Harbors' policy requires the wearing of hard hats at all Clean Harbors work sites.

9.2.1. Types of Head Protection:

A. Hard Hats:

Hard hats are designed for protection when there is a potential for injury caused by impact or penetration to the head from falling objects. Class A and B hard hats are also designed to provide limited electrical protection. Limitations: Hard hats provide impact protection for the top of the head only. They do not provide protection for the back, front or side of the head.

B. Bump Caps:

Bump caps provide a covering for the scalp to reduce abrasions and lacerations due to minor bumps. Limitations: Bump caps DO NOT provide head protection required by OSHA and ANSI Z89.1-1986.

9.2.2. Selection of Head Protection

Hard hats should be worn whenever there is a potential for injury caused by impact or penetration to the head from falling objects, overhead objects, or contact with exposed electrical conductors.

9.2.3. Inspection

Hard hats should be inspected before each use for worn and damaged parts, including shell, suspension and nape strap. Heat, cold, sunlight and chemical exposure can cause cracks, craze patterns, and chalky appearance. Inspect the shell for brittleness by flexing the brim. There should be no holes in the shell. Labels should be nonmetallic, and should be at least one-half inch away from the edge of the shell.

9.2.4. Maintenance and Storage

Hard hats should be cleaned periodically to maintain condition and prevent deterioration. Store hard hats in a clean, dry location.

9.2.5. ANSI Requirements

All head protection equipment purchased after July 5, 1994 must comply with the American National Standards Institute (ANSI) Standard Z89.1-1986, "Protective Headwear for Industrial Workers."

9.3. Foot Protection

Clean Harbors policy requires the wearing of steel-toe safety shoes at all Clean Harbors work sites. The steel-toed safety shoes or boots must have a rigid sole, be at least 6” in height, and meet ANSI Z-41-1991 standards.

9.3.1. Types of Foot Protection

A. Steel-Toe Safety Shoe:

Protects the worker from foot damage in the presence of potential falling, rolling, or pinching objects. Limitations: Steel-toe shoes may not prevent sharp objects, saws or water blaster streams from piercing the sole, or leather upper.

B. Steel-Shank Overboot:

Steel-shank overboots are required if floor surfaces contain sharp objects which could pierce the sole. Limitations: Overboots present potential fall hazards.

C. PVC Overboot (Chicken Boot):

Overboots are required if feet may contact chemical contamination or be immersed in liquid. Limitations: Overboots are not impermeable to all chemicals.

9.3.2. Selection of Foot Protection

Foot protection should be worn whenever there is a potential for foot injury caused by falling or rolling objects, objects piercing the sole, or chemical contact.

9.3.3. Inspection

Foot protection should be inspected before each use for worn and damaged parts, including steel toe, and shank. Chemical protective overboots should be inspected for holes and degradation.

9.3.4. Maintenance and Storage

Foot protection should be decontaminated with soap and water if chemical contact has occurred. Contamination by chemicals, which can cause skin damage such as cyanide, isocyanates, hydrofluoric acid, cashew nut oil, etc., will require disposal. Contaminated footwear should not be worn home. Store footwear in a clean, dry location.

9.3.5. ANSI Requirements

All foot protection purchased after July 5, 1994 must comply with the American National Standards Institute (ANSI) Standard Z41-1991, "Personal Protection - Protective Footwear."

9.4. Hand Protection

Hand protection is required whenever an employee is exposed to hand or finger injury such as puncture, laceration or chemical contact. For additional information on Hand and Arm Protection, see Appendix 6.

9.4.1. Types of Hand Protection

A. Leather/Canvas Work Gloves:

Provide grip and protection against nuisance dirt and abrasion. Limitations: Not chemical resistant.

B. Chemical Protective Gloves (i.e. PVC, latex, neoprene, nitrile, viton, butyl, silver shield):

Provide protection against chemical contact. See Section 10.3 for instructions on the use of manufacturer permeation data. Limitations: Gloves may interfere with dexterity and are not resistant to all chemicals.

C. Kevlar Gloves:

Provide resistance to lacerations and puncture caused by sharp objects. Reusable. **NOTE**: Kevlar is only 2x more resistant to cuts than cotton gloves. Limitations: Not chemical resistant.

D. Metal-Stitched Palmed Gloves:

Provide resistance to puncture from sharp objects. Limitations: Metal protection does not extend to top of hand. Not chemical resistant. Metal can become electrically conductive. Do not wear around electrical hazards.

E. Rubber Linesman Gloves:

See Section 9.6 - Electrical Protection.

9.4.2. Selection of Hand Protection

Hand protection is selected based upon the type and severity of chemical and physical hazards associated with each task or work site.

HAZARD DESCRIPTION	PPE SELECTION
Chemical contact	Chemical protective gloves (Refer to permeation data).
Cut or laceration: deheaded drums, broken glass	Kevlar gloves
Penetration by Sharp Objects: Path Waste boxes	Metal stitched gloves
Electrical:	Rubber linesman gloves
Nuisance Dirt/Splinters	General work gloves: leather, canvas, PVC

NOTE: One glove may not protect against all hazards at a work site. Gloves may need to be layered to obtain necessary protection.

9.4.3. Inspection

Hand protection should be inspected before each use for worn and damaged parts, including fingertips and web. Chemical protective gloves should be inspected for holes and degradation. Damaged or defective gloves should be discarded and replaced.

9.4.4. Maintenance and Storage

Disposable gloves should be removed without contacting the wearer's hands and disposed appropriately. Contaminated gloves should not be brought home. Store gloves in a clean, dry location.

9.4.5. ANSI Requirements

None.

9.5. Fire Protection

Most of the personal protective equipment used by Clean Harbors provides NO fire protection. CHES employees are not trained to fight fires beyond the incipient stage, and professional fire fighting clothing ensembles are not provided.

However, some worksites may have the potential for a flash or electric arc. Fire protective clothing should be worn at these work sites.

9.5.1. Purpose

A. Fire resistant clothing is designed to prevent third degree burns during an instantaneous flash or arc. These fabrics will not burn when exposed to flames, and will not melt when exposed to high heat.

B. CLOTHING THAT CAN MELT UNDER CONTACT WITH FIRE OR HEAT CANNOT BE WORN UNDER FIRE RESISTANT CLOTHING. The following fabrics can melt against the skin, causing third degree burns even when Nomex or similar fabrics are worn:

1. Polyester
2. Polyester/cotton blends
3. Polypropylene
4. Nylon
5. Rayon

C. Street clothing made of the following fabrics can be worn under fire resistant clothing.

1. 100% Cotton
2. Wool
3. Silk

9.5.2. Types of Fire Protective Clothing

A. Nomex:

A Dupont aramid fiber that is inherently flame resistant due to chemical structure of the fibers. During exposure, the fabric forms a tough, carbon-based char that acts as a stable barrier between the fire and the wearer's skin. This barrier is effective up to 7 seconds. After seven seconds, second-degree burns will occur. **NOTE**: DOES NOT PROTECT EXPOSED SKIN (face, eyes, hands). Limitations: PROVIDES ESCAPE TIME ONLY – NOT DESIGNED FOR FIRE ENTRY. Second-degree burns can still occur under the garment due to heat of fire.

B. PBI Clothing:

PBI is an inherently flame resistant fiber made by Hoechst Celanese. PBI is resistant to heat, fire and retains these properties when exposed to corrosive and organic chemicals. **NOTE**: DOES NOT PROTECT EXPOSED SKIN (face, eyes, hands). Limitations: PROVIDES ESCAPE TIME ONLY – NOT DESIGNED FOR FIRE ENTRY.

C. Flame Resistant Cotton Clothing (i.e. Indura):

Cotton fabric coated with a polymer to provide protection against clothing ignition, burning and melting. The flame resistant property of the polymer is activated by the heat of fire. Provides 1-3 seconds escape time from fire or high heat. **NOTE**: DOES NOT PROTECT EXPOSED SKIN (face, eyes, hands). Limitations: PROVIDES ESCAPE TIME ONLY - NOT DESIGNED FOR FIRE ENTRY. Second-degree burns can still occur under the garment due to heat of fire.

D. Aluminized (Level A) Over-Suit for Chemical and Flash Protection (i.e. MSA First Team XE Hazmat suit):

Designed to provide protection from chemical exposure, radiant heat and flash while wearing an SCBA. **NOTE**: Manufacturer's technical data package (provided in compliance with NFPA 1991) must be followed for donning, doffing and maintenance of the suit and ensemble. Limitations: PROVIDES ESCAPE TIME ONLY - NOT DESIGNED FOR FIRE ENTRY. NOT DESIGNED FOR USE IN FLAMMABLE ATMOSPHERES.

E. Aluminized (Level B) Over-Suit for Flash Protection (i.e. Lifeguard):

Designed to provide protection from radiant heat and flash while wearing an SCBA. Limitations: Not chemical resistant. Not a Level A suit. Does not comply with NFPA 1991. PROVIDES ESCAPE TIME ONLY - NOT DESIGNED FOR FIRE ENTRY. NOT DESIGNED FOR USE IN FLAMMABLE ATMOSPHERES.

9.5.3. Selection of Fire Protective Clothing

The selection of fire protective clothing depends upon the potential hazards involved in each work site or activity, i.e. fire, explosion, electric arc, etc. Consult manufacturer's product information for performance data.

9.5.4. Inspection

Fire and flash protective equipment should be inspected before each use. Level A flash suits must be pressure tested every 6 months or after each use, whichever is sooner. Discard any fire resistant clothing (Nomex, PBI, Indura, Aluminized over-suits) if it has been used in a flash or high heat situation.

9.5.5. Maintenance and Storage

Flame resistant clothing can be decontaminated and laundered between use. Follow manufacturer's instructions since some soaps may shorten the fabric's lifespan. Discard equipment if it has been used in a flash or high heat situation. Store equipment in a clean, dry, cool location.

9.5.6. Performance Standards (ANSI, ASTM, NFPA)

Flame Resistant Clothing:	ASTM D-4108
Level A Aluminum Flash Suit:	NFPA 1991
Level B Aluminum Flash Suit:	None

9.6. Electrical Protection

Electrical protection should be utilized during work in underground electrical utilities. **NOTE**: Clean Harbors personnel should not intentionally handle live or dead electrical lines.

9.6.1. Types of Electrical Protection

A. Nomex Clothing:

Nomex is flame resistant, and can provide protection from heat generated by an electric arc. This heat can ignite normal everyday clothing. Limitations: Nomex does NOT provide protection from electrocution. Severe body burns can result when electricity directly contacts the body.

B. Rubber Insulating Lineman Gloves:

High quality rubber gloves designed to be non-conductive and insulate against electrical hazards. Electrical insulating gloves can be worn under chemical protective gloves to shield them from contamination, tears and cuts. Limitations: Gloves do not retain insulating property if there are pinholes, tears or cracks. DAILY INSPECTION IS REQUIRED. **NOTE**: One type of glove will not protect against all voltage levels:

Class 0	<750 volts low voltage
Class 1	<10,000 volts linemen's gloves
Class 2	<20,000 volts linemen's gloves
Class 3	<30,000 volts linemen's gloves
Class 4	<40,000 volts linemen's gloves

Clean Harbors utilizes Class 1 linemen's gloves.

Electrical Protective Hard Hat:	Class A and B hard hats provide limited electrical protection.
Class A:	Tested up to 2,200 volts
Class B:	Tested up to 20,000 volts
Class C:	Provides NO electrical protection
Limitations:	Electrical protection is not provided if there are cracks or holes in helmet shell, if stickers are placed within one-half inch of edge, or if metallic stickers are placed on hat.

9.6.2. Inspection of Linemen's Gloves

Insulating equipment should be inspected for damage before each day's use, and immediately following any incident that can be suspected of causing damage. Inspection should be conducted in accordance with OSHA 29 CFR 1910.137(b)(2).

9.6.3. Daily Visual Test

A. Insulating equipment (gloves, blankets, shields, line hoses) should be visually inspected before each use. Stretch and flex the rubber to allow a careful examination for cuts, scratches, bubbling or deterioration. Turn the glove inside out, and repeat the visual inspection.

B. Gloves should be rejected and discarded if any of the following items are observed:

1. Hole, tear, puncture or cut;
2. Cuts or interlacing cracks;
3. An embedded foreign object;
4. Texture changes, such as: swelling, softening, hardening, or becoming sticky or inelastic; and
5. Any other defect, which damages the insulation properties.

9.6.4. Daily Glove Air Test

A. Insulating gloves should be given an air test before each use.

B. Inflate glove manually by rolling the sleeve tightly toward the palm so that the trapped air will stretch the rubber; or grasp the edges of the cuff with thumb and forefinger and twirl the glove to fill it with air.

C. Hold glove closed with one hand so that no air escapes.

D. Squeeze fingers, thumb and palm of the glove to make certain that no air leaks out.

E. Visually inspect glove in the inflated condition.

F. Reject and discard glove if any of the following items are observed:

1. Air leak;

2. Hole, tear, puncture or cut;

3. Cuts or interlacing cracks;

4. An embedded foreign object;

5. Texture changes, such as: swelling, softening, hardening, or becoming sticky or inelastic; and

6. Any other defect, which damages the insulation properties.

9.6.5. Semi-Annual Glove Laboratory Test

A. Rubber insulating gloves shall be electrically tested by a certified laboratory before their first issue and every 6 months thereafter. NOTE FOR INFREQUENT GLOVE USE: if the gloves have been electrically tested but not issued for service, they may not be placed into service unless they have been electrically tested within the previous 12 months.

B. Record keeping: Testing certificates, issued by the testing laboratory, shall be maintained at each local office. An individual serial number will be issued for each glove to allow tracking of record keeping.

9.6.6. Maintenance and Storage of Insulating Gloves

A. Cleaning: Insulating equipment should be cleaned as needed to remove foreign substances. Oil, grease, or other contamination cannot be allowed to remain on gloves since these chemicals attack rubber.

B. Wash gloves with water and mild soap. Do not use bleach, since this will attack rubber. Rinse thoroughly with water after washing with soap. Dry gloves before storage. Gloves may be air dried by placing them upright over a support structure such as a wood rod or cardboard tube.

C. Storage: Insulating equipment should be stored away from light, temperature extremes, excessive humidity, ozone and other injurious substances and conditions.

1. Never store gloves inside out.
2. Clean gloves before storage. Oil contamination will cause the rubber to swell.
3. Store gloves flat.
4. Do not roll or fold gloves during storage.
5. Do not tape or tie gloves.
6. Do not store gloves under heavy objects. These objects may leave an imprint and damage the rubber.
7. Do not store gloves in sunlight.
8. Do not store gloves adjacent to heat radiators or heat sources. Do not store next to truck heaters.

9.6.7. Performance Standards

ASTM D 120-87	Rubber Insulating Gloves
ASTM F 496-93b	In-Service Care of Insulating Gloves and Sleeves

9.7. Noise Protection

Instruction for the selection, use and maintenance of hearing protection is provided in Clean Harbors' Hearing Conservation Program. Clean Harbors policy requires the use of engineering controls and hearing protection whenever noise levels exceed 85 decibels.

9.8. Respiratory Protection

Instruction for the selection, use and maintenance of respiratory protection is provided in Clean Harbors' Respiratory Protection Guidelines. Clean Harbors policy requires the use of engineering controls and respiratory protection whenever chemical exposure exceeds one-half (1/2) of the established Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV), whichever is lower.

9.9. Miscellaneous PPE

Personal protective equipment for activities such as abrasive blasting, hotwork, traffic control and boating are addressed separately in either OSHA standards or Clean Harbors standard operating procedures.

10. CHEMICAL PROTECTIVE CLOTHING (CPC)

Chemical Protective Clothing (CPC) is available in a wide range of materials and styles from a large number of manufacturers. Each of these different types of CPC are tested for resistance to various chemicals. However, with the myriad of chemicals that exist, it is impossible to test clothing materials for all possible chemicals nor is it possible to produce one material that can be effective in all situations against all chemicals.

10.1. Types of Chemical Protective Clothing

10.1.1. Uncoated "White" Tyvek:

Provides protection against dusts only. Does not provide liquid or splash protection.

10.1.2. Poly-coated Tyvek, Saranex, Barricade, CPF garments:

Provides protection against liquid and solid organic and inorganic chemicals. Permeation data must be consulted.

10.1.3. Level A garments:

Provides protection against gases and vapors in addition to liquids and solids. Permeation data must be consulted.

10.1.4. PVC, nitrile, neoprene, butyl, viton, silver shield:

These common glove fabrics provide protection against liquid and solid organic and inorganic chemicals. Permeation data must be consulted.

10.1.5. PVC Overboots and "Raingear":

Provide splash protection and limited chemical resistance. Effective worn over poly-coated Tyvek or Saranex when permeation data for these suits is available.

10.2. Limitations of CPC

10.2.1. Permeation:

Permeation is the process by which a chemical dissolves in and/or moves through a protective clothing material on a molecular level. The extent of permeation is a function of contaminant concentration, contact time, and material thickness.

10.2.2. Degradation:

Degradation is the loss of, or change in, the fabric's chemical resistance or physical properties due to chemical exposure or ambient conditions (i.e. light, temperature).

10.2.3. Penetration:

Penetration is the movement of chemicals through zippers, stitched seams or imperfections (i.e. pinholes).

10.2.4. Seams:

Breakthrough may occur much faster through seams and zippers than through the fabric. Seams and zippers are not tested. Seams on Saranex suits are often stitched over poly-tyvek fabric, not Saranex fabric.

10.2.5. Sizing:

Wearing the correct size clothing is important for its performance. Clothing which is too small often tears or rips at the seams and zipper. Clothing which is too large can interfere with dexterity.

10.3. Selection of CPC

10.3.1. Manufacturer's permeation data must be consulted before selecting chemical protective clothing. The following guidelines are designed to assist this selection process.

A. List all known or suspected site contaminants and any additional chemicals that may be used on-site.

B. For each chemical, record the corresponding CPC material(s) tested and the respective "Breakthrough Times."

C. Select the specific CPC material(s) that protects against the greatest range of chemicals and has the longest breakthrough time(s).

D. When permeation data is not available for a specific chemical, contact the fabric manufacturer (i.e. Dupont, Kappler, Pioneer, Ansell) for consultation.

NOTE: One type of material may not be adequate to protect against all site contaminants. It may be necessary to "layer" two or more CPC materials to obtain adequate protection, (e.g., it may be necessary to utilize PVC gloves over silver shield gloves).

E. Estimate the amount of time the chosen CPC will effectively protect against the anticipated contaminants.

F. Evaluate:

1. breakthrough times;
2. bulk concentration of the contaminants;
3. extent of contact with the material;
4. scope of work and types of tasks;
5. location of operation;
6. seams/construction of garment, etc.

G. Determine an IN-USE inspection interval by dividing the estimated, effective CPC protection time, (determined in 10.3.1.E), by four.

For Example: The estimated effective protection time is determined to be 6 hours. The subsequent IN-USE inspection interval would therefore be every 90 min.

10.4. PPE Inspection Procedures

Chemical protective suits and gloves should be inspected immediately before use, during use, and in the case of non-disposable CPC, after-use.

10.4.1. Limited Use/Disposable CPC Inspection (Level A Responder, Level B, Level C)

A. Pre-Use Inspection

These procedures should be conducted PRIOR TO equipment use, (preferably at time of equipment issuance). Visually inspect suit components:

1. Fabric - for abrasions, cuts, holes, or tears, and original flexibility;
2. Seams - for separations, or holes;
3. Zippers, buttons, storm flaps, and other connecting devices for proper sealing and operation;
4. Signs of previous chemical attack or incomplete decontamination;
5. Elastic around wrists and ankles, and the drawstrings on hoods are in good condition, (if applicable);
6. Discoloration; or
7. Other unusual flaws or defects.

B. Deficiencies

If any irregularities or deficiencies (as described above) are noted, the specific piece(s) of chemical protective clothing shall not be utilized. All problems with chemical protective clothing must be reported to CHES Health and Safety as soon as possible.

C. In Use Inspection

Frequent in-use inspections are necessary to ensure the integrity of the CPC. These inspections shall include but are not limited to:

1. Fabric - for abrasions, cuts, holes, or tears;
2. Seams - for separations or holes;
3. Zippers, buttons, storm flaps and other connecting devices - for proper sealing and operation;
4. If applicable
    a. Exhalation valves for debris and proper functioning;
    b. Condition of waist belts, Velcro adjustments;
    c. Condition of airline attachment.

D. Deficiencies

If any irregularities or deficiencies (as described above) are noted, personnel shall leave the Exclusion Zone immediately. CPC shall then be re-evaluated or replaced as necessary and deemed appropriate by CHES Health and Safety.

10.4.2. Non-Disposable CPC Inspection (Level A Butyl):

Fully encapsulating suits require additional inspection, which includes the following:

A. Prior to and After Use Inspection:

These inspection procedures should be conducted prior to and after use.

1. Exhalation valves - (positive pressure) for debris and proper functioning;
2. Suit Face piece - for poor visibility, (cuts, scratches, dirt) and an adequate Face piece to suit seal;
3. Presence and condition - of waist belts, Velcro adjustments, (head and hips), and ankle straps;
4. Condition of - integral gloves, boots, and leg gaiters;
5. Presence of - hard hat or ratchet head suspension;
6. Presence and condition - of airline attachment and hoses for cooling system;
7. Leak detection and pinholes –
   a. If an air source is available, secure the suit and inflate it, then using a mild soap solution, observe for bubbles on the surface or around seams; or
   b. Inside of a dark room, run a flashlight inside the suit, and look for pinpoints of light from outside the suit; or
   c. Follow OSHA recommended procedure for testing suit integrity.

B. Deficiencies

Any fully encapsulating suit found incapable of passing CHES Fully Encapsulating Suit Testing Procedures shall be removed from service, (and/or discarded). No fully encapsulating suit shall be returned to service until such time as repairs are conducted and successful re-testing is completed.

C. Non-Disposable In Use Inspection

Frequent in-use inspections are needed to ensure the integrity of the CPC. These inspections shall include but are not limited to:

1. Fabric - for abrasions, cuts, holes, or tears;
2. Seams - for separations, or holes;

3. Zippers, buttons, storm flaps and other connecting devices - for proper sealing and operation;

4. If applicable

    a. Exhalation valves for debris and proper functioning;

    b. Condition of waist belts, velcro adjustments;

    c. Condition of airline attachment.

D. Deficiencies

If any irregularities or deficiencies are noted, personnel shall leave the Exclusion Zone immediately. CPC shall then be re-evaluated or replaced as necessary and deemed appropriate by CHES Health and Safety.

10.5. CPC Donning, Doffing & Proper Fitting

This section will address proper donning and doffing procedures and also how to properly fit an employee in CPC. This section is in two parts: (1) Non Disposal CPC and (2) Disposable/Limited Use CPC. Proper fitting, donning and doffing is essential to provide the best possible protection for the employee.

10.5.1. Non-Disposable and Limited Use CPC (Level A)

A. Donning Level A

1. INSPECTION: Inspect suit, gloves and respiratory equipment for proper function. DO NOT use any suit with holes, rips, malfunctioning closures, cracked masks, etc. If suit contains a hood or a hard hat is worn, adjust it to fit user's head. If suit has a back enclosure for changing air bottles, open it.

2. LUBRICATION: A moderate amount of talcum powder or cornstarch can be used to prevent chafing and increase comfort. Both also reduce rubber binding.

3. FACEPIECE: Use antifog on suit and mask face pieces.

4. TECHNIQUE: While sitting (preferably), step into legs, place feet properly, and gather suit around waist.

5. FOOT PROTECTION: While sitting (preferably), put on chemical resistant steel toe and shank boots over feet of suit. Properly attach and affix suit leg over top of boot.

    a. For one-piece suits with heavy-soled protective feet, wear leather or short rubber safety boots inside suit.

    b. Wear an additional pair of disposable boot protectors if necessary.

6. SCBA: Put on SCBA air tank and harness assembly. Don face piece and adjust it securely yet comfortably, Do not connect breathing hose. Open valve to air tank. (The air tank and harness assembly could also be put on before stepping into legs of suit).

7. GLOVES: Depending on type of suit -

    a. Put on inner gloves.

    b. For suits with detachable gloves, secure gloves to sleeves if this has not been done prior to entering the suit. (In some cases, extra gloves are worn over suit gloves).

8. SUIT: While standing, put arms into sleeves, and then head into hood of suit. The helper pulls suit up and over SCBA, resting hood on top of SCBA, adjusting suit around SCBA backpack and user's shoulders to ensure unrestricted motion. To facilitate entry into the suit, bend at the knees as hood is placed over wearer's head. Avoid bending at the waist, as this motion tends to use up room in the suit rather than provide slack. For a tall or stout person, it is easier to put on the hood of the suit before getting into the sleeves.

9. Begin to secure suit by closing all fasteners until there is only room to connect the breathing hose. Also, secure all belts and/or adjustable leg, head, and waistbands. Connect breathing hose while opening main valve.

10. When breathing properly in SCBA, complete closing suit.

11. Helper should observe for a time to assure that wearer is comfortable and equipment is functioning properly.

B. Doffing Level A

1. Compliance with doffing procedures is necessary to minimize or prevent contamination of the wearer and assistant from contact with the outside surface of the suit.

2. The following procedure assumes that before the suit is removed, it has been properly decontaminated. (See Chapter I, Decontamination.) The procedure requires the consideration of the type and extent of contamination, and requires that a suitably attired helper is available. (Note that the level of protection for the helper will vary depending on extent and type of contamination, as well as the stage of the decontamination and suit removal process. In most cases, helpers shall assist in Level B protection.)

    a. Remove extraneous or disposable clothing, boot covers, or gloves.

    b. If possible, wearer kicks off chemical-resistant boots unassisted. To achieve this, oversized boots are often selected. Otherwise, helper loosens and removes chemical-resistant boots.

    c. Helper opens front of suit to allow access to SCBA regulator. As long as there is sufficient air pressure, the breathing hose is not to be disconnected.

    d. Helper lifts hood of the suit over wearer's head and rests hood on top of SCBA air tank. For a tall or stout person, it is easier to remove the arms from the sleeves of the suit prior to removing the hood.

    e. Remove external gloves.

f. To minimize contact with contaminated clothing, helper touches only the outside of the suit and the wearer touches only the inside. Remove arms, one at a time, from the suit. Helper lifts suit up and away from SCBA backpack, avoiding any contact between outside surface of suit and wearer's body. Helper lays suit out flat behind wearer.

g. While sitting (preferably), remove both legs from the suit.

h. After suit is completely removed, roll internal gloves off hands, inside out.

i. Walk to clean area to procedure for doffing SCBA.

j. Remove inner clothing, clean body thoroughly.

10.5.2. Disposable CPC (Level B, Level C)

A. Donning

1. Before donning, the suit shall be inspected for defects. If ANY defects are found, the suit SHALL NOT be used.
2. While sitting (preferably), step into legs, place feet properly and gather suit around waist.
3. If overboots are required, don boots.
4. Pull up suit and put arms into sleeves.
5. Zip up suit and seal.
6. Put gloves on.
7. Fully tape boots and gloves.
8. If a respirator is required, put on respirator.
9. Put on hood and tape around face piece.

B. Doffing

When doffing limited use CPC, proper decontamination procedures must be performed prior to doffing. The decontamination procedures give step-by-step directions for doffing CPC.

10.6. PPE Maintenance and Storage

10.6.1. Every employee is responsible for ensuring that his or her issued PPE is properly cleaned and stored according to Clean Harbors and the manufacturers' standards. PPE, which is not an "issued item", shall be stored in accordance with the manufacturers' recommendations. Good maintenance and storage procedures help to ensure that PPE provides the protection for which it is designed in addition to prolonging the useful life of the equipment.

10.6.2. All CHES fully encapsulating (Level A) suits shall be stored according to manufacturers' suggested procedures and periodically tested to ensure suit integrity.

11. TRAINING

Training in the use of personal protective equipment shall be provided to each employee required to use such equipment.

11.1. Training Components

11.1.1. Training on Personal Protective Equipment shall include, but is not limited to, the following:

- A. When PPE is necessary;
- B. What PPE is necessary;
- C. How to properly don, doff, adjust and wear PPE;
- D. Limitations of PPE; and
- E. Proper care, maintenance, useful life and PPE disposal.

11.2. Demonstration of Competence

Before being allowed to perform work requiring the use of PPE, each affected employee shall demonstrate an understanding of the training and ability to use the required PPE properly. Employee knowledge can be demonstrated through hands-on donning, doffing and inspection, or through written examination.

11.3. Frequency of Training

11.3.1. Training shall be provided initially before any employee is permitted to conduct work that requires the use of PPE. In addition, retraining of an employee is required if that employee demonstrates that he or she does not have the understanding and skill required to use an item of personal protective equipment.

11.3.2. Circumstances where retraining is required include, but are not limited to:

- A. Changes in workplace render previous training obsolete,
- B. Changes in the types of PPE to be used render previous training obsolete;
- C. Inadequacies in an affected employee's knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill.

11.4. Associated Training Courses

Employees will also complete training in respiratory protection and hearing conservation if they are covered by these programs.

11.5. Record keeping

11.5.1. A written certification that contains the name of each employee trained, the date(s) of training, and topic of training shall be maintained. (Please see Appendix 3.)

11.5.2. Training records are maintained on a database managed by the Clean Harbors Training Department.

12. EVALUATION OF THE PPE PROGRAM

12.1. Program Review

12.1.1. Clean Harbors Personal Protective Equipment Program shall be reviewed at least annually and more frequently if changes occur with a job, task, equipment or process. If program deficiencies are identified or suspected by a Clean Harbors employee, it is their responsibility to notify their supervisor, their local Health and Safety Manager, the Regional Health and Safety Manager, or the Health and Safety Director.

12.1.2. Review of the PPE Program shall include, but is not limited to, the following:

A. Work area Hazard Assessment for PPE selection;

B. Accident and illness experience;

C. Type and degree of exposure;

D. Adequacy of equipment selection procedures;

E. Degree of fulfillment of program objectives;

F. Employee acceptance;

G. Coordination with overall safety and health program elements;

H. Recommendations for program improvements and modifications;

I. The adequacy of program records.

APPENDIX 1: PPE Performance Standards

EQUIPMENT	OSHA STANDARD	DESIGN/SPECIFICATION STANDARD
Eye and Face	1910.133	ANSI Z87.1-1989 "Occupational and Educational Eye and Face Protection"
Respirators	1910.134	ANSI Z88.2-1991 "Respiratory Protection"
Head	1910.135	ANSI Z89.1-1986 "Protective Headwear for Industrial Workers - Requirements"
Foot	1910.136	ANSI Z41-1991 "Personal Protection - Protective Footwear"
Electrical	1910.137	ASTM D 120-87 "Rubber Insulating Gloves" ASTM F 496-93b "In-Service Care of Insulating Gloves and Sleeves"
Hand	1910.138	None
Noise	1910.95	ANSI S3.19-1974 "Measurement of Real-Ear Protection of Hearing Protectors"
Chemical Protective Clothing	1910.120	ASTM F739 "Test Method for Resistance of Protective Clothing Materials to Permeation by Liquids and Gases

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APPENDIX 2: Hazard Assessment/Task Analysis and Selection Guide

Task
Health and Safety Department

Personal Protective

PERSONAL PROTECTIVE EQUIPMENT - HAZARD ASSESSMENT RECORD																
FACILITY TASK/OPERATION:		Hazard Categories (check at least one) - All That Apply -														
		Mechanical/Physical									Chemical				Biological	
DATE: CONDUCTED BY / SIGN. POSITION TITLE PARTS OF BODY		Falls from heights	Cuts, Abrasions	Impact, Crushing	Slip, Trip, Falls	Thermal Burns	Heat/Cold Stress	UV/IR Radiation (welding, cutting)	Electrical	Noise	Gases, Vapors	Dust, Fumes, Particles	Contact with Contaminated Surfaces	Splashes, Spurts	Harmful Bacteria	Harmful Virus
Head	Cranium															
	Ears															
	Eyes															
	Resp Tract															
	Face															
	Whole Head															
Upper Limbs	Hands															
	Arms															
Lower Limbs	Feet															
	Legs															
Various	Skin															
	Abdomen															
	Whole Body															

▭	**PPE Required**	**Specify Type**
	Hard Hat	
	Safety Glasses	
	Goggles	
	Face Shield	
	Hearing Protection	
	Respirator	/Cartridge

▭	**PPE Required**	**Specify Type**
	SCBA/Airline	
	Work Uniform	n/a
	Tyvek	
	Gloves	
	Steel Toe Boots	
	Other	

CleanHarbors

APPENDIX 3: Workplace Hazard Assessment Training Documentation

Health and Safety Department
WORKPLACE HAZARD ASSESSMENT Training Documentation

FACILITY ____

1. **Location/Task:**

2. **Hazards:**
   Physical:

   Chemical:

   Biological:

3. **PPE Required:**

______________ **Hard Hat**
______________ **Safety Glasses**
______________ **Goggles**
______________ **Face Shield**
______________ **Hearing Protection**
______________ **Respirator**
______________ specify cartridge type
______________ **SCBA/Airline**

______________ **Work Uniform**
______________ **Tyvek**
______________ specify type
______________ **Gloves**
______________ specify type
______________ **Steel Toe Boots**
______________ specify type
______________ **Other**

Employee Name	Employee Signature	Employee ID Number	Training Date

"I certify that I have read and understand the PPE Hazard Assessment identified above. I also had the opportunity to discuss with the Training Department or my immediate Supervisor any questions concerning the PPE Hazard Assessment. I also understand that this assessment can change based on information gathered by exposure monitoring or change in condition; either of which will require re-training and certification."

Trainee Signature ______________________________ Date ____________________

APPENDIX 4: OSE Checklist

OPERATIONS
SAFETY EVALUATION CHECKLIST

Job # ______ Supervisor ______ Foreman ______
Client ______ Location ______
Job Scope: ______

SUBSTANCES: **Name** ______ **Conc/Amount** ______ **MSDS Available** ______ **Analysis Available** ______

1. Operations requiring a **SITE SPECIFIC PLAN:** Y ____ N ____
    - ______ **OSHA REGULATED SUBSTANCES** (See latest list)
    - ______ **MANDATED BY GOVN'T AGENCY**
    - ______ **CORRECTIVE ACTION AT RCRA TSDF**
    - ______ **UNCONTROLLED HAZ-WASTE SITE**
    - ______ **LAB PACK**
    - ______ **EMER RESP/POST EMERG RESP**
    - ______ **UST REMOVAL**
    - a) ______ SSH&SP Completed/Available on-Site
    - b) ______ Signed by **all** on-site crews
    - c) ______ Sections 1-12 attached
2. **CONFINED SPACE ENTRY** (Per - 8.4.10) Y ____ N ____
    - a) ______ Mechanically Ventilated ______ Level B ______ Exemption (H&S sign-off)
    - b) ______ Training Received
    - c) ______ CPR/First Aid (Min. 2) (Ind. Names)
    - d) ______ Monitoring Conducted
    - e) ______ Permit Completed/Attached
    - f) ______ Hazardous Energy Sources Isolated
    - g) ______ Emergency Procedures
    - h) ______ Comm. System Est.
    - i) ______ Hot Work
    - j) ______ PPE
    - k) ______ Other Safety Equipment (i.e. Emergency)
    - l) ______ Safety Meeting
3. **SOIL EXCAVATIONS** (Per 8.4.16) Y ____ N ____
    - a) ______ Digsafe Obtained
    - b) ______ Area Barricaded
    - c) ______ Competent Person on-site
    - d) ______ Sloping/Shoring Options followed
    - e) ______ Water Accum. Cntld.
    - f) ______ Spoils Properly located
    - g) ______ Ladders-Sufficient Number and Located
    - h) ______ Daily Inspection Checklist Completed
4. **LOCKOUT/TAGOUT** (Per 8.4.21) Y ____ N ____
   (**Hazardous Energy Sources** — Electric; mechanical; hydraulic; pneumatic; compressed air/liquids; pipelines, etc.)
    - a) ______ Hazardous Energy Sources ("HES") Identified
    - b) ______ Residual Energy Identified/Controlled/Verified
    - c) ______ Mechanical Energy Identified/Controlled/Verified
    - d) ______ Lockout/Tagout Worksheet completed
5. **HOT WORK** (Per — 8.4.20) Y ____ N ____
    - a) ______ Training Received
    - b) ______ Inspection Conducted
    - c) ______ Monitoring Conducted
    - d) ______ Toxic Material Determined
    - e) ______ Permit Completed and Posted
    - f) ______ Safety Meeting Conducted
    - g) ______ Fire Ext. Selected & Stationed
    - h) ______ Fire Watches Select. & Stationed
    - i) ______ CSE Procedure Implemented
    - j) ______ Hazard. Energy Prgm. Implemented
    - k) ______ Fire Inspection Conducted
    - l) ______ Welding, Brazing, Arc or Torch Cutting Operations
6. **ELECTRICAL POWERED EQUIPMENT** (Per 8.4.13) Y ____ N ____
    - a) ______ Appropriate for the Location (Class 1, Div. 1 if flammable handled)
    - b) ______ Low Voltage isolation transformer; or
    - c) ______ Ground Fault Circuit interrupter (GFCI)
    - d) ______ PPE (specify type below)
7. **WORK ON OR NEAR WATER** (Per 8.4.15) Y ____ N ____
    - a) ______ "Certified" boat Operator
    - b) ______ Checklists completed
    - c) ______ PFDs in use
    - d) ______ Ring Buoy and 90' of line available
    - e) ______ Distance between shore side buoys no greater than 200 feet
8. **VEHICULAR TRAFFIC** Y ____ N ____
    - a) ______ Reflective vests
    - b) ______ Warning Signs
    - c) ______ Traffic Cones
    - d) ______ Police Detail
9. **VACTOR, SUPERSUCKER, or GUZZLER.** Y ____ N ____
    - a) ______ Emergency Shutdown procedures established
    - b) ______ Hands, body kept 2 feet or more from hose end.
10. **ELEVATED AREAS** (> 4 ft.) Y ____ N ____
    - a) ______ Harness/lifeline utilized for fall protection
    - b) ______ Other Fall Protection
11. **"UNKNOWN" MATERIALS/CONTAINERS** Y ____ N ____
    - a) ______ Consult Health and Safety prior to handling
12. **CUSTOMER SAFETY REGULATIONS IN EFFECT** Y ____ N ____
    - a) ______ Copy Obtained, Reviewed, Available
13. ______ **FLAMMABLE** ______ **COMBUSTIBLE** liquids Transfer (Per 8.4.24) Y ____ N ____
    - a) ______ Bonding/Grounding
    - b) ______ Pressure offloading prohibited
    - c) ______ Area Monit. Conduct.
    - d) ______ Ignition sources identified and controlled
14. **PHYSICAL HAZARDS** Y ____ N ____
    - a) ______ Physical Hazard Evaluation Sheet Completed
    - b) ______ Physical Hazard Control Sheets Available
15. **PPE:**

Respiratory (type) ______
Resp. Cartridge (type) ______
Prot. Cov'alls (mat'l) ______
Gloves (mat'l) ______
Safety Glasses ______
Safety Goggles ______
Face Shield ______
Harness/L'line ______
Hardhat ______
Hearing Prot. ______
Overboots ______
PFD ______
Steel toe boots ______
Disp. boots ______
"Welding" Shade # ______

REMARKS: ______

THE ABOVE REPRESENTS A CERTIFICATION OF HAZARD ASSESSMENT FOR PPE PURPOSES AND HAS BEEN REVIEWED AND DISCUSSED BY:

OPERATIONS
NAME: ______ (print)
______ (sign)
______ (date)

HEALTH AND SAFETY
NAME: ______ (print)
______ (sign)
______ (date)

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APPENDIX 5: References

Guidelines for the Selection of Chemical Protective Clothing; American Conference of Governmental Industrial Hygienists, 3rd Edition, February 1987.

Occupational Safety and Health Act of 1970, 29 CFR 1910 Subpart I (29 CFR 1910.132 through 1910.140) and preamble;

Occupational Safety and Health Act of 1970, 29 CFR 1910.120;

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, DHHS (NIOSH) Publication No. 85-115;

Personal Protective Equipment for Hazardous Materials Incidents: A Selection Guide, US Department of Health and Human Services, Public Health Service, Centers for Disease Control, NIOSH, October 1984.

Response Safety Decision-Making, EPA Training Manual

Safety and Health in EPA Field Activities, Norman V. Steere & Associates, Inc.

Flexible Insulating Protective Equipment for Electrical Workers, National Safety Council Data Sheet I-598-Rev 85.

APPENDIX 6: Notes for Hand and Arm Protection Selection

1. Care should be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards. Adequate protection against the highest level of each of the hazards should be provided. Protective devices do not provide unlimited protection.

2. Gloves should be long enough to come well above the wrists, leaving no gaps between the glove and the coat of shirtsleeve. Long, flaring gauntlets should be avoided unless they are equipped with closing snaps or straps to ensure a snug fit around the wrist.

3. Gloves or mittens having metal parts or reinforcements should never be used around electrical apparatus. Work on energized or high-voltage equipment requires specially made and tested rubber gloves. Workers should wear over-gloves of leather to protect the rubber gloves against wire punctures and cuts and to protect the rubber in the event of electrical flashes.

4. The selection of chemical protective gloves depends greatly on the type and physical state of the chemicals to be handled. Both permeation (the process by which a chemical dissolves in and/or passes through a protective material on a molecular level) and degradation (loss of or change in the protective material's resistance or chemical properties) must be considered when selecting an appropriate glove material.

5. Mixtures of chemicals can be significantly more aggressive toward protective materials than can any single component alone. Gloves should be selected that offer the widest range of protection.

6. The type of material used to coat the gloves will have a range of chemicals and conditions to which it is resistant. Each protective material performs well in certain working conditions, and not so well in others. Some general guidelines are provided below. Additional detailed information is available from Health and Safety Services.

Natural Rubber

- Has excellent abrasion, cut and tear resistance, grip and temperature resistance (effective range 0^{o} F to300^{o} F).
- Has poor flame resistance.
- Generally withstands all liquids that will mix with water, such as acetones and alcohols, but not those that do not mix with water, such as petroleum and oil-based solvents.
- Swells and degrades in contact with hydrocarbon fluids like kerosene, mineral spirits, and gasoline. It is not recommended where resistance to grease, oil or petroleum solvents is required.

Neoprene

- Provides good abrasion resistance, but not as good as PVC or nitrile, and good cut resistance, but not as good as natural rubber.
- Has excellent tactile strength and resembles natural rubber in feel and flexibility.
- Performs well and resists degradation in continuous contact up to 200^{o} F and in intermittent contact up to 300^{o} F.
- Flame resistance and will not support combustion.
- Remains flexible and performs well down to around -10^{o} F, but below that stiffens, becoming brittle around -40^{o} F.
- Is much more resistant than natural rubber to gases, vapor and moisture, and resists degradation due to aging, sunlight, ozone, oxidation and weather.

Appendix 6 continued

Nitrile

- Has better resistance to cuts and abrasion than neoprene or PVC gloves.
- Depending on the type of glove and application, nitrile may function well in temperatures ranging from 25^{o} F to 300^{o} F.
- Provides excellent resistance to a wide range of solvents and hazardous chemicals, such as oils, acids, grease, caustics and many petroleum products.

Polyvinyl Chloride PVC

- Provide excellent abrasion resistance, but lacks tactile sensitivity of rubber.
- Different compounding processes affect the wear, flexibility, chemical resistance and cost of PVC gloves.
- Depending on the glove and application, may function well in temperatures ranging from 25^{o} F to 150^{o} F. PVC begins to melt around 180^{o} F.
- Special, low temperature PVC formulations may remain serviceable down to -30^{o} F.
- Provides resistance to most acids, oils, fats, caustics and petroleum hydrocarbons.
- Provides resistance to alcohols and glycol ethers, but not aldehydes, ketone, aromatic hydrocarbons, halogen compounds, heterocyclic compounds or nitro-compounds.

Butyl Rubber

- Does not provide the physical strength of natural rubber
- Provides superior resistance to highly corrosive acids and is excellent for handling ketones and esters.
- Provides excellent permeation resistance to gases and water vapor.
- Provides good chemical resistance to bases, alcohol, amines, amides, glycol ethers, nitro-compounds and aldehydes, but does not perform well in halogen compounds, aliphatic hydrocarbons or aromatic hydrocarbons.

Viton

- Material is flexible, but offers minimal resistance to cuts or abrasion. For applications where Viton is recommended for chemical resistance, heavier gauge Viton gloves or over-gloves made of more durable materials may be necessary.
- Is the most chemical resistant of all rubber materials and protects against many toxic materials such as PCBs, polychlorinated triphenyls, benzene, and aniline.
- Provides excellent resistance to gas and water vapor.
- Provides excellent resistance to most solvents.

HS 1.69 PORTABLE FIRE EXTINGUISHERS –FIRE PROTECTION GUIDELINES

PORTABLE FIRE EXTINGUISHERS – FIRE PROTECTION GUIDELINES

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PORTABLE FIRE EXTINGUISHERS – FIRE PROTECTION GUIDELINES

1. PURPOSE

The purpose of this guideline is to provide the information and guidance necessary to place, use, and test portable fire extinguishers utilized by CHES personnel.

2. SCOPE

This guideline applies to all Clean Harbors Environmental Services employees who operate or may be called upon to operate portable fire extinguishers. Note that unless specific authorization and training is obtained, any fire fighting procedures implemented by CHES personnel shall be for incipient fire fighting only. Only employees who have received training in the use of fire extinguishers shall use this equipment.

3. RESPONSIBILITIES

3.1. CHES Employee

The CHES employee shall adhere to these guidelines and always operate equipment safely.

3.2. General Manager

Ensures that all employees who have responsibility for portable fire extinguisher use successfully complete the required training noted in these guidelines.

3.3. Supervisors

Enforce these guidelines and notify the General Manager and Health & Safety of any unsafe operation.

3.4. Health and Safety

3.4.1. Assists the General Manager in implementing and managing the training program.

3.4.2. Periodically reviews and updates these guidelines, and provides technical guidance on interpreting any regulations or guidelines.

4. DEFINITIONS

Class A fires: fires involving wood, paper, trash having glowing embers.

Class B fires: fires involving flammable liquids, gasoline, oil, paints, grease, etc.

Class C fires: fires involving electrical equipment.

Class D fires: fires involving combustible metals.

5. REQUIREMENTS

5.1. General

5.1.1. Ensure that extinguishers are mounted and identified so that they are readily accessible to employees in the event of a fire. Portable extinguishers shall not be obstructed or obscured from view.

5.1.2. Extinguisher operating instructions shall be located on the front of the extinguisher, shall be clearly visible, and shall not be obscured by other labels.

5.1.3. Only use approved portable fire extinguishers (UL listed or equivalent).

5.1.4. Carbon tetrachloride or chlorobromomethane shall not be used as extinguishing agents.

5.1.5. Ensure that extinguishers are maintained in a fully charged and operable condition and ensure that they are kept in their designated places at all times except during use, or when they are taken out of service. Equivalent protection must be put in place when a particular extinguisher is taken out of service.

5.1.6. No soldered or riveted shell self-generating soda acid or self-generating foam or gas cartridge water-type portable fire extinguishers shall be used.

5.1.7. Extinguishers shall be selected based on anticipated classes of workplace or worksite fires and on the size and degree of the hazard that would affect their use. National Fire Protection Association (NFPA 10), Occupational Safety and Health Administration (OSHA), or other appropriate guidelines and/or standards shall be used to determine distribution requirements. Consult H&S for guidance.

5.1.8. Halogenated agents shall only be used where a clean agent is necessary to extinguish a fire efficiently without damaging equipment or area being protected, or where the use of alternate agents can cause a hazard to personnel in the area.

5.1.9. Pressurized flammable liquids, pressurized gases, and three-dimensional Class B fires are generally considered special hazards, and providers of equipment for these applications must be consulted to determine appropriate extinguishers for these hazards. Consult with H&S for guidance.

6. TRAINING

6.1. Requirements

Each operator is to be trained in accordance with 29 CFR 1910.157 (g). No employee shall be permitted to operate portable fire extinguishers unless they have received the necessary training.

6.1.1. The training shall include, at a minimum, information on the general principles of fire extinguisher use and the hazards associated with incipient fire fighting.

6.1.2. The training shall be provided upon initial assignment and at least annually thereafter for covered employees.

7. INSPECTION, MAINTENANCE AND TRAINING

7.1. Inspections

Portable fire extinguishers shall be visually inspected monthly. The monthly inspection shall include the following:

A. Located in designated space;

B. No obstruction to access or visibility(maintain a 3 foot clearance);

C. Operating instructions on nameplate legible and facing outward;

D. Safety seals and tamper indicators not broken or missing;

E. Fullness determined by weighing or "hefting";

F. Examination for obvious physical damage, corrosion, leakage, or clogged nozzle;

G. Pressure gauge reading or indicator in the operable range or position;

H. Condition of tires, wheels, carriage, hose, and nozzle checked (for wheeled units);

I. Hazard Communication label in place.

In addition to the above listing, refer to the CHES Portable Fire Extinguisher Inspection Form and Checklist found in the Inspection Forms and Procedure Section of the H&S Guidance Manual.

7.2. Maintenance

7.2.1. Portable fire extinguishers shall have an annual maintenance check by qualified personnel, and the record of that check shall be retained for at least one year after the last entry or the life of the shell, whichever is less.

7.2.2. Stored dry chemical extinguishers that require a 12-year hydrostatic test must be emptied and subjected to applicable maintenance procedures every 6 years. Dry chemical extinguishers having non-refillable disposable containers are exempt from this requirement. When recharging or hydrostatic testing is performed, the 6-year requirement begins from that date.

7.2.3. During any period where a portable extinguisher is removed from service, equivalent protection must be ensured during that period.

8. HYDROSTATIC TESTING

8.1. General Procedures

8.1.1. Hydrostatic testing of portable extinguishers shall meet, at a minimum, the requirements noted in 29 CFR 1910.157(f).

8.1.2. Personnel or service providers with sufficient training and equipment to conduct the testing in accordance with OSHA regulations and NFPA recommendations shall perform hydrostatic testing.

8.1.3. Portable fire extinguishers shall also be tested whenever they show new evidence of corrosion or mechanical injury.

8.1.4. Portable extinguishers including shells, cylinders, or cartridges, which fail a hydrostatic test or are not fit for service, shall be removed from service.

8.1.5. The record of the hydrostatic testing shall include the following:

A. Date of test;

B. Signature of person conducting the testing and name of the service provider company, if applicable;

C. Serial number or other unique identifier of the unit being tested.

9. RECORD KEEPING

9.1. Documentation Requirements

9.1.1. Documentation of classroom and any hands-on-training (lecture, video, quiz, etc.) shall be entered into the training database system and a hard copy must be kept at the employee's location with their training records for the duration of employment.

9.1.2. Monthly inspection records shall be maintained with the fire extinguisher or other official documentation record retention file, and should be kept for one month after the date of the last inspection..

9.1.3. Records of annual maintenance checks and shall be maintained for at least one year after the last entry or the life of the shell, whichever is less. A tag or label showing that date and identity of the person conducting the annual check must be secured to the extinguisher.

9.1.4. Hydrostatic Testing records shall be kept until the extinguisher is retested or until the extinguisher is removed from service, whichever comes first.

HS 1.15 REFLECTIVE VESTS

HS 1.15 REFLECTIVE VESTS

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HS 1.15 REFLECTIVE VESTS

1. Purpose

To protect employees from vehicular traffic injuries by warning motorists of their presence. Note: Rule 634.3 also applies to this procedure

2. Description and Procedures

All Company employees exposed to vehicular traffic while performing their duties are required to wear high visibility reflective vests. Locations where reflective vests are required include, but are not limited to, work in and around city streets, country roads, highways, parking lots, etc. The vests shall be worn at all times while on the job. Employees are responsible for utilizing the vests proved to them, as appropriate, when construction vehicles and equipment are utilized.

The General Manager is responsible for communicating and enforcing this Policy.

Supervisors and Foremen are responsible for enforcing compliance on each site.

3. Application

This Policy applies to all Company operations.

4. Issuing Department and Contact

Health and Safety Department

5. Other Policies and Procedures Affected and Interpretation

No other Policies or Procedures are affected.

Questions on the applicability of this Policy should be referred to members of the Health and Safety Department.

6. Sign-Off Department

Law Department

HS 1.7 RESPIRATORY PROTECTION GUIDELINES

HS 1.7 RESPIRATORY PROTECTION GUIDELINES

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HS 1.7 RESPIRATORY PROTECTION GUIDELINES

1. PURPOSE

To provide procedures that will enable employees to properly and effectively utilize respiratory protection equipment and to ensure compliance with mandatory protection requirements specified under OSHA regulation 29 CFR 1910.134.

The goal of Clean Harbors Environmental Services, Inc.'s (CHES') Health and Safety guidelines is to provide employees with a safe and healthful workplace. This is generally accomplished by utilizing facilities, equipment and engineering controls that have all feasible safeguards incorporated into their design. When effective engineering controls are not feasible and respiratory hazards potentially exist, respiratory protection must be used to ensure personal protection. Due to the mobile and varied nature of CHES tasks and employees, the use of respirators by Clean Harbors employees is often the only method of adequate personnel protection. However, respirators must only be used with careful attention to operating limitations and maintenance requirements. All CHES respirator users must strictly adhere to the guidelines presented in this Respiratory Protection Program.

2. SCOPE

This program establishes procedures for selection, use, care and training in all aspects of respiratory protection for CHES employees. A copy of this program is available to all employees through the CHES Web site via the employee portal and each facility has a copy with any additional site-specific information that is applicable. This program does not apply to contractors or subcontractors, who are responsible for providing their own program and equipment for their employees.

3. RESPONSIBILITIES

3.1. Director of Industrial Hygiene

3.1.1. The Director of Industrial Hygiene is the Corporate Manager responsible for Program oversight, including the annual evaluation of program effectiveness and ensuring what the tasks listed in 3.2 are accomplished. The Director of Industrial Hygiene shall review these guidelines annually and update them whenever changes occur that may affect this program and its effectiveness. These changes may include regulatory changes, updated respirator cartridge information, issues with Health and Safety, medical status of respirator users, etc., and are brought to the attention of the Director, Industrial Hygiene at any time.

3.1.2. The Program Administrator shall ensure that employees covered under this program who are required to use respirators are regularly consulted to assess the employees' views on program effectiveness and to identify any problems. Any problems that are identified during this assessment shall be corrected. Factors to be assessed include, but are not limited to:

A. Respirator fit (including the ability to use the respirator without interfering with effective workplace performance);
B. Appropriate respirator selection for the hazards to which the employee is exposed;

C. Proper respirator use under the workplace conditions the employee encounters; and

D. Proper respirator maintenance.

This assessment shall be documented utilizing Appendix 11. The completed assessment shall be kept on file at the location where the employee is domiciled.

3.2. Health and Safety Department

3.2.1. Develops procedures for effective utilization of respiratory protective equipment.

3.2.2. Coordinates implementation of this program.

3.2.3. Periodically reviews and updates the program to ensure continued effectiveness.

3.2.4. Audits work sites to determine compliance with guidelines and evaluate tasks for which respiratory protection is deemed necessary.

3.2.5. Manages Medical Evaluation Program.

3.2.6. In conjunction with the Training Department, provides materials and training for employees to ensure they understand the proper use, limitations and maintenance of respirators.

3.2.7. Develops requirements and guidelines for the training program.

3.2.8. In conjunction with the Training Department, provides training for all new employees and annually for all employees who use respiratory protection equipment.

3.2.9. Provides document training.

3.2.10. Notifies appropriate Operations personnel of required employee training.

3.3. General Managers

3.3.1. The General Manager is the respiratory Protection Program Administrator and, unless another facility or project individual is assigned that responsibility, is responsible for implementing and evaluating the program effectiveness. This responsibility includes regularly conducting with employees required to use respirators to assess the employee's views on program effectiveness. Problems identified during such assessments shall be corrected. Significant factors to be assessed include, but are not limited to, the following:

A. Ensure that the necessary respiratory protection training is provided to employees as well as the training designated within this program including initial (prior to use) and annual training.

B. Ensure appropriate respirator selection for the hazards to which the employee is exposed.

C. Ensure respirator fit testing as required in this program is conducted (prior to use and annually). Respiratory protection is not to interfere with the employee's ability to perform work effectively.

D. Ensure the proper use, care and maintenance of respiratory protection when it is required and the proper storage and the proper storage and cleaning resources are available.

3.4. Training Department

3.4.1. In conjunction with Health and Safety Department, administers training for all new employees and annually for all employees who use respiratory protection equipment.

3.4.2. Provides training materials for the training program.

3.4.3. Documents training and maintains existing company-wide training database.

3.5. Foreman

3.5.1. Maintains a safe work environment by utilizing engineering or work practice controls, where feasible.

3.5.2. Provides and ensures proper use of respiratory protection where controls mentioned above are being implemented or are not feasible.

3.5.3. Instructs employees on use and care of respiratory protection.

3.5.4. Notifies General Manager and Health and Safety Department of issues and deficiencies in the use of respirators.

3.5.5. Notifies General Manager and Health and Safety Department of changes in workplace or type of respirator which renders previous training obsolete or when inadequacies in employees' training or use of respirator indicates that additional training is necessary.

3.5.6. Instructs employees in proper respiratory use if any deficiencies or inadequacies are identified.

3.6. Employees

3.6.1. Ensure that they understand information supplied during training and notify supervisors/foremen immediately should they not understand any aspect of the training and the respiratory protection program.

3.6.2. Review the guidelines and requirements of this program.

3.6.3. Comply with all rules and guidelines set forth in this program, including wearing assigned respiratory equipment properly and maintaining the equipment.

3.6.4. Notify supervisor of deficiencies in respiratory protection usage.

3.6.5. Notify Supervisor of any changes in their physical condition which could affect respirator fit: facial scarring; dental changes; cosmetic surgery; significant changes in body weight (>20lbs.).

4. DEFINITIONS

Air-Purifying Respirator: Respirator with an air-purifying filter, cartridge or canister that removes specific air contaminants by passing ambient air through an air-purifying element.

Atmosphere Supplying Respirator: Respirator that supplies user with breathing air independent of ambient atmosphere, and includes supplied-air respirators (SAR's) and self-contained breathing apparatus units (SCBA).

Canister or Cartridge: Container with a filter, sorbent or catalyst, or a combination of these items, which removes specific contaminants from the air passed through the container.

Demand Respirator: An atmosphere-supplying respirator that admits air into the face piece only when a negative pressure is created in the face piece by inhalation (wearer breaths in).

Emergency Situation: Any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

Employee Exposure: Exposure to a concentration of an airborne contaminant that would occur if the employee were not wearing respiratory equipment.

End of Service-Life Indicator (ESLI): A system that warns the user of the approach of the end of adequate respiratory protection. For example, the ESLI may indicate that the sorbent is approaching saturation or is no longer effective.

Escape-Only Respirator: A respirator intended to be used only for emergency exit**.**

Filter or Air-Purifying Element: A component used in respirators to remove solid or liquid aerosols or particulates from the inspired air.

Filtering Face piece (Dust Mask): A negative particulate respirator with a filter as an integral part of the face piece or with the entire face piece composed of the filtering medium.

Fit Factor: A quantitative estimate of the fit of a particulate respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

Fit Test: The use of a protocol or procedure to qualitatively or quantitatively evaluate the fit of a respirator on an individual.

High Efficiency Particulate Air (HEPA) Filter: A filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are N100, R100 and P100 filters.

Immediately Dangerous to Life or Health (IDLH): An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects or would impair an individuals' ability to escape from a dangerous atmosphere.

Negative Pressure Respirator (Tight Fitting): A respirator in which the air pressure inside the face piece is negative during inhalation with respect to the ambient air pressure outside the respirator.

Oxygen-Deficient Atmosphere: An atmosphere where the oxygen content is below 19.5% by volume.

Positive-Pressure Respirator: A respirator in which the pressure inside the respirator inlet covering exceeds the ambient air pressure outside the respirator.

Powered Air-Purifying Respirator: An air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

Pressure Demand Respirator: A positive pressure atmosphere-supplying respirator that admits breathing air to the face piece when the positive pressure is reduced in the face piece by inhalation.

Qualitative Fit Test: A pass/fail fit test to assess the adequacy of respirator fit. It relies on the individual user's response to the test agent.

Quantitative Fit Test: An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the face piece.

Self-Contained Breathing Apparatus (SCBA): An atmosphere supplying respirator for which the breathing air source is designed to be carried by the user.

Service Life: The period of time that a respirator, filter or sorbent, or other respiratory equipment, provides adequate protection to the wearer.

Supplied Air Respirator (SAR) or Airline Respirator: An atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

Tight-Fitting Face piece - a respiratory inlet covering that forms a complete seal with the face.

5. TRAINING

5.1. Record keeping

5.1.1. A record keeping database will maintain an accurate company-wide record of initial and annual respiratory protection training, along with a record of any other respiratory protection training provided to the employee.

5.1.2. A separate record of respiratory training must be maintained where the employee is located.

5.1.3. Training records shall be maintained for the duration of employment plus 30 years.

5.1.4. Records must be maintained in a manner so that the individual employee records can be obtained easily by both subject matter and year.

5.2. Frequency

5.2.1. Each employee who will use respiratory protection will receive training outlined in this Section, prior to using the respirator.

5.2.2. Retraining of affected employees will be required annually. A record of this retraining will be maintained as per the initial training record keeping requirements. (See Appendix 8.) Employees must demonstrate their knowledge of respiratory protection by a combination of practical exercises and a written examination.

5.2.3. Retraining must also occur when changes in the workplace or respirator render the previous training obsolete or when the employee's knowledge or use of the respirator is shown to be inadequate.

5.3. Training Program Content

5.3.1. Instruction in the nature of the respiratory hazards and how improper fit, usage or maintenance can compromise the protective effect of respirators.

5.3.2. Discussion of proper selection techniques, including limitations and capabilities of respirators.

5.3.3. How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.

5.3.4. Instruction in the care of respirators, including: cleaning techniques, inspection for worn or deteriorated parts, replacements of those parts, changing cartridges and proper storage. Instruction in inspecting, donning and checking the respirator's fit. Instruction in qualitative and quantitative fit testing techniques and their purpose.

5.3.5. Instruction in recognition and coping with emergency situations.

5.3.6. Training (both initial and annual retraining) will include an opportunity to handle the respirator, test for proper face piece-to-face seal, wear it in normal air and to wear it in a challenge atmosphere (e. g. qualitative fit test.)

5.3.7. Discussion of these guidelines and the OSHA respiratory protection requirements found in 29 CFR 1910.134.

5.3.8. Testing upon completion of the training to demonstrate that training has been effective.

6. RESPIRATOR SELECTION

Note that in accordance with 29 CFR 1910.134 (c)(4) respirators, training, and medical evaluations shall be provided at no cost to the employee.

Additionally, the selection criteria noted below and within this section are general in nature. Each CHES location shall establish necessary specific work-site respiratory procedures in accordance with CHES procedures and 29 CFR 1910.134 (c)(1).

Each location shall establish a written respiratory program with worksite-specific procedures. The program shall be updated as necessary to reflect changes in workplace conditions that affect respirator use.

6.1. General Selection Criteria

6.1.1. Many factors must be considered in determining the appropriate respiratory equipment. These include:

A. certified equipment;

B. respirator limitations, including use in IDLH atmospheres, oxygen availability and air-purify cartridge limitations;

C. applicable exposure limits, exposure monitoring results and/or estimated airborne concentration of substances;

D. contaminant warning properties;

E. respirator protection factors;

F. hazardous, chemical, physical and toxicological properties;

G. worker capability to wear a respirator, including medical evaluation; and

H. effectiveness of device against substances of concern.

6.1.2. This selection section considers these factors. To assist in the proper selection of respirators, the NIOSH Respiratory Decision Logic is also incorporated in these guidelines and is located in Appendix 9.

6.1.3. Recommended respirator selections are based on the chemical, physical and toxicological properties of the contaminant and the limitations of each class of respirator, including filtration efficiency, oxygen concentration and face seal characteristics and leakage. Thus, the selection criteria noted in this program including this decision logic, are limited to identifying classes of acceptable respirators, rather than individual respirators.

6.1.4. After suitable classes of respirators are identified for a given situation, an evaluation is made of other factors of the particular work environment so that the best respirator can be selected. In some situations, the selection of a respirator classified as providing a higher level of protection may be advisable.

6.1.5. A sufficient number of respirator models and sizes must be made available to employees to ensure that each employee receives a proper fit and selects an appropriate respirator.

6.2. Selection Limitation

6.2.1. Although a respirator may be properly identified using these guidelines, an employee must not be allowed to use the respirator until he/she participates in all aspects of the Respiratory Protection Program Guidelines. Participation includes: training, medical evaluation, fit testing and proper cleaning, inspection, maintenance and storage. These elements are necessary to ensure employees receive the degree of protection anticipated from a respirator.

6.3. Certified Equipment

6.3.1. Only National Institute of Occupational Safety and Health (NIOSH)-certified respiratory equipment shall be worn. The certification is indicated by a "TC No. xxx" on the respiratory components or packaging.

6.3.2. Replacement of respirator components must only be made with appropriate parts from the same manufacturer. Respiratory approval will be voided if parts from different types or manufacturers are switched.

6.3.3. Should there be any question about whether a respirator or part is certified, contact the Health and Safety Department.

6.4. Respirator Limitations

6.4.1. Oxygen Deficiency

Air purifying respirators do not supply oxygen, and must never be used in an oxygen deficient atmosphere (less than 19.5% oxygen).

6.4.2. Maximum Use Concentrations

Air purifying respirator cartridges are rated for a maximum use, which is published by the manufacturer. Cartridges must never be used above these concentrations. Note that manufacturers may publish both "Routine Use" and "Escape Use" concentrations. Consult the specific manufacturer's data or contact the Health and Safety Department for questions.

6.4.3. IDLH Atmospheres

A. The only acceptable respirators for entry into IDLH atmospheres are full face piece pressure demand SCBA's (minimum service life of 30 minutes) or a combination full face piece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply (e.g. MSA Hip Air). If entry into an IDLH atmosphere is planned, the CHES Health and Safety Department must be contacted and provide approval.

B. Atmospheres containing greater than 10% of the Lower Explosive Limit (LEL) or atmospheres where oxygen concentration exceeds 22% shall never be entered. Contact the Health and Safety Department for guidance if either one of these situations is encountered.

6.4.4. Warning Properties

To use an air-purifying respirator, the substance being filtered must have adequate warning properties. Warning properties include a substances inherent ability to be detected by odor or taste, or to cause irritation. Manufacturer's data and MSDS can provide guidance or warning properties. Because of the variation in peoples' responses to substances and the variation with these warning properties, warning properties must never be used solely in selecting respiratory protection for air-purifying respirators. Cartridge change out schedules, as discussed in the following section, must be followed in order to provide adequate protection for CHES personnel.

6.4.5. Clean Harbors Action Levels

See Appendix 9 for guidelines for determining CHES Action Levels

6.5. Cartridge Change-Out Schedules for Air-Purifying Respirators

6.5.1. In order to ensure that employees receive the maximum protection from air-purifying cartridges, the cartridges must be changed out whenever there is an indication of breakthrough or problem. Also, a change-out schedule will be developed that takes into account the maximum service life of the respirator cartridge, a Health and Safety evaluation, and in accordance with the manufacturer’s recommendations. The information in this section provides general guidelines for establishing this schedule

6.5.2. In selecting a proper change out schedule, the following factors can affect the service life of the cartridge, and must be considered when determining when to change a respirator cartridge:

A. the concentrations of contaminants in the air;

B. patterns of respirator use (intermittent or continuous use;)

C. work/breathing rate; and

D. environmental factors (temperature and humidity).

6.5.3. Listed below are the basic guidelines to follow in determining the change out schedule for the air-purifying cartridges CHES currently uses – MSA Inc. brand cartridges. These guidelines will be periodically updated as new information is available, and whenever there is a change (e.g. respirator manufacturer type) requiring revaluation. If cartridges and respirators other than MSA are to be evaluated, contact Health and Safety to determine appropriate change out schedules for the cartridges. Any schedule developed and the information and data used to determine that schedule will be appended to these guidelines.

The guidelines listed below were based on the following sources: (1) "MSA Cartridge Change Test Program" MSA Inc. 1/5/99, (2) OSHA Directive CPL2-0.120, "Inspection Procedures for the Respiratory Protection Standard" (Sept. 25, 1998) and (3) "The Occupational Environmental Evaluation and Control" American Industrial Hygiene Association, chapter 36.

6.5.4. Powered Air Purifying Respirators (PAPR)

A. When PAPRs are worn, employees shall change filter/cartridge elements in accordance with the change-out schedule defined in separate section of this policy.

B. Use of PAPR requires corporate approval.

6.6. Guidelines

6.6.1. Any cartridge equipped with an End-Of-Service-Life Indicator (ESLI) shall be changed when that indicator shows the cartridge has expired (e.g. Mersorb MSA cartridge).

6.6.2. For other cartridges without ESLI's, cartridges must be changed according to the following general guidelines. Because of the variety of chemicals and tasks that CHES employees encounter on a regular basis, each project or task must be evaluated for service life times to ensure employees are provided the maximum protection. The manufacturer's testing data will be used in determining the appropriate change-out schedule. The basic procedure is included in Appendix 10, APR CARTRIDGE CHANGE OUT FORM. This form should be used to determine appropriate change out times, unless another H&S approved procedure is used.

6.6.3. As noted earlier, factors that must be considered include:

A. the concentration of contaminants in the air. Higher concentrations may result in shorter service lives. Also, mixtures of various chemicals may affect the service life;

B. work/breathing rate. Higher work rate may result in shorter service life;

C. humidity/temperature. Higher humidity and temperature may shorten the service life. Note that MSA reports that humidity tends to increase the service life of acid cartridges.

6.6.4. Some general rules of thumb that should be considered include:

A. service life is inversely proportional to work rate;

B. reducing concentration by a factor of ten will increase service life by a factor of five;

C. humidity above 85% will reduce service life by 50%.

6.6.5. Change Out Schedules

Cartridges must be changed out for:

A. Any indication of breakthrough (odor, taste, smell, irritation);

B. A noticeable increase in breathing resistance occurs. Note that for protection against particulates, CHES will typically use MSA P-100 cartridges. The use of other particulate cartridges may be appropriate, but must be approved by Health and Safety;

C. For certain specific chemicals, as noted below, the following regulatory change-out schedules must be followed:

1. Acrylonitrile 1910.1028(g)(2)(ii) - end-of-service life or end of shift (whichever comes first).
2. Benzene 1910.1028(g)(4)(i) - end-of-service life or beginning of shift in which they will be used (whichever comes first).
3. Butadiene 1910.1051(h)(2)(ii) - every 1, 2 or 4 hours dependent on concentration according to Table 1 shown below from 29 CFR 1910.1051 and at the beginning of each shift.

RESPIRATORY CARTRIDGE REPLACEMENT REQUIREMENTS FOR BUTADIENE		
BD Concentration or condition of use	Respirator Interval	Replacement Type
< or = 5 ppm	every 4 hours	half
< or = 10 ppm	every 3 hours	half
< or = 25 ppm	every 2 hours	full
< or = 50 ppm	every hour	full
> 50 ppm	supplied-air required	

4. Formaldehyde 1910.1048(g)(2)(ii) – for cartridges, every 3 hours or at the end of the shift (whichever is sooner). For canisters, every 2 or 4 hours according to the schedule in (g)(3)(iv).
5. Vinyl Chloride 1910.1017(g)(3)(ii) - end-of-service life or end of shift in which they are first used (whichever occurs first).
6. Methylene Chloride 1910.1052(g)(2)(ii) - cartridges cannot be used, canisters can only be used for escape use and must be replaced after use.

D. Other factors used in determining change out times:

1. If concentration exceeds 10X the PEL/TLV (whichever is less);
2. If task or chemicals change to a different compound or mixture deemed substantially different from original (discuss with H&S);
3. If situation involves a mixture;
4. If humidity level exceeds 70%;

E. A safety factor will be used for factors listed in D, above. The calculation procedure is listed in Appendix 10.

F. Cartridges may be used for a maximum time of one shift (again, within other aspects of these guidelines or that specified by an OSHA substance specific standard); or cartridges can be changed out in accordance with the site specific cartridge change out schedule approved by the appropriate HS manager.

G. Compound Specific Guidelines are found in MSA Substance Specific Guideline (access to this data can be obtained through MSA Website – www.msanet.com):

1. Acid Gases - e.g. chlorine, hydrogen chloride, hydrogen sulfide, sulfur dioxide.

2. Aldehydes - e.g. valeraldehyde, formaldehyde.
3. Aliphatic Primary Alcohols - e.g. 1-propanol.
4. Aliphatic Secondary Alcohols - e.g. 2-propanol.
5. Amines - e.g. methylamine.
6. Ammonia - e.g. ammonia.
7. Aromatic Hydrocarbons - toluene, xylene, chlorobenzene.
8. Chlorinated Hydrocarbons - e.g. 1, 2-dichloroethylene; 1, 2-dichloropropane; 1, 2-dichloroethane; trichloroethylene; 1, 1, 2-trichloroethance; 1, 2, 3-trichloropropane; carbon tetrachloride; perchloroethylene.
9. Cyclic Ethers - e.g. tetrahydrofuran.
10. Cyclic Saturated Hydrocarbons - e.g. cyclohexane.
11. Esters - e.g. isopropyl acetate; ethyl acetate; isopentyl acetate; pentyl acetate; butyl acetate; sec-butyl acetate; 2-ethoxyethly acetate; 2-methylethly acetate.
12. Ether Alcohols - e.g. 2-methoxyethanol.
13. Ethers - e.g. methyl tertiary-butyl ether.
14. Ketones - e.g. methyl ethyl ketone.
15. Saturated Aliphatic Hydrocarbons - e.g. hexane.
16. Unsaturated Hydrocarbons - e.g. hexene.

7. FITTING

7.1. Frequency

7.1.1. Fit testing for all tight fitting respirators shall be performed according to the following schedule (Health and Safety must be contacted if loose-fitting respirators are worn (e.g. Powered Air-Purifying Respirator (PAPR)):

A. prior to initial use of respirator;

B. whenever a different respirator facepiece (size, style, model or make) is used;

C. whenever employee reports or other CHES personnel note and report obvious visual changes in employee's physical condition that could affect fit (e.g. facial scarring or injury, dental changes, cosmetic injury or an obvious change in body weight (>20 lbs. since last fit test));

D. annually.

7.2. Record keeping

7.2.1. Completed quantitative and qualitative fit testing forms are included in Appendix 1 and 2. A separate form or its equivalent should be completed and signed for each fit test. For quantitative testing, the strip chart recording of the test shall be stapled to the form and kept.

7.2.2. A current (annual) copy of each employee's fit test record must be maintained by the facility General Manager/Project Manager or designee. The office location selected by each facility for storage of fit test records should be accessible and available for record's inspection and review. Records older than one year can be transferred to the employee's personal file, but must not be discarded.

7.2.3. The record will include:

A. name of test subject

B. date of testing

C. name of test conductor

D. respirators selected (indicate manufacturer, model and size)

E. testing agent

7.3. Fit-Check

Each time the respirator is donned, the user must perform a positive and negative pressure fit check. These checks are not a substitute for a fit test.

7.4. Negative Pressure Check

7.4.1. Applicability/Limitations: This test cannot be carried out on all respirators; however, it can be used on face pieces of air purifying respirators equipped with tight-fitting respirator inlet covers and an atmosphere-supplying respirator equipped with breathing tubes which can be squeezed or blocked at the inlet to prevent the passage.

7.4.2. Procedure: Close off the inlet opening of the respirator's cartridge(s) or filter(s) with the palm of the hand, or squeeze the breathing air tube or block its inlet so that it will not allow the passage of air. Inhale gently and hold for at least 10 seconds. If the face piece collapses slightly and no inward leakage of air into the face piece is detected, the test passes. If leakage is detected, reposition the face piece and try again. If fit check fails after several attempts, conduct a thorough inspection of the respirator and identify the cause of the leakage. Do not use the respirator if a leakage is detected.

7.5. Positive Pressure Checks

7.5.1. Applicability/Limitations: This check cannot be carried out on all respirators; however, respirators equipped with exhalation valves can and must be fit checked. For most wearers, the exhalation valve cover must be removed during the test in order to seal the valve. Ensure that it is replaced and is seated securely at the end of the test.

7.5.2. Procedure: Close off the exhalation valve or the breathing tube with the palm of the hand or something impenetrable, like a thin latex or nitrile glove. Exhale gently. If the respirator is positioned properly, a slight positive pressure will build up and can be maintained in the face piece without detection of any outward leak between the sealing surface of the face piece and the face. As with the negative pressure fit check, if leakage is detected, reposition the face piece and ensure an acceptable fit check is obtained before using the respirator.

7.6. Quantitative Fit Testing (QNFT)

CHES shall use only approved QNFT equipment. (Please check with the Health and Safety Manager for guidance.) One example of approved fit testing equipment is the TSI Portacount. The protocols for testing using this equipment are included in Appendix 1, Quantitative Fit Testing Instructions for the Portacount Plus (Model 8020).

7.7. Qualitative Fit Testing

7.7.1. Qualitative Fit Testing protocols are listed in Appendix 2, Qualitative Fit Testing Instructions.

7.7.2. Qualitative fit testing shall only be used to fit test half-face respirators - those that must achieve a fit factor of 100 or less, or full-face respirators where QNFT is not currently available. Until QNFT testing is done with the full-face respirators, the respirator can only be used to protect employees up to a concentration 10X the selected action level.

8. MAINTENANCE, CARE AND ISSUANCE OF RESPIRATORS

8.1. Cleaning and Sanitizing

8.1.1. Frequency

Employee issued respirator shall be cleaned and disinfected as frequently as necessary to ensure skin-penetrating and dermatitis-causing contaminants are removed. Respirators intended for everyday use or used by more that one person shall be cleaned as necessary after each use.

8.1.2. Procedures

A. Remove any cartridges and place to the side.

B. Immerse the respirator in a mild cleaner/sanitizer (e.g. Ivory Soap or MSA cleaner-sanitizer). Water temperature should be no greater than 120 degrees Fahrenheit.

C. Remove any heavy soil using a brush (nylon or hair bristles).

D. As necessary, disassemble the respirator while it is submerged. Remove gaskets, valve covers, valves, steps.

E. Scrub the face-piece with the brush.

F. Clean disassembled parts with hands.

G. Thoroughly rinse the face piece and parts with clean water. Ensure no cleaner or disinfectant remains on the face piece.

H. Rinse thoroughly with clean water.

I. Hand wipe the respirator and parts with lint-free cloth as needed to remove water residue.

J. Visually inspect parts and replace any parts, which are defective.

K. Reassemble the respirator.

L. Clean the filter cartridges with a wet cloth.

M. Permit assembled respirator to air dry on a clean surface such as a disposable paper towel. If rapid drying is necessary, use a lint free cloth or towel.

N. Once the respirator is cleaned, sanitized and dry, place it in the original bag or an appropriate storage bag and then a box of sufficient size so as not distort the face-piece.

8.2. Inspection and Maintenance

8.2.1. Frequency

INSPECTION FREQUENCY		
	BEFORE & AFTER	MONTHLY
1 AIR PURIFYING	XXX	
2 AIR SUPPLYING	XXX	XXX
3 SCBA	XXX	XXX
4 EMERGENCY USE ANY TYPE	XXX	XXX

8.3. Storage

8.3.1. Procedures - Air-Purifying

A. After respirators are cleaned, inspected and repaired (where appropriate), the respirators shall be placed in a zip-lock plastic bag, or its equivalent.

B. The bagged respirator shall then be placed with the yoke (most all have yokes) facing downward in the original cardboard or a carton of sufficient size to avoid any distortion of the respirator's original configuration.

C. The respirator may then be stored in the spill bag, employee locker, etc.

D. The respirator must not be stored only in a zip-lock type bag and then in a spill bag. This may result in reduced respirator effectiveness, contamination or a damaged respirator.

8.3.2. Self-Contained Breathing Apparatus (SCBA) and Air Line Respirators

A. After cleaning, inspection and/or repair, the unit shall be placed into its storage/carrying case so as to avoid damaging or disturbing the unit parts.

B. Cylinders shall never be exposed to temperatures exceeding 125 degrees Fahrenheit.

C. Before the unit is placed in the case, ensure the following:

1. cylinder refilled as necessary and unit cleaned and inspected;

2. cylinder valve closed;

3. high-pressure hose connector tight on cylinder;

4. pressure bled off of high-pressure hose and regulator;

5. by-pass valve closed;

6. main line valve closed;

7. all straps completely loosened and laid straight;

8. face-piece properly cleaned and stored to protect against dust, direct sunlight, extreme temperatures, excessive moisture and damaging chemicals.

8.4. Compressor-Supplied Breathing Air

8.4.1. All compressors used for supplying breathing air shall be equipped with the following safety and standby devices.

A. The compressor intake shall be located to ensure that only uncontaminated air is admitted. Attention must be applied to the location of the compressor intake with respect to compressor engine exhaust, vehicle engine exhaust, and chemical storage areas.

B. Alarms to indicate compressor failure (such as low-pressure air horns, etc.) shall be installed in the system.

C. If an oil-lubricated compressor is used to supply breathing air, it shall be equipped with both of the following devices:

1. Continuous reading carbon monoxide monitoring system set to alarm should the carbon monoxide concentration exceed 10 ppm; and

2. High temperature alarm, which will activate when the discharge air exceeds 110% of the normal operating temperature.

D. An in-line purifying assembly to remove oil, condensed water, particulates, odors and organic vapors shall be used in conjunction with the air compressor.

E. Air quality test should be performed according to the manufacturer’s recommendations.

F. Routine inspection and maintenance of air compressors shall be performed according to the manufacturer’s recommendations.

9. MEDICAL CONSIDERATION

9.1. Health and Safety Department

9.1.1. Will manage program to ensure that each respirators user's medical status is evaluated annually or on a schedule called for by CHES’ Medical Provider;

9.1.2. Notify divisions if the employee can no longer wear respiratory protection;

9.1.3. Choose the consulting physician;

9.1.4. Provide necessary additional information to the physician or medical provider that is required for the physician to make a determination of the employee's ability to use a respirator. This information includes, but is not necessarily limited to the following:

A. type and weight of respirators to be used;

B. duration and frequency of respirator use;

C. expected physical work effort;

D. additional protective clothing to be worn during respirator use;

E. temperature and humidity extremes that may be encountered.

9.2. Consulting Physician

9.2.1. Will determine appropriate physical and psychological conditions that are pertinent for the wearing of respiratory protection.

9.2.2. Performs medical evaluations.

9.2.3. Reports findings to the Health and Safety Department and to designated CHES Operations and/or Administrative Personnel, including written recommendations regarding employee's ability to use a respirator.

9.3. Frequency

Employee's fitness for respirator use will be evaluated initially for all new employees in the respirator program and thereafter on a schedule determined by the CHES Medical Provider.

9.4. Additional Medical Evaluations

9.4.1. Additional evaluations must be performed if:

A. Employee reports medical signs or symptoms related to the ability to wear a respirator;

B. Anytime CHES' Program Administrator, Health and Safety Department or Supervisor informs an employee that revaluation is necessary;

C. Information from fit testing or program evaluation indicates a need for employee revaluation;

D. Change in workplace conditions (e.g. physical work effort, temperatures encountered and ppe use), which may result in an increase in physiological stress on employee during respirator use.

9.5. Medical Evaluation Procedures

9.5.1. Potential employees and employees shall be sent to CHES' Medical Provider as designated by the Health and Safety Department.

9.5.2. Medical provider will administer medical questionnaire (as found in 29 CFR 1910.134, Appendix C, Sections 1 and 2, Part A or equivalent) and examination.

A. The questionnaire or its equivalent and examination must be administered confidentially during employee's normal working hours or at another convenient time for the employee.

B. The employee will be provided an opportunity to discuss the results of the questionnaire or its equivalent, and examination with the medical provider.

9.5.3. Medical provider will provide to the Health and Safety Department, the employee, and other designated CHES personnel (by Health and Safety Department) a written recommendation regarding employee's respirator use.

9.6. Recordkeeping

9.5.1. The Corporate Medical Surveillance provider retained by CHES retains records of all medical evaluations associated with qualifying employees to wear respiratory protection. These records, including results of all physical examinations are available through Health Resources, Woburn, MA our Medical Surveillance provider, and can be made available ion accordance with 29 CFR 1910.1020.

10. SPECIAL CONSIDERATIONS

10.1. Facial Hair

10.1.1. As a condition of employment, affected employees shall be required to be clean shaven on a daily basis.

10.1.2. Obstructions to the face-to-facepiece seal of a donned respirator are not permitted. Facial hair that comes between the sealing surface of the facepiece and the face, or that interferes with the valve function, is not permitted.

10.1.3. Candidates for employment at CHES shall be made aware that their versatility may be limited and that this can affect their job assignments. As a consequence, an individual's attitude should be assessed regarding the removal of gas-tight face seal obstructions prior to employment.

10.2. Dentures

Partial of full dentures can be worn with respirators, subject to certain restrictions:

10.2.1. Full and partial dentures present few problems and should be worn because the jaw may distort without them, causing leakage in the chin area.

10.2.2. If the employee is assigned a respirator on the basis of fit while wearing dentures, those dentures must be worn while wearing the respirator under normal use conditions.

10.3. Prescription Glasses

Prescription glasses or safety glasses may be worn with half-mask respirators. Glasses with standard temple bars shall not be worn with a full-face respirator. If the employee uses prescription glasses and a full-face respirator is worn, a special insert must be worn. The lenses will be provided under the Clean Harbors' Basic Personal Protective Equipment Policies found within the General Policies and Procedures.

10.4. Contact Lenses

The use of contact lenses in atmospheres containing toxic substances, irritant gases, vapors or aerosols constitutes special problems; therefore, contact lenses are not permitted when respirators are in use.

10.5. Head Protection

Protective headgear may be worn while wearing respiratory protection equipment only if the head protection does not interfere with the normal operation of the respirator. The head protection shall be placed over the respirator straps, not between the straps and the head.

10.6. Scars

Facial scars may alter the fit of a respirator. An employee who develops a facial scar after fitting must be re-tested to assure a satisfactory fit can be achieved. The employee is responsible for notifying the Supervisor or Health and Safety Representative should a facial scar develop and fit testing has not been conducted with the changes.

10.7. Low Temperatures

10.7.1. Low temperatures may fog respirator lenses. Coating the inner surface of the lens with the anti-fogging compound should prevent fogging down to 32 degrees Fahrenheit, but severe fogging may occur below 0 degrees Fahrenheit. Full face pieces with nose cups that direct the warm, moist exhaled air through the exhalation valve without its touching the lens, are effective in reducing lenses fogging and should be worn for temperatures below 32 degrees Fahrenheit. They should provide satisfactory vision at as low as -30 degrees Fahrenheit. At very low temperatures, exhalation valves may freeze due to moisture.

10.7.2. NIOSH performs cold temperature testing on SCBAs. The minimum temperature that the SCBA has been tested to and approved for is listed on the approval label.

10.8. Breathing Air Quality

10.8.1. The quality of air supplied to an air-supplied respirator is required to meet Grade "D" or higher quality as set forth by the Compressed Gas Association Commodity Specifications for Air G-7.1-1997. (See Appendix 7.)

10.8.2. Each office using cylinders of compressed air shall obtain annually a certificate from the supplier of their cylinders or breathing air indicating that the breathing air meets requirements for Type 1-Grade D air. See Appendix 7 for an example of a form that can be used for this certification. (This form or an equivalent can be used.)

10.9. Compressed Air Cylinders

10.9.1. Cylinders used for either SCBAs or cascade systems must only be filled with Grade "D" or higher quality air.

10.9.2. Each office shall ensure that the cylinders are tested and maintained as prescribed in the Shipping Regulations of the Department of Transportation (49CFR parts 173 and 176).

10.9.3. If any cylinders are filled with air by systems at CHES offices, those filling (compressor) systems must follow the requirements specified in 29 CFR 1910.134, Section (i).

10.9.4. Cylinders shall never be exposed to temperatures exceeding 125 degrees Fahrenheit.

10.10. Breathing Air Generators

10.10.1. In situations where CHES generates it's own breathing air, the quality of air must be determined quarterly. Several sources are available to determine breathing air quality. Contact the Health and Safety Department for appropriate references.

10.10.2. Additional requirements apply when a compressor for supplying air are used. Prior to the purchase, installation and operation of any such unit, the Health and Safety Department must be contacted. The Health and Safety Department will designate personnel responsible to operate this equipment.

10.11. Air-Line Hose Length Limitations

10.11.1. Airline hoses can only be connected with threaded or locking-type connections (per manufacturer's instructions). Quick-type connections must never be used as they can disconnect inadvertently during use and are not approved for this use.

10.11.2. NIOSH limits the length of hose for airline (cascade) systems to a maximum of 300 feet. This limitation must not be exceeded.

10.12. Cascade System Audi-Alarm

Each cascade unit must be equipped with an alarm warning users of low air pressure. The Audi-Alarm must be in a location where it can be heard by personnel using the cascade system or by a designated air-bottle watcher. This designated employee must be in a position to provide aid as needed to the personnel on the cascade system.

10.13. Procedures for Respirator Use in IDLH Atmosphere

10.13.1. Where respirators are used in known or suspected IDLH atmospheres, the following conditions apply:

A. Approval for entry must be given by Health and Safety:

B. At least one standby employee is located outside the IDLH atmosphere. The site supervisor, in conjunction with Health and Safety, shall make the determination of how many personnel are required for standby roles;

C. Visual, voice, or signal line communication must be maintained between personnel inside and those outside the IDLH atmosphere;

D. All personnel must be trained and capable of emergency rescue;

E. Standby personnel must be equipped with 1) positive pressure SCBA(s), or positive pressure SAR(s) equipped with an auxiliary SCBA (e.g. MSA Hip Air), and 2) Retrieval or equivalent means for rescue of the employee(s) in the IDLH. The equipment and/or means must be appropriate to the situation and must not increase the overall risk resulting from entry.

10.14. Continuing Respirator Effectiveness

10.14.1. The General Manager/Project manager or their designee shall be responsible to ensure that adequate surveillance of respiratory protection users is maintained and that changes in wok area conditions and degree of employee exposure or stress are evaluated. When there is a change in work area conditions or degree of employee exposure or stress that may affect respirator effectiveness, the employer shall reevaluate the continued effectiveness of the respirator.

10.14.2. The General Manager/Project manager or their designee shall ensure that employees are permitted and able to lave the respirator use area when:

A. It is necessary to wash their faces and respirator face pieces as to prevent eye or skin irritation associated with respirator use; or

B. The employee detects vapor or gas break-through, changes in breathing resistance, or leakage of the face piece; or

C. It is necessary to replace the respirator or the filter, cartridge, or canister elements.

10.14.3. If the employee detects vapor or gas breakthrough, changes in breathing resistance, or leakage of the face piece, the employer must replace or repair the respirator before allowing the employee to return to the work area.

APPENDIX 1: Quantitative Fit Test Instructions for the Port Account Plus (Model 8020)

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IMPORTANT NOTES:

Respirator Face piece: Use the employee's assigned face piece(s) with the MSA Portacount adapter. This adapter is attached to one of the respirator cartridge holders. A HEPA or P-100 cartridge is then attached to the adapter. Ensure face piece is clean and dry. Disinfect after each test.

Cigarette Smokers: Wait at least 30 minutes after last cigarette. Smokers exhale particles for at least 30 minutes after they have smoked a cigarette. The Portacount will count these as if they were caused by face seal leakage.

Isopropyl Alcohol: REMOVE alcohol cartridge before shipping and storage. Flooding of the Portacount optics can occur.

Respirator Cartridges: Dust accumulated on old filters can interfere with the test and can give low fit factors. Replace the filters if necessary (e.g. low fit factors are seen).

Portacount Mode of Operation: The Portacount compares the amount of particles in the ambient room air to the number of particles inside the respirator face piece. Particles with diameters as small as 0.02 microns are detected. Isopropyl alcohol is used to enlarge small particle size so they consistently can be detected by an optical sensor.

QUANTITATIVE FIT TEST INSTRUCTIONS FOR THE PORTACOUNT FIT TESTER

I. SET UP

1. CONNECT PRINTER AND ELECTRIC CORD.

   Use batteries if you are in a mobile trailer.

2. INSERT ALCOHOL CARTRIDGE (Blue Top).

   Cartridge needs to be refilled after 30 hours of use.

3. CHECK FIT TEST SETTINGS:

   A. Exercise Duration

      1. Turn on Portacount. (There is a 60 second warm-up).
      2. Immediately turn the printer on.
      3. A printout will be produced with the current settings.
      4. Each mask sample must be 60 seconds. (This cannot be changed without software).

   B. Number of Exercises (8)

      1. Press the "No. of Exer" key to display setting.
      2. To change, press and hold key to scroll through settings.
      3. Release key at desired number (8).
      4. Eight exercises are required for OSHA Compliance.

C. Fit Factor Pass Level (Full face=500; Half face=100)

1. Press the "Pass Level" key to display setting.
2. To scroll through choices, press and hold key.
3. Release key at desired number.
4. Full-face respirator = 500; Half-face =100.

YOU ARE NOW READY FOR FIELD CALIBRATION!

II. FIELD CALIBRATION

A. Zero Check

1. Press "Count" key.
2. A particle count will be displayed for ambient air.
3. Normal particle count is in the range of 3,000 - 50,000.
4. Attach HEPA filter cylinder to sample (clear) tygon tube.
5. Particle count should drop to zero in less than 30 seconds.

B. Maximum Fit Factor Check

1. Zero check performed above must pass.
2. Press "Fit Test" key.
3. Attach HEPA filter cylinder to sample (clear) tygon tube.
4. Press "Start/Stop Test" key to begin a fit test.
5. At the completion of one fit test exercise (80 seconds), a fit factor will be displayed at the completion of each test exercise.
6. Fit factor should be greater than 50,000.
7. If fit factor is greater than 50,000 – press "Start/Stop Test" key to end test.
8. If factor is less than 50,000, continue test through exercise 2. If fit factor remains too low, consult manual for troubleshooting information.

YOU ARE NOW READY TO CONDUCT FIT TESTS!

III. QUANTITATIVE FIT TESTING

A. Adapt Face piece for Quantitative Testing

1. Attach MSA Quik Check Adapter to one of the inhalation cups of the face piece. Unit must be snug, with the probe extending through the inhalation valve and into the face piece.
2. Attach MSA Quik Check Adapter to Portacount sample tube (clear tygon tube).

B. Donning and Fit Check:

Ensure cartridges are high-efficiency or P-100 filters (or combination cartridges containing these filters). The test subject shall conduct a positive pressure and negative pressure fit test on the respirator. Employee should don respirator at least five minutes before fit testing begins. Fit checking can be included in this time. Employee and tester should also check placement of chin, adequate strap tension (not overly tightened), fit across nose bridge, respirator is of proper size to span distance from nose to chin, and tendency of respirator to slip.

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C. Printer:

Ensure printer is on and recording the fit test results.

D. Perform Fit Test:

Press "Fit Test" key. Then press "Start/Stop Test" key.

Begin Exercises:

1. Normal Breathing
2. Deep Breathing
3. Turn Head Side to Side. Take a breath at each shoulder.
4. Move Head Up and Down.
5. Talk
6. Grimace
7. Bend at Waist and Touch toes Repeatedly
8. Normal Breathing.

E. Test Results:

At the end of each exercise, a fit factor will be displayed. The overall (average of 7 exercises) fit factor determines if the person passes or fails. If a person fails more than one exercise, it is most efficient to stop the test immediately, examine reasons for failure, and begin a new test. At the end of the testing, detach print out results and attach printed results to completed form included in this Appendix.

The test results measured for the grimace exercise are not to be used in calculating the average test agent concentration inside the respirator. The purpose of the grimace exercise is to determine whether the respirator being fit tested will reseat itself on the face after the respirator seal is stresses during the exercise. With a properly fitting respirator, the test instrumentation should record a rise in test agent concentration inside the mask during the grimace exercise, and a drop in test agent concentration when the respirator reseats itself.

IV. EXPLANATION OF EXERCISES

1. NORMAL BREATHING

Breathe normally in a standing position, without talking.

2. DEEP BREATHING

Breathe slowly and deeply, as if doing heavy work.

3. TURN HEAD SIDE TO SIDE

Turn far enough to each side to stretch the neck muscles. Take a deep breath at each shoulder.

4. MOVE HEAD UP AND DOWN

Slowly move head up and down, looking at the ceiling and the floor. Take a deep breath in the up position (looking at the ceiling).

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5. TALKING

   Talk slowly and loudly. If the subject is at a loss for words, count backwards from 100, or read the Rainbow Passage.

6. GRIMACE

   Grimace by smiling or frowning, as if doing heavy work.

7. BENDING OVER

   Bend at the waist and touch the toes. Repeat.

8. NORMAL BREATHING

   Breathe normally in a standing position.

V. SHUTTING EQUIPMENT DOWN

1. TURN PORTACOUNT OFF.

   Press "ON/OFF" key. Display should disappear.

2. REMOVE ALCOHOL CARTRIDGE.

   Remove alcohol cartridge and return it to the carrying cylinder. Cover the cartridge port with the Storage Cap.

3. UNHOOK THE PRINTER AND THE ELECTRIC CORDS.

4. RECHARGE THE BATTERIES, IF NECESSARY.

   Each battery has 3 hours of service life.

5. RETURN ALL ITEMS AND THE MANUAL TO THE CARRY CASE.

VI. TROUBLESHOOTING

1. RESPIRATOR CARTRIDGES - HEPA OR P-100 FILTERS

   A. Use fresh cartridges as necessary (dust on the bottom of the cartridge can enter the face piece and interfere with the test).

   B. Combo cartridges can be used, but single HEPA or P-100 filters are better.

   C. Make sure the cartridges are tight and the gaskets are in position.

2. CLEAN RESPIRATOR FACEPIECE

   A. Dust inside the mask will interfere with the test.

3. CIGARETTE SMOKERS - WAIT 30 MINUTES

   A. Smokers exhale particles for at least 30 minutes after they have smoked a cigarette. The portacount counts these particles as if they were caused by face seal leakage.

4. ALCOHOL CARTRIDGE

   A. Cartridge of isopropyl alcohol is empty or not inserted.

   B. Do not use pharmacy grade isopropyl alcohol! This will damage the particle counter.

5. DAMAGED SAMPLE (TYGON) TUBE

   A. Plug tube with the tip of the finger to detect leaks.

   B. Portacount is calibrated with specific length of tube - do not lengthen!

   C. Make sure the correct tube (clear) is attached to the respirator.

6. Respirator must be very clean, disassemble all parts for a thorough cleaning or replace the mask if in question.

7. Do not dry the mask with a paper towel or cloth, the instrument will pick up residue particles. Utilize respirator wipes for the final cleaning.

8. Facial hair severely affects results, employees must be clean-. Mustaches should be trimmed.

9. Inhalation valves should seat properly, replace if warped, disfigured or in question.

10. Make sure clear tube is properly seated in the Quik Check Adaptor. Do not shorten any of the tubes.

11. Warping of older masks around the face piece may cause small leaks that are undetectable during routine positive or negative fit testing. If the face piece is shiny, bulging or deformed (a common sign of improper storage or decontamination) a replacement mask may be necessary.

12. Have several sizes of masks available during testing, individual facial bone structure will affect the overall fit factor of a mask.

13. If low fit factors are seen consistently, use new HEPA or P-100 filter cartridges. Old cartridges can release small particulates into the face piece, affecting the fit test results.

14. Before conducting a test, check the interior concentration of the mask. Generally, particulate range should be below 100 particulates/cm3 in order to pass.

APPENDIX 2: Qualitative Fit Testing Instructions

Page 1 of 8.

I. RESPIRATOR SELECTION

A. The test subject must be allowed to select from a sufficient number of respirators (models and sizes) so that the respirator is acceptable to, and correctly fits, the user.

B. The selection process shall be conducted in a room or area separate from the fit-test room or area to prevent olfactory fatigue. Prior to the selection process, the test subject shall be shown (or already be familiar with) how to don the respirator, how it should be positioned on the face, how to set strap tension and how to assess a "comfortable" respirator. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This does not constitute the review.

C. The test subject should understand that he/she is being asked to select the respirator that provides the most comfortable fit for him/her. The respirator, if fit properly, will provide adequate protection.

D. The test subject holds each face-piece up to the face and eliminates those, which are obviously not giving a comfortable fit.

E. The most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in F below. If the test subject is not familiar with using a particular respirator, the employee shall be directed to don the mask several times and to adjust the straps each time, so that he/she becomes adept at setting proper tension on the straps.

F. Assessment of comfort shall include reviewing the following points with the test subject.

1. chin properly placed
2. positioning of mask on nose
3. strap tension
4. fit across nose bridge
5. room for safety glasses
6. distance from nose to chin
7. room to talk
8. tendency to slip
9. cheeks filled out
10. self-observation in mirror
11. adequate time for assessment

G. The tests shall not be conducted if there is any hair growth between the skin and the face piece sealing surface (beard stubble, beard, mustache, sideburns which crown the respirator sealing surface). Any type of apparel that interferes with a satisfactory fit (e.g. glasses, temple bars) shall be removed or altered so it does not interfere. See Appendix 3 for a sketch of acceptable and unacceptable hair growth.

H. The test subject shall conduct the conventional negative and positive-pressure fit checks (see Section 7.0 of the guidelines). Before conducting the negative or positive pressure checks, the subject shall be told to "seat" the mask by rapidly moving the head side-to-side and up and down, taking deep breaths.

I. The test subject is now ready for fit testing.

J. After passing the fit test, the test subject shall be questioned again regarding the comfort of the respirator. If it has become uncomfortable, another model of respirator shall be tried.

K. The employee shall be given the opportunity to select a different face-piece and be re-tested if during the first two weeks of on-the-job wear, the chosen face-piece becomes unacceptably uncomfortable.

II. IRRITANT FUME PROTOCOL

A. FIT TEST

1. The test subject shall be allowed to smell a weak concentration of the irritant smoke to familiarize the subject with the characteristic odor.

2. The test subject shall properly don the selected respirator and wear it for at least 5 minutes before starting the fit test.

3. The test subject shall perform the conventional positive pressure and negative pressure fit checks. Failure of either check shall be cause to select an alternate respirator.

4. Break both ends of a ventilation smoke tube containing stannic oxychloride, such as the MSA part #5645, or equivalent. Only stannic oxychloride (or stannic chloride) tubes shall be used. Attach a short length of tubing to one end of the smoke tube to protect employees from the jagged edge. Attach the other end of the smoke tube to a low-pressure air pump set to deliver 200 milliliters per minute, or a hand-operated aspirator bulb.

5. Advise the test subject that the smoke can be irritating to the eyes and instruct the subject to keep the eyes closed while the test is performed, unless a full-face piece mask is worn.

6. No form of test enclosure or hood shall be used. Conduct the testing in a room or area with adequate ventilation to prevent exposure to the tester, or build up of smoke in the room.

7. The test conductor shall direct the stream of irritant smoke from the tube towards the face seal area of the test subject. The person conducting the test shall begin with the tube at least 12 inches from the face piece and gradually move to within one inch moving around the whole perimeter of the mask.

8. The test subject shall be instructed to do the following exercises while the smoke is challenging the respirator. Each exercise shall be performed for one minute.

   a. Breathe normally.

   b. Breathe deeply. Be certain breaths are deep and regular.

   c. Turn head all the way from one side to the other. Be certain movement is complete. Inhale on each side. Do not bump the respirator against the shoulders.

   d. Nod head up-and-down. Be certain motions are complete and made approximately every second. Inhale when head is in the full up position (looking toward the ceiling). Do not bump the respirator against the chest.

   e. Talking. Talking aloud and slowly for several minutes. The following paragraph is called the Rainbow Passage. Repeating it after the test conductor (keeping eyes closed) will result in a wide range of facial movements, and thus be useful to satisfy this requirement. Alternative passages, which serve the same purpose, may also be used. For example, if the eyes must stay closed, count backwards from 100.

Rainbow Passage:

When sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

f. Bending over or jogging in place.

g. Breathe normally.

9. The test subject shall indicate to the test conductor that irritant smoke is detected. If smoke is detected, the test conductor shall stop the test. In this case, the tested respirator is rejected and another respirator shall be selected.

10. Each test subject passing the smoke test (i.e. without detecting the smoke) shall be given a sensitivity check of smoke from the same tube to determine if the test subject reacts to the smoke. Failure to evoke a response shall void the fit test.

11. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to an occupational physician to determine whether the test subject can wear a respirator while performing her or his duties.

III. ISOAMYL ACETATE PROTOCOL

A. ODOR THRESHOLD SCREENING

1. Three 1-liter glass jars with metal lids (e.g. Mason or Bell jars) are required.

2. Odor-free (e.g. distilled or spring water) at approximately 25 degrees Celsius (77 degrees Fahrenheit) shall be used for the solutions.

3. The isoamyl acetate (IAA) (also known as isopentyl acetate or banana oil) stock solution is prepared by adding 1 cc pure IAA to 800 cc of odor-free water in a 1-liter jar and shaking for 30 seconds. This solution shall be prepared new at least weekly.

4. The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well ventilated but shall not be connected to the same recirculating ventilation system.

5. The odor test solution is prepared in a second jar by placing 0.4 cc of the stock solution into 500 cc of odor free water using a clean dropper or pipette. Shake for 30 seconds and allow to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution may be used for only one day.

6. A test blank is prepared in a third jar by adding 500 cc of odor-free water.

7. The odor-test and test-blank jars shall be labeled 1 and 2 for jar identification. If the labels are put on the lids, they can be periodically peeled, dried off and switched to maintain the integrity of the test.

8. The following instructions shall be typed on a card and placed on the table in front of the two test jars (i.e. 1 and 2): "The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds.

9. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil.

10. The mixtures used in the IAA odor detection test shall be prepared in an area separate form where the test is performed, in order to prevent olfactory fatigue in the subject.

11. If the test subject in unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test may not be used.

12. If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit testing.

B. FIT TEST

1. The fit test chamber shall be similar to a clear 55 gallon drum liner suspended inverted over a 2 foot diameter frame, so that the top of the chamber is about 6 inches above the test subject's head. The inside top center of the chamber shall have a small hook attached.

2. Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors. The cartridges or masks shall be changed at least weekly.

3. After selection, donning and properly adjusting a respirator, the test subject shall wear it to the fit testing room. This room shall be separated from the room used for odor threshold screening and respirator selection, and shall be well ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.

4. A copy of the following test exercises and rainbow passage shall be taped to the inside of the test chamber:

   Test exercises - each exercise shall be performed for one minute:

   a. Breathe normally;

   b. Breathe deeply. Be certain breaths are deep and regular;

   c. Turn head all the way from one side to the other. Inhale on each side. Be certain movement is complete. Do not bump the respirator against the shoulders;

   d. Nod head up-and-down. Inhale when head is in full up position (looking toward ceiling). Be certain motions are complete and made about every second. Do not bump the respirator on the chest.

e. Talking: Talk aloud and slowly for several minutes. The following paragraph is called the Rainbow Passage. Reading it will result in a wide range of facial movements, and thus be useful to satisfy this requirement. Alternative passages (including counting backwards from 100), which serve the same purpose, may also be used.

Rainbow Passage:

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

f. Bending over or jogging in place.

5. Upon entering the test chamber, the test subject should be given a 6-inch by 5-inch piece of paper towel or other porous absorbent single-ply material, folded in half and wetted with three-quarters of one cc of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber.

6. Allow two minutes for the IAA test concentration to be reached before starting the fit-test exercises. This would be an appropriate time to talk with the test subject, to explain the fit test, the importance of cooperation, the purpose for the head exercises or to demonstrate some of the exercises.

7. Each exercise described in #4 above shall be performed for at least one minute.

8. If at any time during the test, the subject detects the banana-like odor of IAA, the test has failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

9. If the test is failed, the subject shall return to the selection room and remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber, and again begin the procedure described above. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait about 5 minutes before resting. Odor sensitivity will usually have returned by this time.

10. When a respirator is found that passes the test, the subject breaks the face seal and takes a breath before exiting the chamber. This is to assure that the reason the test subject does not smell the IAA is the good fit of the respirator face piece seal and not olfactory fatigue.

11. When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test. To keep the area from becoming contaminated, the used towels shall be kept in a self-sealing bag so there is no significant IAA concentration build-up in the test chamber during subsequent tests.

12. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to an occupational physician to determine whether the test subject can wear a respirator while performing her or his duties.

IV. SACCHARIN SOLUTION AEROSOL PROTOCOL

A. TASTE THRESHOLD SCREENING

1. An enclosure about the head and shoulders shall be used for threshold screening (to determine if the individual can taste saccharin) and for fit testing. The enclosure shall be approximately 12-inches in diameter by 14-inches tall with at least the front clear to allow free movement of the head when a respirator is worn.

2. The test enclosure shall have a three-quarter inch hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

3. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

4. During the threshold-screening test, the test subject shall don the test enclosure and breathe with open mouth with tongue extended.

5. Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the threshold check solution into the enclosure, away from the nose and mouth of the test subject. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

6. The threshold check solution consists of 0.83 grams of sodium saccharin, USP, in water. It can be prepared by putting 1 cc of the test solution in 100 cc of water.

7. To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then is released and allowed to fully expand.

8. Ten squeezes of the nebulizer bulb are repeated rapidly and then the test subject is asked whether the saccharin can be tasted.

9. If the first response is negative, ten more squeezes of the nebulizer bulb are repeated rapidly and the test subject is again asked whether the saccharin can be tasted.

10. If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin can be tasted.

11. The test conductor will take note of the number of squeezes required to elicit a taste response.

12. If the saccharin is not tasted after 30 squeezes (Step 10), the saccharin fit test cannot be performed on the test subject.

13. If a taste is elicited, the test subject shall be asked to make note of the taste for reference in the fit test.

14. Correct use of the nebulizer means that approximately 1 cc of liquid is used at a time in the nebulizer body.

15. The nebulizer shall be thoroughly rinsed in water, shaken dry and refilled at least every four hours.

B. FIT TEST

1. The test subject shall don and adjust the respirator without the assistance from any person.

2. The fit test uses the same enclosure described above.

3. Each test subject shall wear the respirator for at least 5 minutes before starting the fit test.

4. The test subject shall enter the enclosure while wearing the respirator selected. This respirator shall be properly adjusted and equipped with a HEPA or P-100 filter.

5. The test subject may not eat, drink (except plain water) or chew gum for 15 minutes before the test.

6. A second DeVilbiss Model 40 Inhalation Medication Nebulizer is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

7. The fit test solution is prepared by adding 83 grams of sodium saccharin to 100 cc of warm water.

8. As before, the test subject shall breathe with mouth open and the tongue extended.

9. The nebulizer is inserted into the hole in the front of the enclosure and the fit test solution is sprayed into the enclosure using the same technique as for the taste threshold screening and the same number of squeezes (See A-8 through A-10 above.)

10. After generation of the aerosol, read the following instructions to the test subject for one minute each.

    a. Breathe normally.

    b. Breathe deeply. Be certain breaths are deep and regular.

    c. Turn head all the way from one side to the other. Be certain movement is complete. Inhale on each side. Do not bump the respirator against the shoulders.

    d. Nod the head up-and-down. Be certain Motions are complete. Inhale when head is in the full up position (when looking toward the ceiling). Do not bump the respirator on the chest.

    e. Talking. Talk aloud and slowly for several minutes. The following paragraph is called the Rainbow Passage. Reading it will result in a wide range of facial movements, and thus be useful to satisfy this requirement. Alternative passages, which serve the same purpose, may also be used.

       When sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

    f. Jogging in place.

   g. Breathe normally.

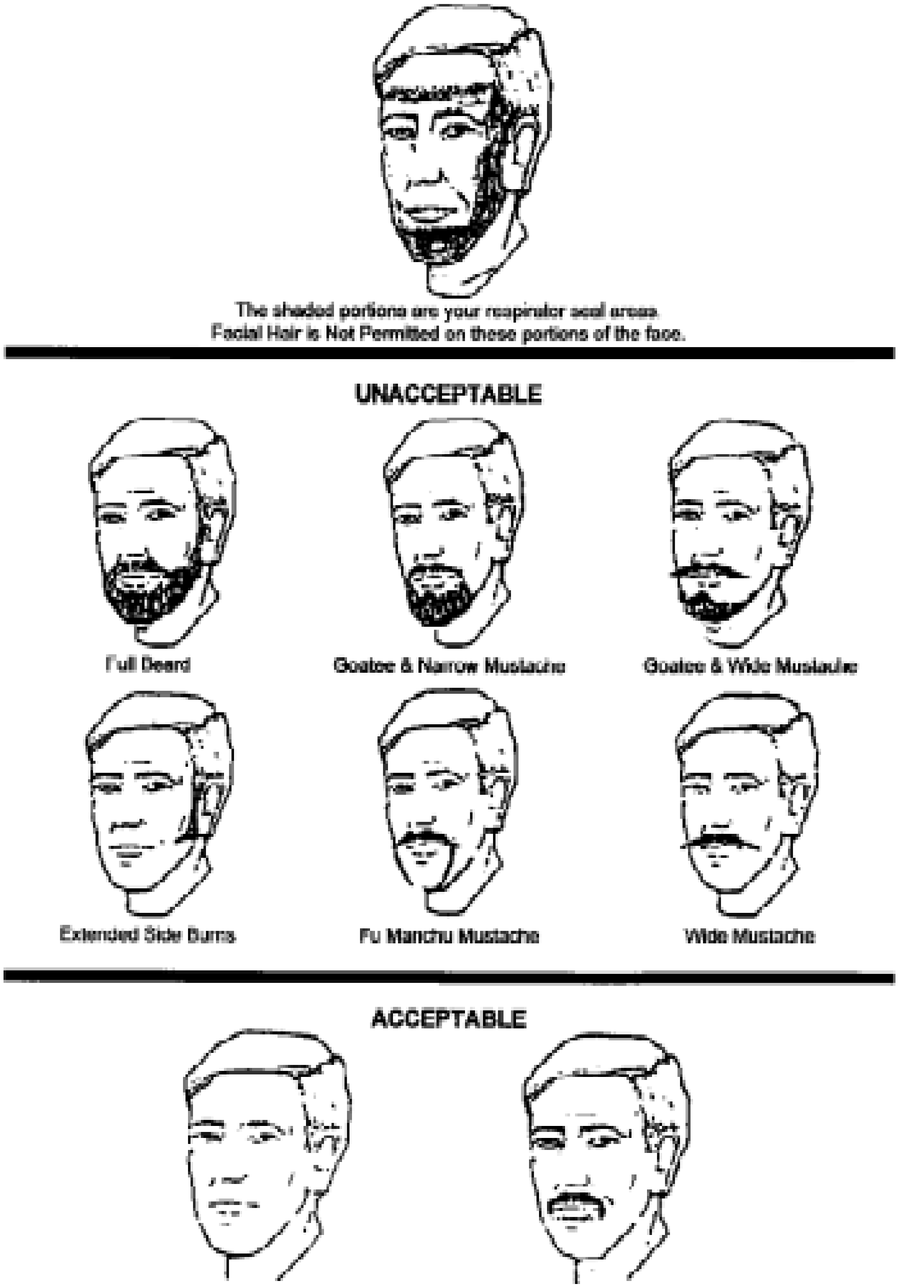
11. At the beginning of each exercise, the aerosol concentration shall be replenished using one-half the number of squeezes as initially described in A-12.

12. The test subject shall indicate to the test conductor if at any time during the fit test the taste of saccharin is detected.

13. If the saccharin is detected, the fit is deemed unsatisfactory and a different respirator shall be tried.

14. If a test subject exhibits difficulty in breathing during tests, she or he shall be referred to an occupational physician to determine whether the test subject can wear a respirator while performing her or his duties.

APPENDIX 3: Facial Hair, Respirator Fitting



APPENDIX 4: Air Purifying Respirators Inspection Guidelines

A. EXAMINE THE FACEPIECE FOR:

1. excessive dirt;
2. cracks, tears, holes or distortion from improper storage;
3. inflexibility (stretch and massage to restore flexibility);
4. cracked or badly scratched lenses in full face pieces;
5. incorrectly mounted full-face piece lens or broken or missing mounting clips;
6. lens sealed properly in receptacle, retaining clamp secured;
7. cracked or broken air-purifying element holder(s), badly worn threads or missing gasket(s) (if appropriate).

B. EXAMINE THE HEADSTRAPS OR HEAD HARNESS FOR:

1. breaks;
2. loss of elasticity;
3. broken or malfunctioning buckles and attachments;
4. (full face pieces only) excessively worn serrations on the head harness which might permit slippage;
5. tears in headband at cradle attachment

C. EXAMINE THE EXHALATION VALVE FOR THE FOLLOWING AFTER REMOVING ITS COVER:

1. foreign material, such as detergent residue, dust particles or human hair under the valve seat;
2. cracks, tears or distortion in the valve material;
3. improper insertion of the valve body in the face piece;
4. cracks, breaks or chips in the valve body, particularly in the sealing surface;
5. missing or defective valve cover
6. improper installation of the valve in the valve body.

D. EXAMINE THE AIR-PURIFYING ELEMENTS FOR:

1. incorrect cartridge, canister or filter for the hazard;
2. incorrect installation, loose connection, missing or worn gaskets or cross-threading in the holder;
3. expired shelf-life date on cartridge or canister

E. DEFECTS FOUND DURING INSPECTION:

Minor - If a defect is found that can easily be repaired, such as replacement of a strap, gasket, valve, etc., the employee (provided they have been trained in respirator maintenance) may obtain the appropriate part and repair the respirator.

Caution - Only replace worn or damaged parts with parts provided by the manufacturer of the original parts. These parts must be NIOSH approved. Replacement with a part from a different manufacturer VOIDS THE CERTIFICATION.

Major - If a major defect is found (such as a cracked cartridge receptacle or deteriorated face piece rubber, etc.) the unit should be tagged indicating the defect, and removed from service and Health and Safety Department should be contacted. UNDER NO CIRCUMSTANCES SHOULD A DEFECTIVE DEVICE BE PLACED INTO SERVICE. Ensure respirator is working properly after replacement parts by performing fit check. If an acceptable fit check cannot be achieved, contact the Health and Safety Department.

APPENDIX 5: SCBA and Air Line Respirator Inspection Guidelines

(Page 1 of 6)

These procedures specify general inspection for SCBA's. Other emergency-use respirators may require additional or further inspection. Only Health and Safety Department qualified (or Health and Safety Department approved) personnel are authorized to perform the weekly and monthly inspection. All 40-hour certified employees are authorized to perform the "After Use" inspection. Repairs can only be performed by trained and qualified personnel as designated by the Health and Safety Department.

Any defective equipment must be tagged out and not used until repairs are conducted by qualified individuals.

A. MONTHLY INSPECTION

Prior to Inspection, Assure:

1. cylinder contains at least 90% of rated capacity- 4050 psi for 4500 psi unit, 1980 psi for 2266 psi unit;
2. high or low-pressure hose is tightly connected to the cylinder;
3. bypass valve is closed (SCBA);
4. main line valve is closed (SCBA);
5. regulator outlet is not covered or obstructed.

Examine the Face piece for:

1. excessive dirt;
2. cracks, tears, holes or distortion from improper storage;
3. inflexibility (stretch and massage to restore flexibility);
4. cracked or badly scratched lenses in full face piece;
5. incorrectly mounted full face piece lens;
6. lens sealed properly in receptacle;
7. retaining clamp secured.

Examine the Head Straps or Head Harness for:

1. breaks;
2. loss of elasticity;
3. broken or malfunctioning buckles and attachments;
4. excessively worn serrations on the head harness which might permit slippage;
5. tears in headband at cradle attachment.

Appendix 5 – Page 2 of 6.

Examine the Exhalation Valve for the Following (after removing it's cover):

1. foreign material, such as detergent residue, dust particles or other debris (e.g. hair) under the valve seat;
2. cracks, tears or distortion in the valve material;
3. improper insertion of the valve body in the face piece;
4. cracks, breaks or chips in the valve body, particularly in the sealing surface;
5. missing or defective valve cover;
6. improper installation of the valve in the valve body.

Cylinder:

1. physically check to assure the cylinder fastens tightly to the back plate;
2. no dents, gouges or rust is visible on the metal or Fiberglas;
3. the cylinder must be hydrostatically tested within the past five years for steel cylinders, and within the past three years for full-wrapped Fiberglass cylinders.

Head and Valve Assembly:

1. if available, valve lock is present;
2. cylinder gauge is present and secured;
3. needle operates smoothly and gauge lens is present.

Breathing Tube:

1. broken or missing end connectors;
2. missing or loose hose clamps;
3. deterioration - determined by closing off ends with palm of one hand and thumb of other hand. Next, stretch the tube. Look for cracks. Tube should collapse and remain under negative pressure for a minimum of 15 seconds.

Breathing Tube Connector:

1. threads are true and no stripping is evident;
2. rubber gasket seal is present and in good condition.

Appendix 5 – Page 3 of 6.

Face piece Pressure Check:

1. Conduct Negative Pressure Test to evaluate the seal and condition of the exhalation valve;

2. Don the face-piece;

3. Stretch the breathing tube to open the corrugations and then cover the open end;

4. Inhale. The mask should collapse against the face. Hold for 5-10 seconds. If the negative pressure drops (the face piece begins moving away from (the face) this indicates a leak. Readjust, then perform the pressure test again. If pressure continues to drop, remove from service and return the face piece to the Health and Safety Department.

Hi-Pressure Leak Check (SCBA):

1. close the mainline and by-pass valves;

2. pressurize unit by opening cylinder valve;

3. alarm should sound briefly (remove from service if alarm fails to ring);

4. listen for leaks at the cylinder valve in high-pressure hose (between cylinder and regulator) and at the regulator.

NOTE: If an air leak is detected, remove the unit from service and contact the Health and Safety Department.

Regulator Pressure Check (SCBA):

1. cover hose connection part on regulator with palm of hand;

2. open mainline valve;

3. check pressure on regulator and cylinder;

4. regulators must agree by + or - 100 psi.

NOTE: If pressures differ by more than 100 psi, remove the unit from service and contact the Health and Safety Department.

Audi-Alarm Operations Check (SCBA):

1. place palm over hose connection port;

2. close cylinder valve with mainline valve in open position;

3. slowly lift palm;

4. observe gauge on regulator;

5. Audi-Alarm should sound when pressure reaches amount specified by manufacturer, typically:
   - 500 on 2215 psi unit
   - 1,000 on 4500 psi unit

Appendix 5 – Page 4 of 6.

NOTE: If air does not bleed from the unit or the alarm does not sound, repeat Audi-Alarm operations check. If proper function still does not occur, tag the unit out-of-service and return it to the Health and Safety Department.

Pressure Evaluation:

1. recharge the cylinder if it is below 90% of full charge:
   - 1990 on 2216 psi unit
   - 4050 on 4500 psi unit

Air-Tightness Check (SCBA):

1. block regulator outlet to breathing tube with rubber cover or palm of hand;

2. open both the cylinder and mainline valves;

3. note cylinder and regulator pressure (must agree within 100 psi);

4. close cylinder valve and observe regulator pressure for 30 seconds;

5. if gauge needle (pressure) drops more than 100 psi, air leaks may be present. Remove the unit from service and contact the Health and Safety Department.

Diaphragm Evaluation (SCBA):

1. check that the cylinder and regulator valves are closed and that the system is not pressurized;

2. sanitize the regulator outlet with alcohol swab or soap and water;

3. place lips over regulator outlet, gently inhale and hold your breath for 10 seconds, if negative pressure is maintained, there is no leakage;

NOTE: If negative pressure is not maintained, tag the unit out-of-service indicating problem and return it to the Health and Safety Department.

4. with lips still in place, gently exhale through regulator outlet for about 10 seconds, if the positive pressure is maintained, there is no leakage.

NOTE: If positive pressure is not maintained, tag the unit out-of-service indicating problem and return it to the Health and Safety Department.

Mainline and Bypass Valve Evaluation (SCBA):

1. don the apparatus as in normal use, face piece on;

2. open cylinder valve, open mainline valve and breath normally, listening for whistling, chattering, clicking, rattling or any unusual noises. Be aware of venting of pressure relief valve on regulator or continuing flow of air through regulator when user is not inhaling;

3. if any of these symptoms or noises are present during normal operation, tag the unit out-of-service and return it to the Health and Safety Department;

4. clean and sanitize the unit and return it to the case.

Cleanliness Evaluation:

1. evaluate for cleanliness of unit and carrying case;
2. if unit is dirty, clean and sanitize it.

Storage:

1. close all valves;
2. de-pressurize unit (SCBA) by opening mainline valve briefly;
3. extend all straps;
4. store in carrying case in original configuration.

B. INSPECTION AFTER EACH USE:

This inspection should be performed by the wearer each time the unit is used. If the unit is returned to storage without this evaluation, the unit may not be available for further use.

Examine the Apparatus:

1. look for missing, cracked or broken parts on all components of the apparatus.

Clean and Sanitize the Unit:

NOTE: Each unit will be evaluated to assure it has been cleaned and sanitized. Units not properly cleaned should be returned to the user for recleaning.

1. clean according to guidelines specified elsewhere in these guidelines;
2. closely inspect tube for perforations, small cracks or signs of wear, especially along the corrugations;
3. check cylinder pressure, ensure that it is at least 90% of rated capacity. refill if necessary;
4. wipe down the entire SCBA case with water and mild detergent or MSA cleaner-sanitizer;
5. harness assembly should be clean and free of surface dirt.

Regulator:

1. remove regulator cap spring and diaphragm;
2. use soft, clean DRY cloth to wipe out inside of regulator. Be careful not to bend arms of lever assembly;
3. examine diaphragm for tears and if it is torn or separated from yellow plastic ring, replace it;

Appendix 5 – Page 6 of 6.

NOTE: Replace the diaphragm if any tears are observed.

4. reassemble regulator insuring short lever arm is on top of the long lever arm;

5. following "after use" inspection, test function of entire apparatus before putting it back on the shelf.

APPENDIX 6: Respiratory Medical Restriction Notification Form

TO:

FROM:

DATE:

RE: Notification of Respiratory Medical Restriction

Your recent medical evaluation has shown a respirator user medical restriction as shown below:

RESTRICTION:

As a Clean Harbors employee, you are not permitted to violate this restriction under any circumstances. If the restriction is lifted by CHES medical personnel, the limitation will be re-evaluated. If you have any questions, contact the Health and Safety Department.

SUPERVISOR'S SIGNATURE: ______________________________

DATE: ______________________________

EMPLOYEE'S SIGNATURE: ______________________________

DATE: ______________________________

APPENDIX 7: Certification of Grade D Air Quality

The breathing air supplied by ____

to Clean Harbors Environmental Services Inc. meets the Compressed Gas Association Specification G-7/1 for Type 1 - Grade D Air.

NAME (print): ______________________________________
(Company Representative)

SIGNATURE: ______________________________________

DATE: ______________________________________

APPENDIX 8: Qualitative/Quantitative Fit Test Form

QUANTITATIVE / QUALITATIVE FIT TEST FORM

Employee Name: ______________________ Title & Location: ______________________

Respirator Information

Respirator Brand:

Respirator Type: Half-Face:

Size: **Small** **Medium** **Large**

Full-Face:
(Includes Level C, SAR, SCBA)

Size: **Small** **Medium** **Large**

Fit Test Information

Irritant Smoke ________ Isoamyl Acetate (Banana Oil) ________ Saccharin Solution ________

Test Instrument: TSI Portacount 8020 Serial # ______________ Media: **IPA**

Pass Levels: Half-Face: 100 Full-Face: 500 (Includes SAR & SCBA)

HALF-FACE RESPIRATOR

Test	**Test Exercise**	**Pass/Fail**
1	Normal Breathing	
2	Deep Breathing	
3	Turning Head Side to Side	
4	Lifting Head Up & Down	
5	Rainbow Passage	
6	Grimace	
7	Bending Over	
8	Normal Breathing	

Overall Fit Factor: __________ Pass/Fail

FULL-FACE RESPIRATOR

Test	**Test Exercise**	**Pass/Fail**
1	Normal Breathing	
2	Deep Breathing	
3	Turning Head Side to Side	
4	Lifting Head Up & Down	
5	Rainbow Passage	
6	Grimace	
7	Bending Over	
8	Normal Breathing	

Overall Fit Factor: __________ Pass/Fail

I certify that I have been trained in the use of respirators and tested with the respirators listed above. I have also had the opportunity to ask questions and those questions have been answered to my satisfaction. I also understand that the above fit test is voided if respirator limitations are not followed or the respirator is not worn or conditions prevent a good face seal, i.e., facial hair.

Employee Signature: ______________________ Date: ______________
Instructor Signature: ______________________ Date: ______________
Employee Name (Print): ______________________ Date: ______________

APPENDIX 9: Determining Action Levels

1. LEVEL D ACTION LEVEL:

Find the Permissible Exposure Limit (PEL) and the Threshold Limit Value-Time Weighted Average (TLV-TWA). Multiply the lower of the two values by 0.5.

One-half (0.5) x (PEL) or (TLV-TWA) = Level D maximum

2. LEVEL C RANGE:

Level D maximum to 10 times level D maximum

Provided

- One-half the IDLH is not exceeded. If exceeded, use ½ IDLH.
- Chemical cartridge is available and maximum use concentrations (MUC) are not exceeded.

3. EXTENDED LEVEL C RANGE:

The extended level C range is equal to 50 times the Level D maximum level provided:

- The concentration is less than one-half the IDLH;
- Does not exceed the chemical cartridge limitation (MUC);
- Quantitative fit testing has been conducted, and tests pass;
- Full face respirators are used; and
- Approval of H&S is obtained.

4. LEVEL B RANGE DETERMINATION

Upper limit of level C range to the IDLH or 1000 x Level D Maximum (whichever is less).

EXCEPTION: For hydrogen fluoride and cyanide the level B maximum will be 1/2 the IDLH.

Continued on next page.

Appendix 9 (Cont'd.)

ACTION LEVEL CALCULATION WORKSHEET

SUBSTANCE ______________________ PEL ____________________
PHYSICAL STATE ______________________ TLV-TWA ____________________
STEL ____
CARTRIDGE APPLICABLE? __________ YES __________ NOCEILING __________
(If NO use Level B only) IDLH

CONCENTRATION

______ (1) Level D Concentration:
0.5 x (Lowest Value PEL or TLV =
(Level D Maximum) __________

______ (2) Level C Range:

a) (level D Maximum- Equation [1] x 10= __________

b) 1/2 the IDLH = __________

c) Maximum Use Concentration (MUC) x 0.9 = __________

USE LOWEST CONCENTRATION FROM a-c

______ (3) EXTENDED LEVEL C RANGE:

When quantitative fit testing is conducted, full face respirators are used and H&S approval has been obtained, use:

a) 50 x Equation (2) maximum = __________

b) 1/2 IDLH = __________

c) Cartridge MUC x 0.9 = __________

USE LOWEST CONCENTRATION FROM a-c

______ (4) LEVEL B MAXIMUM

Use whichever is LESS:

a) 1000 x Level D maximum __________

b) IDHL __________

APPENDIX 10: APR Cartridge Change Out Form

Name ______________________________ Date ______________________________

Location ______________________________ Project # ______________________________

Project Description ______________________________

Note: Use of this form assumes that an APR cartridge can be used for the situation being evaluated. Utilize the NIOSH Respirator Decision Logic and good industrial hygiene practices in making the decision. The NIOSH procedures can be found on pages 19-20 of that document. If no cartridge is available or appropriate, and airborne concentrations are above or potentially above the action level or CHES' action level, then a SAR must be used.

List expected or measured concentration ____________________

List OSHA PEL ____________________

ACGIH TLV ____________________

IDLH ____________________

List Maximum Use Concentration (MUC) of cartridge

Concentration cannot exceed 90% of Maximum Use Concentration- use SAR

1. Is there an End of Service Life Indicator (ELSI) Y ________ N ________

   If Yes, follow manufacturer's instructions;

   If No, proceed:

2. Is this a specific OSHA "regulated" chemical? Y ________ N ________

   Acrylonitrile
   Benzene
   Butadiene
   Formaldehyde
   Methylene chloride
   Vinyl chloride

   If Yes, use change out schedules listed for those standards- see 6.6.;

   If No, proceed:

3. Select chemical class/structure from MSA Data Tables (or other if appropriate) (MSA Data Tables included in Appendix):

   Chemical Class ______________________________

Appendix 10 (Cont'd.)

4. Select change out time for cartridge-type using MSA data tables.

   (For mixtures of compounds, select contaminant with lowest PEL or TLV as basis for determination.)

   (For concentrations not listed in data tables, select the next highest concentration listed.)

   Cartridge Type __________________ Change Out Time __________________
   (Minutes/Hours) (A)

5. If situation involves one or more of the following:

   If concentration exceeds 10X PEL/TLV (whichever is less), or;

   If task(s) or chemicals change to a different compound or mixture deemed substantially different from original (discuss with H&S) or;

   If situation involves a mixture, or;

   If humidity level exceeds 90%;

   then, divide time value calculated above by safety factor of 2

   A/2 = ______________________
   (B)

6. Use A or B for change out time, whichever is less.

7. Use cartridges for maximum time period of one shift, in agreement with other limitations listed within the respirator program.

APPENDIX 11: Employee Program Assessment Questionnaire

Date Assessment Conducted : ____/_____/____

Individual Conducting Assessment: ___________________________

Name of Employee: __________________________

Branch Location of Employee: ______________________

	YES	NO	REMARKS
Do the respirators regularly used by the employee fit properly?			
Does the employee feel that they are adequately protected from the respiratory hazards to which they may be exposed?			
Does the employee feel that he/she has received appropriate training per Section 5.3 of this program?			
Does the employee feel he/she is capable of performing routine maintenance on the respirators which they utilize regularly?			

ADDITIONAL COMMENTS:

____

____

____

____

____

I certify that I have been trained in the use of respirators. I have also had the opportunity to provide feedback regarding the effectiveness of Clean Harbors' Respiratory Protection Guidelines, ask questions and those questions have been answered to my satisfaction

Employee Signature: ________________________________ Date: ______________________
Employee Name (Print): ________________________________ Date: ______________________
Assessors' Signature: ________________________________ Date: ______________________

APPENDIX 12: References

Publications used as references in the preparation of this program include:

Occupational Safety and Health Act of 1970, 29 CFR 1910.134, as amended in Final Standard, January 9, 1998.

A Guide to Industrial Respiratory Protection, DHHs NIOSH No. 87-116.

Practices for Respiratory Protection, ANSI Z88.2 - 1989.

Respirator Decision Logic, DHHS (NIOSH) No. 87-108.

Certified Equipment List, DHHS (NIOSH) No. 87-102.

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, DHHS (NIOSH) No.85-115.

Patty's Industrial Hygiene and Toxicology, Vol. 3a, John Wiley and Sons, N.Y., 1982, pages 662-685.

Personal Protective Equipment for Hazardous Material Incidents: A Selection Guide, DHHS (NIOSH) No. 84-114.

MSA Cartridge Change Test Program, 1/5/99.

OSHA Directive CPL 2-0.120

The Occupational Environment, Evaluation and Control, American Industrial Hygiene Association, Chapter 36, 1995

Compressed Gas Association, Commodity Specification for Air G-7, 1-1997

CleanHarbors

HAZARDOUS WORK PERMIT

HAZARDOUS WORK ☐ HOT WORK ☐ LINE/EQUIP OPENING ☐ LOCKOUT/TAGOUT ☐ (Check all that apply)

Permit authorization and permit termination for each type of permit must be completed on the last page of this permit

Start Time/Date: /	Expires: /	Completion Time:	
Client: *ARCADIS-US*	Client Contact: *Matthew Bowman*	Client Phone #: *(989)277-4852*	Dig Safe #:
CHES Job #: *GX3741007*	CHES Location: *GX Kalkaska, MI*	CHES Phone #: *(781)792-5000*	H&S Rep: *Rich Analoro*

Job Location: *117 Blanchard Street, Newark, NJ 07105*

Scope of Work - Task 1: *Mobilization and establish necessary temporary facilities*
Task 2: *Provide and install all equipment and materials for the WTS*
Task 3: *Complete WTS startup and testing/winterization of WTS*
Task 4: *Perform OMM services for the water treatment system.*
Task 5: *Decontaminate and demobilize equipment*
Task 6:

Special Conditions: *In case of emergency, contact CHES, followed by ARCADIS-US.*

EMERGENCY TELEPHONE NUMBERS - Fire: *911* Police: *911* Ambulance/Rescue: *911*

Emergency Assembly Area: primary: *CHES field trailer* secondary: *117 Blanchard St. Site Entrance*

Hospital Name & Location: *St. Michael's Medical Center – 111 Central Avenue, Newark NJ 07105*

HAZARD IDENTIFICATION

(circle task number) **(List specific substances in air monitoring section)**

CHEMICAL/BIOLOGICAL

1 2 3 4 5 6 Toxic:	1 2 3 4 5 6 Corrosive:	1 2 3 4 5 6 Flammable:	1 2 3 4 5 6 Combustible:	1 2 3 4 5 6 Reactive:
1 2 3 4 5 6 Shock Sensitive	1 2 3 4 5 6 Path Waste	1 2 3 4 5 6 Oxygen Deficiency		

PHYSICAL

1 2 3 4 5 6 Abrasive Blasting	1 [✓ 2 3 4 5] 6 Extreme Cold/Heat	1 2 3 4 5 6 Lighting	[✓ 1 2 3 4 5 6] Sharp Objects	1 2 3 4 5 6 Underground Utilities
1 2 3 4 5 6 Drum Sumps	1 2 3 4 5 6 Floor Holes	1 2 3 4 5 6 Live Electrical Circuits	[✓ 1 2 3 4 5] 6 Slips/Trips/Falls	1 [✓ 2] 3 [✓ 4] [✓ 5] 6 Vactor/Cusco
1 2 3 4 5 6 Drilling In Soil	1 2 3 4 5 6 Hot Work	1 [✓ 2] 3 4 [✓ 5] 6 Manlifts/Highlifts	1 2 3 4 5 6 Soil Excavation	[✓ 1 2 3 4 5] 6 Vehicle Traffic
1 2 3 4 5 6 Drum Handling	1 2 3 4 5 6 Hotsy	[✓ 1 2 3 4 5 6] Noise	1 2 3 4 5 6 Tank Excavation	1 2 3 4 5 6 Waterblaster
1 [✓ 2] 3 4 [✓ 5] 6 Elevated Work Area	[✓ 1 2 3 4 5] 6 Ladders	1 2 3 4 5 6 Overhead Utilities	1 2 3 4 5 6 Trenching	1 2 3 4 5 6 Work On/Near Water
1 2 3 4 5 6 Excavation/Trench	[✓ 1 2 3 4 5] 6 Lifting	1 [✓ 2] 3 4 [✓ 5] 6 Pneumatic Tools	1 2 3 4 5 6 Uncontrolled Work Area	

PERSONAL PROTECTIVE/SAFETY EQUIPMENT

(Review requirements with H&S)(Line opening; minimum level C)

__ SCBA	__ Supplied Air Resp.	__ SAR w/Egress Bottle	__ Air Purifying Respirator/Cartridge: ___________	
__ Protective Coverall Type: _______________	__ Outer Gloves Type: _______________	__ Inner Gloves Type: _______________	__ Fully Encapsulating Suit Type: _______________	Cartridge Use Time: __________
__ Barrier Cream	__ Evacuation Plans	__ GFCI Required	__ Nomex Coveralls	__ Safety Shower
__ Bonding/Grounding	__ Explosion Proof Equip	__ Hardhats	__ Non-Sparking Tools	__ Ventilation
__ Chemical Goggles	__ Eye Wash	__ Harness/Lanyard	__ Over Boots	Type: _____________
__ Communications	__ Face Shield	__ Hearing Protection	__ PFD's	__ Welding/Cutting
__ Cylinders Secured	__ Flashback Prev. Device	__ Hearing Prot.; Double	__ Reflective Vests	Shaded Lenses
__ Eliminate Ignit. Source	__ Flash Suit	__ MSDS's Reviewed	__ Safety Glasses	

EQUIPMENT INSPECTIONS – Foreman must initial to verify equipment has been inspected and is safe to use/operate.

_______ D/D Pump (pressure relief valve)
_______ Fall Protection (harness, lanyard Anchor points support > 5000 lbs)
_______ Fire Extinguisher(s)
_______ Forklift

_______ Hoses/Hose Connections
_______ Ladder(s)
_______ Retrieval Device
_______ SAR/SCBA
_______ Scaffold

_______ Shower/Eyewash
_______ Vactor Butterfly
_______ Wire Rope/Sling
OTHER _______ ____________________________
_______ ____________________________

LINE/EQUIPMENT OPENING PREPARATION

(Line opening portion is required for breaking process chemical or waste chemical lines, pumps, or associated valves)

☐ Locked Out (verified) ☐ Line/Equipment Drained ☐ Bleeder/Vent Open/Pressure Released ☐ Line/Equipment Steamed
☐ Line/Equipment Flushed with: ☐ Water ☐ Other media ___________________________________
☐ Line/Equipment Purged/Inerted with: ☐ N_2 ☐ CO_2 ☐ Other media ________________________

HOT WORK

ATTENTION: The Fire Safety Supervisor or appointee shall inspect the work area and confirm that precautions have been taken to prevent fire prior to approving the hot work permit. Local Fire Department notification may be required for hot work or fire system de-activation.

RESTRICTIONS: DO NOT perform hot work if any the following conditions exist- CONTACT HEALTH AND SAFETY:

- Oxygen level exceeds 22%
- Lower explosive limit exceeds 0%
- Organic vapor levels exceed 10ppm
- If fire hazards cannot be moved or guarded from the hot work

WORK ON WALLS OR CEILINGS:

☐ Ensure heat transfer through conductive material is prevented.
☐ Ensure that material is noncombustible and without combustible covering (i.e. insulation, etc).
☐ Combustibles moved away from opposite side of wall (May require an additional fire watch on the blind side of the wall if all potential hazards cannot be eliminated.)

PRECAUTIONS

☐ Sprinklers must be in service if present.
☐ Cutting/welding and all other equipment must be in good repair.
☐ Shut down ducts or conveyor systems that may convey sparks to distant combustibles.
☐ Combustible Gas Meter/LEL required for the duration of the process.
☐ General/Local ventilation must be adequate to provide control of smoke, fumes or toxic vapors.
☐ Flammable liquids / combustible materials within 35 feet must be moved or protected with covers, guards, or metal shields if not removable.
☐ No open-container work (sampling, pumping, or consolidating of flammable/combustible liquids) within 50 feet.
☐ Use fire blankets to secure all openings, cracks, and holes where sparks may migrate to potential fire hazards.
☐ Atmospheric monitoring conducted. (Document in Air Monitoring section)
☐ Evaluate any product pipelines in the area for potential fire hazards.
☐ Remove all paint coatings and residual contamination from the surface and clean down to the bare metal or similar.
☐ Combustible floor wetted down, covered with damp sand, or shielded.
☐ Signs and barriers posted (if publicly accessible).
☐ Welding curtains used where applicable
☐ Type ABC fire extinguisher required Number _______ Size ___________

FIRE WATCH:

☐ Required (Present for duration of work and for 30 minutes after the operation)
☐ Supplied with fire extinguisher / hose
☐ Trained in use of equipment and alarms

CONTACT HEALTH & SAFETY *__FOR APPROVAL PRIOR__* TO PERFORMING HOT WORK ON ENCLOSED EQUIPMENT/SYSTEMS

☐ Containers must be cleaned of all combustibles/flammables.
☐ Containers/product lines must be drained and purged of vapors with water and/or inert gas.

LOCKOUT/TAGOUT

DESCRIPTION OF WORK TO BE PERFORMED

METHOD TO VERIFY ISOLATION

LOCKBOX EQUIPMENT TO BE USED ☐Y ☐N

(All isolating devices, blinds, locks, etc., must be identified and have a tag attached and listed on this form.)

Note: if a diagram of the system is needed or available, please attach as a separate page

LOCKOUT/TAGOUT Continued

Hazardous Energy Sources Present:

☐ Mechanical Energy (i.e. moving parts)
☐ Pneumatic Energy (i.e. air or nitrogen driven)
☐ Electrical Energy (i.e. plugged in or battery)
☐ Thermal Energy (i.e. steam or frost)
☐ Chemical Reaction Energy (i.e. exothermic or endothermic)
☐ Hydraulic Energy (i.e. water, oil, or other fluids)
☐ Residual or stored energy may be present
☐ Potential energy may be present
☐ Material is conductive and may retain a charge
☐ System may retain pressure
☐ Explosion hazard
☐ Gravity flow hazard may exist

TAG NUMBER*	DEVICE BEING ISOLATED	ISOLATION METHOD	DEVICE LOCATION

ENERGY RESTORATION:

	YES
ALL PERSONNEL ACCOUNTED FOR AND IN THE CLEAR	☐
EQUIPMENT FREE OF TOOLS AND DEBRIS	☐
LOCKOUT/TAGOUT HARDWARE REMOVED	☐
PROPER EQUIPMENT OPERATION VERIFIED	☐
LOCKOUT/TAGOUT TERMINATED	☐

OR

CLIENT ASSUMES RESPONSIBILITY FOR ENERGY RESTORATION ☐

If Client assumes responsibility, supervisor must attempt to obtain the client contact information in the termination section

*Required for multiple LO/TO permits on one project.

ATMOSPHERIC MONITORING LOG

Instrument Type/ Manufacturer ________________________________ **DATE LAST CALIBRATED** ____________________________
Instrument Type/ Manufacturer ________________________________ **DATE LAST CALIBRATED** ____________________________
Instrument Type/ Manufacturer ________________________________ **DATE LAST CALIBRATED** ____________________________

ENVIRONMENTAL CONDITIONS: (weather, temp, wind, etc.) ____
____
____

	ACTION LEVELS		
SUBSTANCE	**LEVEL B MAX.**	**LEVEL C MAX.**	**LEVEL D MAX.**

ATMOSPHERIC MONITORING LOG Continued

TIME	LOCATION ACTIVITY	Parameter Monitored						COMMENTS	Sampler's Initials
		O_2	LEL	CO	H_2S				
		Instrument							

ADDITIONAL COMMENTS: ____

PERMIT AUTHORIZATION

AFFECTED PERSONNEL/CHES CREW *PRINT NAME AND SIGN*

__________________ __________________ __________________ __________________

__________________ __________________ __________________ __________________

__________________ __________________ __________________ __________________

__________________ __________________ __________________ __________________

HAZARDOUS WORK AUTHORIZATION TO PROCEDE: Foreman's Signature: ____________________

LINE OPENING AUTHORIZATION TO PROCEDE: Foreman's Signature: ____________________

HOT WORK AUTHORIZATION TO PROCEDE: Foreman's Signature: ____________________

LO/TO AUTHORIZATION TO PROCEDE: Foreman's Signature: ____________________

FORMAN'S COMMENTS/MINUTES OF SAFETY MEETING: ____

HEALTH & SAFETY COMMENTS: ____

FOREMAN: ____________________ / __________ **HEALTH & SAFETY**: ____________________/____________

PERMIT TERMINATION

Haz. Work Termination	Line Opening Termination	Hot Work Termination	LO/TO Termination
☐ Decontamination of personnel and equipment is complete. ☐ All waste is labeled and staged for proper disposal. ☐ All postings/notifications removed. ☐ Work completed and accepted.	☐ Work completed and accepted.	☐ The work area and all adjacent areas to which sparks and heat may have spread (including floors above and below and on opposite sides of walls) were inspected 30 minutes after the work was completed and were found fire safe. ☐ All fire systems are re-activated. ☐ Work completed and accepted.	☐ All Lockout and Tagout Devices have been removed. ☐ Verified that equipment is back to normal operating conditions. ☐ All affected personnel notified that system is back in service. ☐ Work completed and accepted. ☐ Client signature obtained for release to restore energy.
Date:	**Date:**	**Date:**	**Date:**
Time:	**Time:**	**Time:**	**Time:**
Signature:	**Signature:**	**Signature:**	**Signature:**

CLIENT CONTACT ________________/____________________ ________/________

PRINT/SIGN(If Available) DATE/TIME

IN THE EVENT OF AN EMERGENCY EVACUATION, ALL PERMITS ARE CANCELLED.

CleanHarbors
ENVIRONMENTAL SERVICES®

FIELD SERVICE
SITE SAFETY INSPECTION

DATE: ___/___/___ **CLIENT:** ________________________________ **LOCATION:** __________________________

SUPERVISOR/FORMAN: ______________________________________ **JOB NUMBER** ________________________

PROJECT DESCRIPTION: ____

____

A. – Acceptable D. – Deficient C. – Corrected Immediately FA. – Further Action Required

HAZCOM (1910.1200)	**A**	**D**	**C**	**FA**
1) MSDS available on site?	☐	☐	☐	☐
2) Daily safety meeting held & attended by crew?	☐	☐	☐	☐
3) Hazardous work permit completed and signed?	☐	☐	☐	☐
PERSONAL PROTECTIVE EQUIPMENT				
1) Personal protective Equipment appropriate?	☐	☐	☐	☐
2) PPE being properly worn by crew?	☐	☐	☐	☐
3) Respiratory protection being utilized?	☐	☐	☐	☐
4) Action levels being adhered to?	☐	☐	☐	☐
AIR MONITORING				
1) Appropriate air monitoring being conducted?	☐	☐	☐	☐
2) Air monitoring instruments properly calibrated?	☐	☐	☐	☐
3) Readings properly documented?	☐	☐	☐	☐
LOCKOUT/TAGOUT (1910.147)				
1) Have all types of energy been de-energized?	☐	☐	☐	☐
2) Is a LO/TO permit completed and available?	☐	☐	☐	☐
3) Do all affected employees have locks applied?	☐	☐	☐	☐
4) All other LO/TO procedures being followed?	☐	☐	☐	☐
HOT WORK				
1) Hot work permit properly completed?	☐	☐	☐	☐
2) Are available fire hoses, sprinklers, or extinguishers in good repair?	☐	☐	☐	☐
3) Hot work equipment (torches, welders, grinders) in good repair?	☐	☐	☐	☐
4) Have containers, tanks or vessels been inerted to less than 8% oxygen?	☐	☐	☐	☐
5) Have explosive atmospheres been eliminated (35 feet)?	☐	☐	☐	☐
6) Have all wall and floor openings been covered (35 feet)?	☐	☐	☐	☐
7) Are welding blankets being utilized where necessary?	☐	☐	☐	☐
8) Has paint or coatings been removed from the area where the hot work will be conducted?	☐	☐	☐	☐
9) Have all combustible & flammable materials/liquids been removed from the area (35 feet)?	☐	☐	☐	☐
10) Has a fire watch been maintained for 30 minutes after the completion of the hot work?	☐	☐	☐	☐
EXCAVATION/TRENCHING (1926.651-652)	☐	☐	☐	☐
1) Is there a competent person on site?	☐	☐	☐	☐
2) Have all utilities been identified or marked?	☐	☐	☐	☐
3) Is there a ladder available in the excavation for every 25 feet of travel distance?	☐	☐	☐	☐
4) For excavations greater than 4 feet, are sloping or shoring options being followed?	☐	☐	☐	☐
5) Are excavation spoils located at least 2 feet from the edge of the excavation?	☐	☐	☐	☐
6) Is standing water in the excavation being controlled?	☐	☐	☐	☐
7) If no personnel entry is required, has a "no-man's-land" been established 3/4 of the excavation depth away from edge?	☐	☐	☐	☐
8) Has the excavation been evaluated for potential confined space hazards?	☐	☐	☐	☐

FIRE SAFETY	**A**	**D**	**C**	**FA**
1) Are sufficient number of appropriate fire extinguishers present?	☐	☐	☐	☐
2) Are all extinguishers inspected with tags attached?	☐	☐	☐	☐
3) For flammable/combustible transfers has grounding/bonding been performed?	☐	☐	☐	☐
4) Has grounding and bonding been checked for continuity?	☐	☐	☐	☐
5) Have all ignition sources been eliminated?	☐	☐	☐	☐
6) Is LEL area monitoring being conducted?	☐	☐	☐	☐
ELECTRICAL SAFETY				
1) Is equipment appropriate for the location (e.g. UL listed Class I Division I for flammable locations)?	☐	☐	☐	☐
2) Is an operable Ground Fault Circuit Interrupter (GFCI) used on all equipment? (Where appropriate)	☐	☐	☐	☐
3) Are equipment leads and extension cords in good repair?	☐	☐	☐	☐
SCAFFOLD & ELEVATED LIFT SAFETY 1910.28				
1) Competent Person on site?	☐	☐	☐	☐
2) Daily inspection documented?	☐	☐	☐	☐
3) All personnel "User" Trained?	☐	☐	☐	☐
4) All components in good condition?	☐	☐	☐	☐
5) Scaffolding erected according to guidelines?	☐	☐	☐	☐
WORKING ON OR NEAR WATER				
1) Is the boat operator certified by CHESI?	☐	☐	☐	☐
2) Has a boating safety checklist been completed?	☐	☐	☐	☐
3) Are appropriate PFD's being used?	☐	☐	☐	☐
VACTOR SAFETY				
1) Electric vacuum relief or in line tee being utilized?	☐	☐	☐	☐
2) Hands & feet kept minimum of 2' from the end of the hose?	☐	☐	☐	☐
EMERGENCY PREPARADNESS				
1) Appropriate size first-aid kit on site, available and stocked?	☐	☐	☐	☐
2) Minimum of two First-Aid/CPR trained personnel on site? (where appropriate)	☐	☐	☐	☐
3) Safety shower, or hose and eye wash in immediate vicinity when working with acids or caustics?	☐	☐	☐	☐
4) Emergency numbers obtained, posted and means to contact emergency services is posted?	☐	☐	☐	☐
5) Location of nearest hospital documented and known by crew?	☐	☐	☐	☐
FALL PROTECTION (GREATER THAN 6 FEET)				
1) Are harnesses and appropriate lanyards being worn?	☐	☐	☐	☐
2) Are anchor points of sufficient strength (ie. 5000lb capacity)?	☐	☐	☐	☐
3) If no harnesses/lifelines are utilized, has a warning line been placed at least 6 feet from the edge?	☐	☐	☐	☐
MISCELLANEOUS SAFETY ITEMS				
1) Have appropriate smoking and eating areas been designated?	☐	☐	☐	☐
2) Is the work zone properly barricaded or secured?	☐	☐	☐	☐
3) Are appropriate decon areas established and sufficient?	☐	☐	☐	☐
4) Is the system of communication utilized by the crew sufficient?	☐	☐	☐	☐
5) Is the lighting utilized on the site sufficient to safely illuminate the work zone?	☐	☐	☐	☐

REMARKS

____

____

____

H&S MANAGER:____(Date) Foreman/Supervisor:______________________________________(Date)

CleanHarbors®	**JOB HAZARD ANALYSIS**	Document Control ID: **HS.00023.FM-10HS**	
		Revision Date: **01-Sep-2011**	Revision #: **8**
		Owner: **Health & Safety**	

SECTION 1: JOB/TASK/PROCESS *(Document General Information Below)*

FACILITY/CLIENT LOCATION:	**CH BRANCH CODE:**	**FACILITY PROCESS AREA/CLIENT PROJECT**	**PROJECT DATE:**	**JOB CODE /PERMIT #:**

SCOPE OF WORK:	**DURATION OF PROJECT/TASK:**

JOB HAZARD ANALYSIS LED BY (Print Name):	**TITLE:**	**ORIGINAL ANALYSIS DATE:**	**REVISION DATE:**
JOB HAZARD ANALYSIS REVIEWED BY (Print Name)::	**TITLE:**	**APPROVED BY:**	**TITLE:**

SECTION 2: Chemical/Physical/ Biological Hazards *(Describe Job Hazard Agents Identified)*

Chemical Agents **(HAZCOM/ WHMIS MSDS Review)**	**Physical Agents**	**Biological Agents**

SECTION 3: PPE HAZARD ASSESSMENT SUMMARY

Head	☐ Hard Hat ☐ Side Impact Hard Hat ☐ DOT Approved Helmet ☐ Lock-On-Life Support Helmet ☐ Other:
Eyes/Face/Neck	☐ Safety Glasses with Side Shields ☐ Goggles – Chemical ☐ Goggles – Dust ☐ Face Shield ☐ Welding Helmet ☐ Balaclava (F.R.) ☐ Other: ______
Respiratory	☐ Dust Mask ☐ Half Face Respirator/Cartridge Type: ______ ☐ Full Face AP Respirator/Cartridge Type: ______ ☐ PAPR/ Cartridge Type: ______ ☐ SABA ☐ SCBA ☐ Lock-On-Life Support Helmet ☐ Other: ______
Ears/Hearing	☐ Ear Plug ☐ Ear Muff ☐ Double (Combination Ear Plugs & Ear Muffs) ☐ Other:
Hands/Arms	☐ Cotton Gloves ☐ Leather Gloves ☐ Puncture/Cut Resistant ☐ PVC ☐ Nitrile ☐ Anti-vibration ☐ Impact Protection ☐ Thermal ☐ Sleeves ☐Wristlets/Type: ______ ☐ Other: ______
Body	☐ Fire Retardant Coveralls/Uniform ☐ Chemical Protective Clothing/Type: ______ ☐ Tyvek/Type: ______ ☐ Apron ☐ Sleeves ☐ Life Jacket/Vest ☐ High Visibility Vest ☐ Heat Reflective Suit ☐ Foul Weather Gear ☐ Cool Vest ☐ Kevlar Cut Resistant Suits ☐ Other: ______
Feet	☐ Safety Boots – Leather or Rubber ☐ Metatarsals (Feet & Shin) ☐ Ice Cleats (Slip-Overs) ☐ Booties/ Type: ______ ☐ Other: ______

SECTION 4: HAZARD ANALYSIS PROCESS *(Document Hazard Analysis and Controls Based on each Job Step/ Task Sequence)*

Sequence Of Job Steps/Tasks (Number)		Hazards/Potential Hazards & Effects (What could go wrong?)	Recommended Hazard Control Or Safe Job Procedures (How can harm be prevented?)	Required PPE (List PPE required for each Job Step)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

SECTION 5: Atmospheric Monitoring Required: ☐ Yes ☐ No

[For assistance determining exposure action levels please refer to Clean Harbors' Respiratory Protection Standard - Appendix 9]

List Substance(s) or Material(s) of Concern Below:	Monitoring Instrument	Substance / Material Exposure Action Levels			
		Level A	Level B	Level C	Level D

SECTION 6: Training *(Document the required Job Task Training)*

SECTION 7: Emergency Procedures *(Document the Emergency Response Procedures - i.e. First Aid, Emergency Call #'s, etc.)*

SECTION 8: Decontamination Procedures *(Document the Decontamination Procedures –i.e. People and Equipment)*

SECTION 9: Additional Job Specific Considerations: ☐ Yes ☐ No

SECTION 10: Job Hazard Analysis Verification (Crew Supervisor Review and Sign Off)

The Job Hazard Analysis Team has assessed the worksite conditions and confirms:

- The job and site specific conditions have been reviewed to ensure additional hazards have been addressed as warranted.
- The JHA addresses the significant Task Steps and applicable hazards and necessary controls.
- The Team has the appropriate resources (people and equipment) to do the job safely.
- Others that could be affected by the work have been informed.
- Energy isolation (if applicable) has been VERIFIED AND DEMONSTRATED.
- This document facilitates compliance of the PPE assessment and hazard analysis pursuant to company, legislative and client requirements.

SUPERVISOR / PM / GM (Please Print):	POSITION:	SIGNATURE:	DATE:

SECTION 11: Job Hazard Analysis Review (Work Team Reviews and Sign-Off)

NAME (Print)	Signature	NAME (Print)	Signature	NAME (Print)	Signature

Appendix A: Table of Hazards and Controls *[This can be used as a tool to trigger situational awareness pertaining to potential Job Hazards]*

This Table of Hazards and Controls can assist the JHA work group to manage hazards for the proposed work. The table does not include all possible hazards and only acts as a guideline. Its intent is to aid in the JHA thought process to determine Job Task Hazards that may be present and identify implementation controls for consideration.

☐ **Pressurized Equipment**	☐ **Poor Lighting or visibility**	☐ **Personnel**	☐ **Confined Space**	☐ **Simultaneous Operations (SIMOPS)**	☐ **Environment**	☐ **Ignition Sources**
☐ Perform isolation – LO/TO, blinding, or defeat ☐ Depressurize, drain, purge, and vent ☐ Relieve trapped pressure ☐ Avoid auto-refrigeration when depressurizing ☐ Anticipate residual pressure or fluids	☐ Provide alternate lighting ☐ Wait or defer until visibility improves ☐ No work over water that could require rescue	☐ Provide induction or training for new workers ☐ Mentor, coach, or supervise ☐ Verify competencies, skills, and experience ☐ Address applicable limitations (fatigue, exhaustion, and restricted duty) ☐ Manage multiple languages	☐ Discuss confined space entry safe work practice ☐ Monitor access or entry ☐ Protect surfaces from inadvertent contact ☐ Do not locate mobile engines near confined space ☐ Provide observer ☐ Develop rescue plan	☐ Interface between groups ☐ Use barriers and signs to segregate activities ☐ Have permit counter signed by leader of affected groups	☐ Implement controls for slippery surfaces ☐ High winds – goggles ☐ Heat – hydration, breaks ☐ Cold – PPE, heaters ☐ Lightning – tool selection, defer work ☐ Wildlife encounters	☐ Remove, isolate, or contain combustible materials ☐ Provide fire-fighting equipment ☐ Construct a fire-safe habitat ☐ Provide a fire watch during and after hot work ☐ Conduct continuous gas testing ☐ Bond or earth for static electricity or cathodic protection ☐ Intrinsically safe tools, equipment, etc?
☐ **Hazardous Substance**	☐ **Potential Spills**	☐ **Equipment Hot or Cold**	☐ **High Noise**	☐ **Falling or Dropped Objects**	☐ **Lifting Equipment**	☐ **Work at Heights**
☐ Drain or purge equipment ☐ Follow MSDS controls ☐ Implement health hazards controls (Lead, Asbestos, H_2S, Iron Sulphide, Sulfur Dioxide, NORM) ☐ Test or analyze material	☐ Drain equipment ☐ Provide spill containment equipment ☐ Have spill clean up materials and equipment on hand ☐ Restrain and isolate hoses when not in use	☐ Heat or cool equipment before work starts ☐ Install barriers ☐ Provide warning signs ☐ Implement cold temperature and brittle failure controls ☐ Wear thermal gloves	☐ Wear correct hearing PPE ☐ Manage exposure times ☐ Shutdown equipment ☐ Use "quiet" tools ☐ Sound barriers or curtains ☐ Provide or use suitable communication techniques	☐ Use signs and barriers to restrict entry or access under work at elevation ☐ Use lifting equipment to raise tools to or from the work platform ☐ Secure tools (tie-off)	☐ Confirm lifting equipment condition and certification ☐ Obtain approval for lifts over processing equipment ☐ Have a documented and approved lift plan	☐ Discuss working at heights safe work practice ☐ Verify fall restraint and arrest equipment certification ☐ Apply abseiling safe work practice
☐ **Portable Electrical Equipment**	☐ **Radiation Hazard**	☐ **Moving Objects or Equipment**	☐ **Manual Handling**	☐ **Equipment and Tools**	☐ **Vibrating Equipment**	☐ **Slips, Trips, and Falls**
☐ Inspect equipment for condition and test date currency ☐ Implement continuous gas testing ☐ Protect electrical leads from impact or damage ☐ Use GFI's	☐ Use barriers and signs to restrict access ☐ Notify personnel who may be affected ☐ Implement NORM controls ☐ Conduct RAD testing	☐ Confirm machinery guard integrity ☐ Provide protective barriers ☐ Observer to monitor proximity of people and equipment ☐ Shut down or lockout equipment	☐ Assess manual handling task ☐ Limit load size ☐ Manage posture ☐ Confirm stability of load and work platform ☐ Get assistance or mechanical aid to avoid pinch points	☐ Inspect equipment and tools ☐ No use of modified tools ☐ Use protective guards ☐ Use correct tools and equipment for task ☐ Protect or remove sharp edges	☐ Manage exposure times ☐ Assess affect of vibration on equipment ☐ Use low vibration equipment ☐ Apply noise controls	☐ Identify and shield uneven surface or projections ☐ Secure or cover cables, cords, and tubing ☐ Clean up liquids ☐ Barricade or rope-off openings and holes
☐ **High Energy or High Voltage**	☐ **Excavations**	☐ **Waste Clean Up and Disposal**	☐ **Other Energy Sources**	☐ **Mobile Equipment**	☐ **Other Hazards**	☐ **Emergency Response**
☐ Restrict access to authorized personnel only ☐ Discharge equipment and make electrically dead ☐ Observe safe work distances for live cables ☐ Use flash burn PPE suit ☐ Use insulated gloves, tools, and mats	☐ Have an excavation plan or safe work practice ☐ Locate underground pipes or cables by hand digging ☐ De-energize underground services ☐ Implement confined space entry controls ☐ Barricade/Flag open excavations	☐ Apply environmental management practices ☐ Follow site waste management procedures ☐ Clean up equipment and materials at site ☐ Optimize task to minimize waste production	☐ Spring compression or expansion control ☐ Implement electromagnetic (radio) controls ☐ Manage pressure or vacuum ☐ Manage heat generating processes ☐ Use seismic activity safe work practice	☐ Assess equipment condition ☐ Implement controls on users or access ☐ Limit and monitor proximity to live equipment or cables ☐ Manage overhead hazards ☐ Adhere to road and site rules ☐ 3-point contact when entering/exiting mobile equip. ☐ Driver security	☐ Implement abrasive blasting controls (for equipment and practices) ☐ Establish a driver journey management plan ☐ Manage potential blocked or plugged equipment ☐ MOC required for temporary connections or modifications	☐ Keep egress route open ☐ Keep shower and eye wash stations accessible ☐ Have a rescue plan in place ☐ Keep emergency alarm, fire equipment, and shutdown locations unobstructed ☐ Plan for emergency first aid in place ☐ Remote Medi-vac plan in place

APPENDIX – A

PLAN APPROVAL AGREEMENT

The following individuals have reviewed the site specific health and safety plan for the Arcadis-Lower Passaic River UPF Temporary Water Treatment System. They are responsible for implementing and enforcing the procedures and items covered by this plan. In addition, Clean Harbors' Manager, Occupational Health and Safety must approve any revisions or alterations to this plan before implementation.

Notify Richard Analoro of any alterations or deviations from the procedures, requirements, etc., listed in this plan, (Return a signed copy of this document to Corporate EH&S).

Richard C Analoro
Regional Health & Safety Representative

10/19/11
Date:

Project Manager

10/17/11
Date:

Project Supervisor

10-19-11
Date

Branch Manager

10/19/11
Date

APPENDIX - B

COMPLIANCE AGREEMENT5

All on-site personnel, (i.e., CHI employees and Subcontractors), must complete and sign this section before the commencement of site activities for the Arcadis-Lower Passaic River UPF Temporary Water Treatment System. (Return a signed copy of this document to Corporate EH&S).

I have read and understand the contents of this site specific health and safety plan, and have had all relevant questions answered to my satisfaction. In addition, I agree to comply with the conditions/provisions outlined therein.

NAME (Print)	SIGNATURE	COMPANY/ CHI BRANCH	DATE

Page _____ of _____

APPENDIX - C

APPROPRIATE
MATERIAL SAFETY DATA SHEETS
(MSDS)

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

Arsenic
ARS2340

Section 1 - Chemical Product and Company Identification

Material Name: Arsenic

CAS Number: 7440-38-2

Chemical Formula: As

Structural Chemical Formula: As_4

EINECS Number: 231-148-6

ACX Number: X1002785-7

Synonyms: ARSEN; ARSENIA; ARSENIC; ARSENIC-75; ARSENIC BLACK; ARSENICALS; COLLOIDAL ARSENIC; GRAY ARSENIC; GREY ARSENIC; METALLIC ARSENIC

General Use: In metallurgy for hardening copper, lead alloys. In the manufacture of certain types of glass.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Arsenic		>98

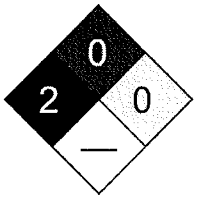
OSHA PEL
TWA: 0.01 mg/m^3.

NIOSH REL
Ceiling: 0.002 mg/m^3; 15-minute.

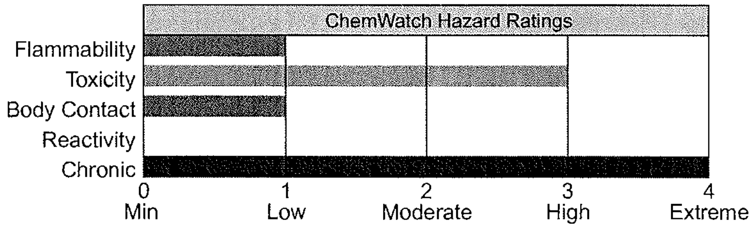
ACGIH TLV
TWA: 0.01 mg/m^3.

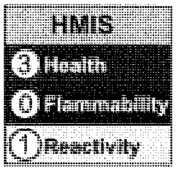
IDLH Level
5 mg/m^3 (as As).

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Warning!

Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Brittle, crystalline, silvery-black metal. Irritating to eyes/skin/respiratory tract. Chronic Effects: damage to blood-forming organs, nervous/cardiovascular systems effects. Cancer hazard. Powder is flammable.

Potential Health Effects

Target Organs: liver, kidneys, skin, lungs, lymphatic system

Primary Entry Routes: inhalation, ingestion of dust and fumes, skin absorption

Acute Effects

Inhalation: The dust is toxic and discomforting to the upper respiratory tract and lungs.

Acute inhalation exposure can cause cough, chest pain, shortness of breath, dizziness, headache, pulmonary edema and extreme general weakness.

Prolonged or repeated exposure can cause perforation of the nasal septum.

High exposures can cause poor appetite, nausea, vomiting and muscle cramps. Heart effects with abnormal EKG can also occur with very high exposures.

Eye: The dust may produce eye discomfort causing smarting, pain and redness.

Skin: The material is moderately discomforting to the skin and may be harmful.

Exposure may result in abnormal redness (caused by capillary congestion), burning, itching, swelling, skin eruptions and dermatitis.

Toxic effects may result from skin absorption.

Repeated skin contact can cause thickened skin and/or patchy areas of darkening and loss of pigment. Some persons develop white lines on the nails.

Ingestion: The solid/dust is discomforting to the gastrointestinal tract and is toxic and may be fatal if swallowed.

Symptoms of acute poisoning by ingestion, which develop within 4 hours include epigastric pain, vomiting and watery diarrhea. Blood may appear in vomitus and stools. If amount ingested is sufficiently high, shock may develop, followed by death within 24 hours.

Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A1, Confirmed human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

Chronic Effects: Symptoms of chronic poisoning by inhalation include weight loss, nausea and diarrhea alternating with constipation, pigmentation and eruption of the skin, loss of hair, peripheral neuritis, blood disorders (anemia), striations on fingernails and toenails.

Long-term exposure can cause an ulcer or hole in the `bone' dividing the inner nose. Hoarseness and sore eyes also occur.

High or repeated exposure can cause nerve damage with `pins and needles', burning, numbness, and later weakness of arms and legs. Repeated exposure can also damage the liver, causing narrowing of the blood vessels, or interfere with the bone marrow's ability to make red blood cells.

Many cases of skin cancer have been reported among people exposed to arsenic through medical treatment with inorganic trivalent arsenic compounds. In some instances skin cancers have occurred in combination with other cancers, such as liver angiosarcoma, intestinal and urinary bladder carcinomas and meningioma. Epidemiological studies of cancer after medical treatment have shown an excess of skin cancers but no clear association with other cancers has been shown. An association between environmental exposure to arsenic through drinking water and skin cancer has been observed and confirmed. Epidemiological studies in areas where drinking water contained 0.35-1.14 mg/l arsenic elevated risks for cancers of the bladder, kidney, skin, liver, lung and colon in both men and women.

Occupational exposure to inorganic arsenic, especially in mining and copper smelting, has consistently been associated with an increased risk of cancer. An almost tenfold increase in the incidence of lung cancer was found in workers most heavily exposed to arsenic and relatively clear dose-response relationships have been obtained with regard to cumulative exposure. Other smelter worker populations have been shown to have consistent increases in lung cancer incidence, as well as increases of about 20% in the incidence of gastrointestinal cancer and of 30% for renal cancer and hematolymphatic malignancies.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Quickly but gently, wipe material off skin with a dry, clean cloth.

Immediately remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center.

If swallowed, and if more than 15 minutes from a hospital, induce vomiting, preferably using Ipecac Syrup APF.

Note: DO NOT INDUCE VOMITING in an unconscious person

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short term repeated exposures to arsenic, soluble compounds:

Treat as per arsenic poisoning.

1. Acute skin lesions such as contact dermatitis usually do not require other treatment than removal from exposure.
2. If more severe symptoms of the respiratory system, the skin or the gastrointestinal tract occur, British Anti-Lewisite (BAL, dimercaprol) may be given. Prompt administration in such cases is vital; to obtain maximum benefit such treatment should be administered within 4 hours of poisoning.
3. In addition, general treatment such as prevention of further absorption from the gastrointestinal tract are mandatory.
4. General supportive therapy such as maintenance of respiration and circulation, maintenance of water and electrolyte balance and control of nervous system effects, as well as elimination of absorbed poison through dialysis and exchange transfusion, may be used if feasible.
5. Dimercaprol is given by deep intramuscular injection as a 5% solution in peanut oil (or a 10% solution with benzyl-benzoate in vegetable oil). It is usually given in a dose of 3 mg/kg, 4-hourly, for the first two days, or twice daily for up to seven days.
6. BAL Therapy is effective for hematological manifestations of chronic arsenic poisoning but not for neurological symptoms. Watch for side effects (e.g. urticaria, burning sensation in the lips, mouth and throat, fever, conjunctivitis etc).
7. Some relief results from administration of diphenhydramine (Benadryl) (1.5 mg/kg intramuscularly or by mouth every 6 hour).

BIOLOGICAL EXPOSURE INDEX - BEI

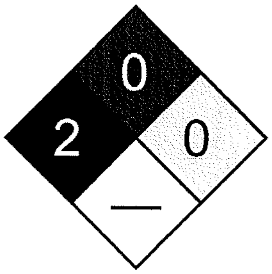
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Inorganic arsenic metabolites in urine	50 ug/g creatinine	End of workweek	B

B: Background levels occur in specimens collected from subjects NOT exposed
Consult specific documentation.

Section 5 - Fire-Fighting Measures

See DOT ERG



Fire Diamond

Flash Point: Noncombustible solid
Extinguishing Media: Use fire fighting procedures suitable for surrounding area.
General Fire Hazards/Hazardous Combustion Products: Solid which exhibits difficult combustion or is difficult to ignite.
Avoid generating dust, particularly clouds of dust in a confined or unventilated space.
Dust may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion.
Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport. Build-up of electrostatic charge may be prevented by bonding and grounding.
Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.
Decomposes on heating and produces toxic fumes of arsenic oxides (AsO_x).
Fire Incompatibility: Avoid contact with acids, oxidizing agents, halogens.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.
Use fire fighting procedures suitable for surrounding area.
Do not approach containers suspected to be hot.
Cool fire exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: Clean up all spills immediately. Wear protective clothing, impervious gloves and safety glasses. Increase ventilation.
Use a vacuum or a wet method to reduce dust during clean-up. DO NOT dry sweep.
Place in suitable containers for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
Large Spills: POLLUTANT -contain spillage. Clear area of personnel and move upwind.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
If contamination of drains or waterways occurs, advise emergency services.
Shut off all possible sources of ignition and increase ventilation.
Stop leak if safe to do so.
Contain spill with sand, earth or vermiculite.
Use dry clean up procedures and avoid generating dust.
Collect recoverable product into labeled containers for recycling. Collect residues and seal in labeled drums for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Use good occupational work practice.
Avoid contact with skin and eyes.
Avoid generating and breathing dust.
Use in a well-ventilated area.

Wear protective clothing when risk of exposure occurs.
Avoid sources of heat. Avoid contact with incompatible materials. Avoid physical damage to containers.
Keep containers securely sealed when not in use.
When handling, DO NOT eat, drink or smoke.
Wash hands with soap and water after handling.
Work clothes should be laundered separately: NOT at home.

Recommended Storage Methods: Glass container. Plastic drum. Polyethylene or polypropylene container. Steel drum. Metal drum.
Check that containers are clearly labeled.

Storage Requirements: Observe manufacturer's storing and handling recommendations.
Store in a cool, dry place. Store in a well-ventilated area. Store away from sources of heat or ignition/bare lights.
Avoid storage at temperatures higher than 60 °C. Store away from incompatible materials. Store away from foodstuff containers.
Protect containers against physical damage.
Keep containers securely sealed.
Check regularly for spills and leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required.
Use ventilated helmet or air-line hood to provide clean air at the breathing zone.
If risk of overexposure exists, wear NIOSH approved respirator. Correct fit is essential to obtain adequate protection.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses. Chemical goggles.
Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Impervious, gauntlet length gloves; Rubber gloves. Neoprene gloves.
Rubber boots.

Respiratory Protection:
Exposure Range >0.01 to 0.1 mg/m^3: Air Purifying, Negative Pressure, Half Mask
Exposure Range >0.1 to 1 mg/m^3: Air Purifying, Negative Pressure, Full Face
Exposure Range >1 to <5 mg/m^3: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range 5 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: magenta (P100)

Other: Overalls. PVC apron. PVC protective suit may be required if exposure severe.
Eyewash unit. Ensure there is ready access to a safety shower.
* Preplacement and periodic medical examinations are essential for workers exposed to arsenic. Preplacement physical examinations should give particular attention to allergic and chronic skin lesions, eye disease, psoriasis, chronic eczematous dermatitis, hyperpigmentation of the skin, keratosis and warts, baseline weight, baseline blood and hemoglobin counts, baseline urinary arsenic determinations.
Annual physical examinations should give attention to general health, weight, skin condition, and any evidence of excessive exposure or absorption of arsenic.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Grey, shiny, brittle, metallic-looking rhombohedral crystals. Can be heated to burn in air with a bluish flame, giving off an odor of garlic and dense white fumes of arsenic trioxide. Loses its luster on exposure to air. Converted by nitric acid or hot sulfuric acid into arsenous or arsenic acid.
Brinell hardness: 147
Mohs' scale: 3.5

Physical State: Divided solid
Vapor Pressure (kPa): Not applicable
Vapor Density (Air=1): Not applicable
Formula Weight: 74.92
Specific Gravity (H_2O=1, at 4 °C): 5.73
Evaporation Rate: Not applicable

pH: Not applicable
pH (1% Solution): Not applicable
Boiling Point: Sublimes
Freezing/Melting Point: 817 °C (1502.6 °F) at 28 atm
Volatile Component (% Vol): Not applicable
Water Solubility: Insoluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Contact with acids liberates toxic gases. Presence of heat source and ignition source.
Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

Storage Incompatibilities: Segregate from oxidizing agents, halogens.

Contact with acids produces toxic fumes.

Section 11 - Toxicological Information

Toxicity

Oral (man) TD_{Lo}: 7857 mg/kg/55 years
Oral (rat) LD_{50}: 763 mg/kg
Tumorigenic - Carcinogenic by RTECS criteria.

Irritation

Nil reported

See *RTECS* CG 0525000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: Food chain concentration potential: Bioaccumulated by fresh water and marine aquatic organisms
BCF: bioaccumulated by aquatic organisms
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Follow all federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Arsenic
ID: UN1558
Hazard Class: 6.1 - Poisonous materials
Packing Group: II - Medium Danger
Symbols:
Label Codes: 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: IB8, IP2, IP4
Packaging: **Exceptions:** None **Non-bulk:** 212 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 25 kg **Cargo aircraft only:** 100 kg
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a), per CAA Section 112 1 lb (0.454 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Section 1 - Chemical Product and Company Identification 42/60

Material Name: DDT **CAS Number:** 50-29-3

Chemical Formula: $C_{14}H_9Cl_5$

Structural Chemical Formula: $(ClC_6H_4)_2CHCCl_3$

EINECS Number: 200-024-3

ACX Number: X1002032-1

Synonyms: AAVERO-EXTRA; AGRITAN; ANOFEX; ARKOTINE; AZOTOX; AZOTOX M-33; BENZENE,1,1'-(2,2,2-TRICHLOROETHYLIDENE)BIS(4-CHLORO-; 2,2-BIS (P-CHLOROPHENYL)-1,1,1-TRICHLOROETHANE; ALPHA,ALPHA-BIS(P-CHLOROPHENYL)-BETA,BETA,BETA-TRICHLORETHANE; 1,1-BIS(P-CHLOROPHENYL)-2,2,2-TRICHLOROETHANE; 1,1-BIS-(P-CHLOROPHENYL)-2,2,2-TRICHLOROETHANE; 2,2-BIS(P-CHLOROPHENYL)-1,1,1-TRICHLOROETHANE; ALPHA,ALPHA-BIS(P-CHLOROPHENYL)-BETA,BETA,BETA-TRICHLOROETHANE; BOSAN SUPRA; BOVIDERMOL; CHLOFENOTAN; CHLOROPHENOTHAN; CHLOROPHENOTHANE; CHLOROPHENOTOXUM; CHLORPHENOTHAN; CHLORPHENOTOXUM; CITOX; CLOFENOTANE; 4,4'-DDT; DDT; P,P'-DDT; P,P-DDT; DEDELO; DEOVAL; DETOX; DETOXAN; DIBOVAN; DIBOVIN; 4,4'-DICHLORODIPHENYLTRICHLOROETHANE; DICHLORODIPHENYLTRICHLOROETHANE; P,P'-DICHLORODIPHENYLTRICHLOROETHANE; DICOPHANE; DIDIGAM; DIDIMAC; DIPHENYLTRICHLOROETHANE; DODAT; DYKOL; ENT 1,506; ENT-1506; EPA PESTICIDE CODE 029201; ESTONATE; ETHANE,1,1,1-TRICHLORO-2,2-BIS(4-CHLOROPHENYL)-; ETHANE,1,1,1-TRICHLORO-2,2-BIS(P-CHLOROPHENYL)-; GENITOX; GESAFID; GESAPON; GESAREX; GESAROL; GUESAPON; GUESAROL; GYRON; HAVERO-EXTRA; HILDIT; IVORAN; IXODEX; KLORFENOTON; KOPSOL; MICRO DDT 75; MUTOXAN; MUTOXIN; NEOCID; NEOCIDOL; NEOCIDOL (SOLID); OMS 0016; OMS 16; PARACHLOROCIDUM; PEB1; PENTACHLORIN; PENTECH; PENTICIDUM; PPZEIDAN; PP'-ZEIDANE; R50; RUKSEAM; SANTOBANE; TAFIDEX; TECH DDT; 1,1,1-TRICHLOOR-2,2-BIS(4-CHLOOR FENYL)-ETHAAN; 1,1,1-TRICHLOR-2,2-BIS(4-CHLOR-PHENYL)-AETHAN; 1,1,1-TRICHLORO-2,2-BIS(P-CHLOROPHENYL)ETHANE; TRICHLOROBIS(4-CHLOROPHENYL)ETHANE; 1,1,1-TRICHLORO-2,2-DI(4-CHLOROPHENYL)-ETHANE; 1,1,1-TRICHLORO-2,2-DI(4-CHLOROPHENYL)ETHANE; 1,1'-(2,2,2-TRICHLOROETHYLIDENE)BIS(4-CHLOROBENZENE); 1,1,1-TRICLORO-2,2-BIS(4-CLORO-FENIL)-ETANO; 1,1,1-TRICLORO-2,2-BIS(4-CLORO-FENYL)-ETANO; ZEIDANE; ZERDANE

Derivation: Prepared by condensing chloral or chloral hydrate with chlorobenzene in presence of sulfuric acid.

General Use: One of the most widely used contact insecticides from 1945 until its ban in 1972. Although banned in the U.S. (except for such uses as emergency health situations and for controlling body lice), it is still widely used in the tropics for control of vector-carrying diseases such as malaria, yellow fever, dengue, filariasis, louse-borne typhus, and louse-borne relapsing fever.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
DDT	50-29-3	*p'p'*DDT 70% wt + *o'p'*DDT 30% wt (technical grade)

Trace Impurities: DDD, DDE

OSHA PEL
TWA: 1 mg/m^3; skin.

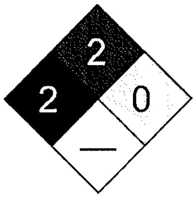
ACGIH TLV
TWA: 1 mg/m^3.

NIOSH REL
TWA: 0.5 mg/m^3.

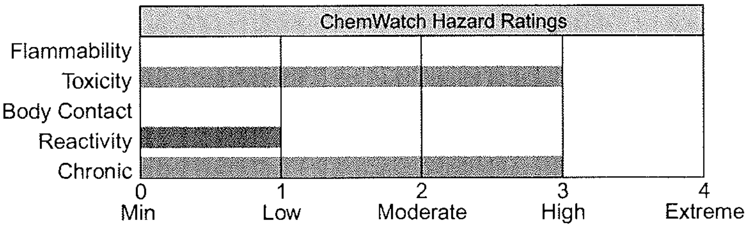
IDLH Level
500 mg/m^3.

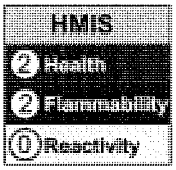
DFG (Germany) MAK
TWA: 1 mg/m^3; PEAK: 8 mg/m^3; skin; measured as inhalable fraction of the aerosol.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Caution

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

White to gray, crystalline solid. Causes: (ingestion of large amounts) CNS effects, possible liver damage. Confirmed animal carcinogen and a suspected human carcinogen.

Potential Health Effects

Target Organs: Central nervous system, liver, skin, peripheral nervous system.

Primary Entry Routes: Inhalation, ingestion, skin contact.

Acute Effects

Inhalation: Inhalation does not appear to cause toxicity beyond that of minor mechanical irritation.

Eye: Exposure to 423 mg/m^3/1 hr/day for 6 days caused eye irritation.

Skin: Skin absorption may occur from some DDT solutions, but degree of absorption will depend on the solvent involved. Aqueous solutions and the powder or crystals are not easily absorbed.

Ingestion: DDT can cause a variety of central nervous system effects if ingested. Large doses generally result in vomiting, while smaller doses cause symptoms within 2 to 3 hr post-ingestion. Symptoms include tingling of the lips, tongue, and face; malaise; headache; sore throat; fatigue; tremors of the head, neck, and eyelids; apprehension; ataxia; and confusion. Convulsions and paralysis of the hands is possible in severe exposures (if vomiting does not occur). Vital signs are usually normal, but in severe poisonings, the pulse may be irregular and abnormally slow. Based on animal studies, it is expected that ventricular fibrillation and sudden death can occur at any time during acute poisoning. Recovery from acute poisoning generally occurs within 24 hr except in the most serious cases.

Carcinogenicity: NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: Possibly, disorders of the central nervous system and liver.

Chronic Effects: There are conflicting reports on whether or not DDT produces chronic effects in humans. Although it is well established that chronic exposure in experimental animals produces effects including liver damage, CNS degeneration, dermatitis, weakness, convulsions, coma, and death, these effects are not confirmed in humans. Liver cancer is confirmed in animals, but has not been documented in humans. These conflicting reports appear due to the lack of documented chronic toxicity in workers and data showing that DDT and its metabolites are retained in the body fat for long time periods, thus providing a basis for the *possibility* of chronic toxicity.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin Contact: *Quickly* remove contaminated clothing. Rinse away any loose material and wash exposed area with soap and water. For reddened or blistered skin, consult a physician. Carefully dispose of contaminated clothing because it may pose a fire hazard.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water to dilute. *Do not* induce vomiting. Gastric lavage should be performed promptly.

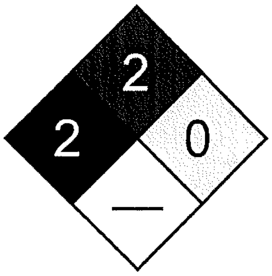
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Effects may be delayed; keep under observation. Solvents such as kerosine are added to DDT as a vehicle and, depending on the type involved, may be more toxic than DDT itself.

Special Precautions/Procedures: Amobarbital or pentobarbital is recommended for the relief of central neurological manifestations; tribromoethanol and paraldehyde are recommended for allaying prolonged convulsions.

Section 5 - Fire-Fighting Measures

See DOT ERG



Fire Diamond

Flash Point: DDT itself is noncombustible but is dissolved in a variety of solvents. The average quoted Flash Point is 162 °F (72.2 °C) (CC) although the specific vehicle is not identified.
Autoignition Temperature: None reported
LEL: None reported
UEL: None reported
Flammability Classification: Class IIIA Combustible Liquid (varies depending on vehicle)
Extinguishing Media: For small fires, use dry chemical, water spray, or regular foam. For large fires, use water spray, fog, or regular foam.
General Fire Hazards/Hazardous Combustion Products: Chloride fumes and carbon oxide gases. Container may explode in heat of fire.
Fire-Fighting Instructions: Do not release runoff from fire control methods to sewers or waterways. Fight fire from maximum distance. Stay away from ends of tanks. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural fire fighters' protective clothing is *not* effective.

Section 6 - Accidental Release Measures

See DOT ERG

Spill/Leak Procedures: Notify safety personnel, isolate area, deny entry, and stay upwind. Shut off all ignition sources. Cleanup personnel should protect against contamination.
Small Spills: For dry spills, carefully scoop up material or vacuum (with an approved filter). Damp mop any residue. For small solution spills, take up with earth, sand, vermiculite, or other absorbent material and place in suitable containers for disposal.
Large Spills: Dike far ahead of liquid spill for later reclamation or disposal. Do not release into sewers or waterways.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use non-sparking tools to open containers. Keep dry chemical extinguishers on hand in case of fire.
Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.
Recommended Storage Methods: Prevent physical damage to containers. Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec. 10). *Do not* store in aluminum or iron containers.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all equipment used with and around DDT. Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.
Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on the liver and central nervous system.
Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets made of butyl rubber to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face- protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.
Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For any detectable concentration, use a SCBA with a full facepiece and operated in pressure demand or other positive-pressure mode, or any supplied-air respirator with a full facepiece and operated in pressure demand or other positive-pressure mode with an auxiliary SCBA. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.
Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: White to gray crystals or powder which is odorless or has a slight aromatic odor.
Physical State: Solid
Odor Threshold: 5.0725 mg/m^3
Vapor Pressure (kPa): 5.5 x 10-6 mm Hg at 68 °F (20 °C)
Formula Weight: 354.48
Specific Gravity (H_2O=1, at 4 °C): 0.98 to 0.99
Boiling Point: 365 °F (185 °C)
Freezing/Melting Point: 227 °F (108.3 °C)
Water Solubility: 0.0012 ppm
Other Solubilities: (g DDT/100 mL): acetone 58, 95% alcohol 2, benzene 78, benzyl benzoate 42, carbon tetrachloride 45, chlorobenzene 74, cyclohexanone 116, dibutyl phthalate 33, o-dichlorobenzene 68, dichlorodifluoromethane 2, dioxane 100, ethyl ether 28, gasoline 10, isopropanol 3, kerosine 8 to 10, methylated naphthalenes 40 to 60, mineral oil 5, morpholine 75, peanut oil 11, pine oil 0 to 16, tetralin 61, tributyl phosphate 50, and xylene 60.

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: DDT is stable at room temperature in closed containers under normal storage and handling conditions. It biodegrades very slowly. Hazardous polymerization does not occur. Exposure to heat, ignition sources, and incompatibles.
Storage Incompatibilities: Strong oxidizers, alkaline materials, iron and aluminum salts.
Hazardous Decomposition Products: Thermal oxidative decomposition of DDT can produce carbon dioxide.

Section 11 - Toxicological Information

Acute Oral Effects:
Rat, oral, LD_{50}: 87 mg/kg; details not reported.
Human, oral, LD_{Lo}: 500 mg/kg caused convulsions, cardiac arrhythmias, and respiratory changes.
Other Effects:
Mutagenicity - *E. coli*: 15 µmol/L caused DNA damage.
Teratogenicity - Rat, oral, TD_{Lo}: 112 mg/kg given to a 56 day old male caused paternal effects (spermatogenesis, testes, epididymis, sperm duct).
Rat, oral, TD_{Lo}: 1225 mg/kg given for 7 continuous weeks caused liver tumors.

See *RTECS* KJ3325000, for additional data.

Section 12 - Ecological Information

Environmental Fate: In water, DDT will adsorb strongly to sediments, significantly bioconcentrate in fish, and will be subject to considerable evaporation with an estimated half-life of several hr to almost 50 hr from certain waters. It may biodegrade when high concentrations of required microbes (*Escherichia*, *Hydrogenomonas*, and *Saccharomyces*) are present. On land, DDT will adsorb strongly and should not appreciably leach to groundwater. It may evaporate (half-life of 100 days) and is subject to photooxidation from soil. DDT may significantly biodegrade in flooded soils or under anaerobic conditions provided high populations of the required microbes are present. Half-life ranges from 2 to >15 yr. In the air, DDT is subject to direct photooxidation and reaction with photochemically produced hydroxyl radicals (est. half-life = 2 days). Wet and dry deposition are significant mechanisms for removal from air.
Ecotoxicity: Glass shrimp (*Palaemonestes kadiakensis*), LC_{50} = 2.3 mcg/L/96 hr at 69.8 °F (21 °C); Japanese quail, 2 month old male, (*Coturnix japonica*), LD_{50} = 841 mg/kg; bluegill (*Lepomis macrochirus*), LC_{50} = 28.7 mcg/L/36 hr.

Section 13 - Disposal Considerations

Disposal: DDT is a good candidate for rotary kiln or liquid injection incineration (furnace with afterburner and alkali scrubber). 60 to 80% removal of DDT from contaminated soils has been achieved in 10 min. by super critical-carbon dioxide extraction. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. Triple rinse containers. Containers in good condition should be returned to the manufacturer and those that are not reusable should be punctured and transported to a scrap metal facility for recycling, disposal, or burial in a designated landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Organochlorine pesticides, solid, toxic
ID: UN2761
Hazard Class: 6.1 - Poisonous materials
Packing Group: I - Great Danger
Symbols:
Label Codes: 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: IB7, IP1
Packaging: **Exceptions:** None **Non-bulk:** 211 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 kg **Cargo aircraft only:** 50 kg
Vessel Stowage: **Location:** A **Other:** 40

Shipping Name and Description: Organochlorine pesticides, solid, toxic
ID: UN2761
Hazard Class: 6.1 - Poisonous materials
Packing Group: II - Medium Danger
Symbols:
Label Codes: 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: IB8, IP2, IP4
Packaging: **Exceptions:** None **Non-bulk:** 212 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 25 kg **Cargo aircraft only:** 100 kg
Vessel Stowage: **Location:** A **Other:**

Shipping Name and Description: Organochlorine pesticides, solid, toxic
ID: UN2761
Hazard Class: 6.1 - Poisonous materials
Packing Group: III - Minor Danger
Symbols:
Label Codes: 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: IB8, IP3
Packaging: **Exceptions:** 153 **Non-bulk:** 213 **Bulk:** 240
Quantity Limitations: **Passenger aircraft/rail:** 100 kg **Cargo aircraft only:** 200 kg
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U061 Toxic Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 1 lb (0.454 kg)
SARA 40 CFR 372.65: Listed as Compound
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

1,4-Dichlorobenzene
DIC2450

Section 1 - Chemical Product and Company Identification 61

Material Name: 1,4-Dichlorobenzene **CAS Number:** 106-46-7
Chemical Formula: $C_6H_4Cl_2$
Structural Chemical Formula: $C_6H_4Cl_2$
EINECS Number: 203-400-5
ACX Number: X1001577-1
Synonyms: 1,4-Dichlorobenzene; 1,4-DICHLOROBENZENE; BENZENE,1,4-DICHLORO-; BENZENE,P-DICHLORO-; P-CHLOROPHENYL CHLORIDE; PARA CRYSTALS; P-DCB; 1,4-DICHLOORBENZEEN; P-DICHLOORBENZEEN; 1,4-DICHLOR-BENZOL; P-DICHLORBENZOL; DI-CHLORICIDE; P-DICHLOROBENZENE; PARA-DICHLOROBENZENE; DICHLOROBENZENE,PARA,SOLID; P-DICHLOROBENZOL; PARA-DICHLOROBENZOL; DICHLOROCIDE; 1,4-DICLOROBENZENE; P-DICLOROBENZENE; EPA PESTICIDE CHEMICAL CODE 061501; EVOLA; GLOBOL; PARACIDE; PARADI; PARADICHLORBENZOL; PARADICHLOROBENZENE; PARADICHLOROBENZOL; PARADOW; PARAMOTH; PARANUGGETS; PARAZENE; PDB; PDCB; PERSIA-PERAZOL; SANTOCHLOR
General Use: As an insecticidal fumigant, moth repellant for fabric and fur, germicide. Deodorant toilet blocks, urinal disinfectant. As a space odorant. In dyes, intermediates, pharmacy, agriculture (fumigating soil); In the manufacture of 2,5-dichloroaniline.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
1,4-dichlorobenzene	106-46-7	>97

OSHA PEL
TWA: 75 ppm; 450 mg/m^3.

NIOSH REL

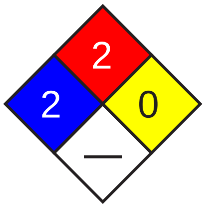
DFG (Germany) MAK
Skin.

ACGIH TLV
TWA: 10 ppm.

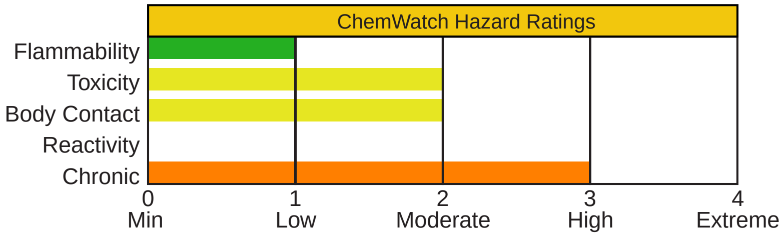
IDLH Level
150 ppm.

EU OEL
TWA: 20 ppm; STEL: 50 ppm.

Section 3 - Hazards Identification



Fire Diamond



HMIS
② Health
② Flammability
⓪ Reactivity

ANSI Signal Word
Warning!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Volatile, white crystals; mothball-like odor. Severely irritating. Other Acute Effects: hemolytic anemia, jaundice, methemglobinemia. Chronic Effects: lung granulomatosis, liver abnormalities, kidney damage, anemia, cataracts. Possible cancer hazard. Combustible.

Potential Health Effects

Target Organs: liver, respiratory system, eyes, kidneys, skin
Primary Entry Routes: inhalation, skin contact

Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract if inhaled and the material may present a hazard from repeated exposures over long periods. The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.

The physiological response to p-DCB is primarily injury to the liver and secondarily to the kidneys. Central nervous system depression will occur at concentrations that are extremely objectionable to the eyes and nose.

Individuals exposed to higher concentrations may show weakness, dizziness and weight loss. Vomiting may occur.

Acute hemolytic anemia with methemoglobinemia has been reported.

Prolonged inhalation exposure may cause dizziness, headache nausea, vomiting, central nervous system depression and damage to liver and kidneys.

Rabbits exposed 8 hours/day for a total of 62 exposures in 83 days at 770-800 ppm exhibited tremors, weakness, and death along with edema of the cornea and opacity of the lens.

Eye: The material is highly discomforting to the eyes and is capable of causing pain and severe conjunctivitis.

Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

The vapor is discomforting to the eyes if exposure is prolonged.

The vapor from heated material is highly discomforting to the eyes.

Vapors from heated material may cause mild corneal damage.

Solid particles in the eye are reported to be very painful. At workplace concentrations ranging from 50-170 ppm periodic medical examination found no evidence of adverse effects in workers with particular reference to ocular lesions including cataracts. Painful irritation of eyes and nose has been recorded at 80-160 ppm.

Skin: The material is moderately discomforting to the skin and it is absorbed by skin.

Toxic effects may result from skin absorption. Absorption by skin may readily exceed vapor inhalation exposure. Symptoms for skin absorption are the same as for inhalation. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.

Skin contact may result in irritation, burning sensation, skin defatting and possible dermatitis. Skin contact resulted in dermatitis when workers handled cakes of the pure chemical. Prolonged occlusive contact will produce a burning sensation.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The material is discomforting and toxic if swallowed.

Large doses have caused tremor in exposed animals; insects exhibit symptoms resembling DDT poisoning.

Hepatic porphyria was produced in rats following seven consecutive doses of 770 mg p-DCB/kg. Slight to moderate corneal opacity was noted in rabbits following 3 weeks of daily dosing with 5000 mg/kg. Rats receiving a daily dose of 500 mg/kg for 20 days showed cloudy swelling and necrosis in the central areas of the liver lobules and swelling of the renal tubular epithelium. 100 mg/kg daily doses did not reproduce this finding. Pale and mottled kidneys were seen in rats given oral doses of 70 to 428 mg/kg/day for 28 days. Rats given 1200 mg/kg for 13 weeks showed degeneration and necrosis of hepatocytes, hypoplasia of the bone marrow, lymphoid depletion of the spleen and thymus, and epithelial necrosis of the nasal turbinates and small intestinal mucosa. At doses of 300 mg/kg male rats showed kidney damage characterized by degeneration or necrosis of the renal cortical tubular epithelial cells. Female rats did not show these lesions even at doses of 1500 mg/kg.

Carcinogenicity: NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: In individuals exposed chronically to p-DCB, liver effects including jaundice, cirrhosis, and possible death may occur. Chronic exposure may also produce weakness, headache, rhinitis, twitching of the facial muscles. A woman who consumed 4 to 5 moth ball pellets daily for 2.5 years developed unsteady gait, tremors of the hand and general mental sluggishness which disappeared 4 months after exposure ceased. Eight workers manufacturing p-DCB based mothproofing agents for 1 to 7 months developed neural disorders including intensified muscle reflexes, mild clonus of the ankle and tremors of the fingers. They reported loss of appetite and hemopoietic changes.

Rats treated for 2 years with gastric intubation showed kidney lesion and in the male, hyperplasia of the thyroid at dose rates of 150 mg/kg.

Mice treated with 300 mg/kg in a similar 2 year gavage study showed liver changes characterized by hepatocellular degeneration. Thyroid follicular cell hyperplasia was increased in male but not female mice. Nephropathy consisting primarily of degeneration of the cortical tubular epithelium was seen and was more pronounced in males.

Rats, guinea pigs, rabbits, mice and monkeys exposed by inhalation 7 hours/day, 5 days/week for 140 exposures at 800 ppm exhibited tremor, weight loss and liver changes, including swelling and central necrosis in female rats, and swelling of the kidney epithelium.

An increase in liver tumors (e.g. renal tubular cell adenocarcinomas) was seen in male rats treated by gastric intubation doses of 150 mg/kg for 2 years. No evidence of carcinogenicity was seen in female rats. An increase incidence of hepatocellular carcinomas and adenomas was seen in mice treated with gavage doses of 300 mg/kg/day for 2 years. A positive dose-trend for adrenal gland pheochromocytomas in male mice was also reported.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush with fresh running water.
Ensure irrigation under the eyelids by occasionally lifting upper and lower lids. If pain persists or recurs seek medical attention.
Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.
If more than 15 minutes from a hospital, induce vomiting, preferably using Ipecac Syrup APF.
Note: DO NOT INDUCE VOMITING in an unconscious person.
Avoid giving milk or oils.

After first aid, get appropriate in-plant, paramedic, or community medical support.

See DOT ERG

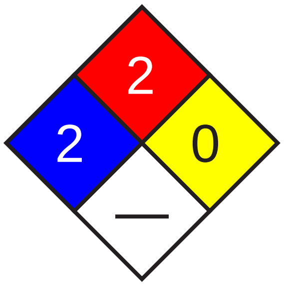
Note to Physicians: Treat symptomatically.
EYES - Stain for evidence of corneal injury.
SKIN - Treat as for dermatitis.
RESPIRATION - Administer oxygen if available. The use of bronchodilators, expectorants and antitussives may help.
There is no antidote for systemic effects.
Readily absorbed after oral administration to rats and found in all organs with accumulation in adipose tissues. 90% of the dose is excreted within 48 hours. Two metabolites, 2,5-dichlorophenylmethylsulfone and 2,5-dichlorophenylsulfoxide are detected in the blood (though not the compound itself). Slow release from the adipose tissues is probably responsible for the persistence of these metabolites. 2,5-dichlorophenol is detected in plasma, urine, liver, kidneys and fatty tissues - in humans this metabolite is a useful monitor of exposure. An occupational exposure for 1 week to 7.4 ppm p-DCB produced an increase of p-DCB in the urine as a direct measurement.

Section 5 - Fire-Fighting Measures

Flash Point: 65.556 °C Closed Cup
Autoignition Temperature: > 482 °C
LEL: 2.5% v/v
UEL: 16% v/v

Extinguishing Media: Water spray or fog; foam.
Dry chemical powder.
Alcohol stable foam.
Carbon dioxide.

See DOT ERG



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Combustible. Slight fire hazard when exposed to heat or flame.
Heat may cause expansion or decomposition leading to violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO).
May emit acrid smoke. May emit poisonous fumes.
Decomposes on heating and produces toxic fumes of hydrogen chloride, chlorine, carbon monoxide (CO), phosgene and carbon dioxide (CO_2).

Fire Incompatibility: Avoid contamination with strong oxidizing agents as ignition may result. Avoid contact with aluminum, powdered metals.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent spillage from entering drains or waterways.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid contact with skin and eyes.
Control personal contact by using protective equipment.
Use dry clean-up procedures and avoid generating dust.

See DOT ERG

Place in a suitable labeled container for waste disposal.

Large Spills: Clear area of personnel and move upwind. Slippery when spilled.
Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent spillage from entering drains or waterways.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so.
Water spray or fog may be used to disperse/absorb vapor.
Contain spill with sand, earth or vermiculite.
Collect recoverable product into labeled containers for recycling.
Collect solid residues and seal in labeled drums for disposal.
Wash area with detergent and water and prevent runoff into drains.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
DO NOT allow material to contact humans, exposed food or food utensils.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately.
Launder contaminated clothing before reuse.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Glass container; Metal can. Steel drum.
DO NOT use aluminum or galvanized containers.
Check that containers are clearly labeled.
Packaging as recommended by manufacturer.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Wear chemical protective gloves, eg. PVC. Wear safety footwear.

Respiratory Protection:
Exposure Range >75 to <150 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range 150 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black with dust/mist prefilter (use P100 or consult supervisor for appropriate dust/mist prefilter)

Other: Overalls. Eyewash unit.

Glove Selection Index:

NEOPRENE	Satisfactory; may degrade after 4 hours continuous immersion
NITRILE	Poor to dangerous choice for other than short-term immersion
PVC	Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Volatile, white crystals with penetrating, aromatic odor. Sublimes (evaporates) at room temperature. Soluble in alcohol, acetone aromatics.

Physical State: Divided solid
Odor Threshold: 15 to 30 ppm
Vapor Pressure (kPa): 1.33 at 54.8 °C
Vapor Density (Air=1): 5.08

Formula Weight: 147.0
Specific Gravity (H_2O=1, at 4 °C): 1.46
Evaporation Rate: Slow
pH (1% Solution): Not applicable.

Boiling Point: 174 °C (345 °F) at 760 mm Hg
Decomposition Temperature (°C): >55
Freezing/Melting Point: 53.1 °C (127.58 °F)
Water Solubility: 65.3 mg/L at 25 °C
Volatile Component (% Vol): 100

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers. DO NOT use aluminum or galvanized containers.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 2000-3000 mg/kg
Oral (human) LD_{Lo}: 857 mg/kg
Oral (human) TD_{Lo}: 300 mg/kg
Oral (rat) LD_{50}: 500 mg/kg
Dermal (rabbit) LD_{50}: >2000 mg/kg
Intraperitoneal (rat) LD_{50}: 2562 mg/kg
Oral (mouse) LD_{50}: 2950 mg/kg
Intraperitoneal (mouse) LD_{50}: 2000 mg/kg
Oral (rabbit) LD_{50}: 2830 mg/kg
Dermal (rabbit) LD_{50}: >2000 mg/kg
Eye effects, respiratory tract changes, diarrhea, specific developmental effects (cardiovascular system) recorded.

Irritation
Eye (human): 80 ppm

See *RTECS* HT 7525000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it can be moderately to tightly adsorbed. Leaching from hazardous waste disposal areas has occurred and the detection in various groundwaters indicates that leaching can occur. Volatilization from soil surfaces may be an important transport mechanism. It is possible it will be slowly biodegraded in soil under aerobic conditions. Chemical transformation by hydrolysis, oxidation or direct photolysis are not expected to occur in soil. If released to water, volatilization may be the dominant removal process. The volatilization half-life from a model river one meter deep flowing one meter/sec with a wind velocity of 3 m/sec is estimated to be 4.3 hours at 20 °C. Adsorption to sediment will be a major environmental fate process based upon extensive monitoring data in the Great Lakes area and K_{oc} values based upon monitoring samples. Analysis of Lake Ontario sediment cores has indicated presence and persistence since before 1940. Adsorption to sediment will attenuate volatilization. Aerobic biodegradation in water may be possible, however, anaerobic biodegradation is not expected to occur. For the most part, experimental BCF values reported in the literature are less than 1000 which suggests that significant bioconcentration will not occur; however, a BCF of 1800 was determined for guppies in one study. Aquatic hydrolysis, oxidation and direct photolysis are not expected to be important. If released to air it will exist predominantly in the vapor-phase and will react with photochemically produced hydroxyl radicals at an estimated half-life rate of 31 days in typical atmosphere. Direct photolysis in the troposphere is not expected to be important. The detection in rain-water suggests that atmospheric removal via wash-out is possible.
Ecotoxicity: LC_{50} Poecilia reticulata (guppy) 4.0 ppm/14 days /Conditions of bioassay not specified; LC_{50} Lepomis macrochirus (bluegill sunfish) 4.54 mg/l/24 hr; 4.3 mg/l/48 hr; 4.25 mg/l/96 hr /Static bioassay; LC_{50} Sheepshead minnow 7.5-10 mg/l/24 hr; 7.17 mg/l/48 hr; 7.4 mg/l/96 hr /Static bioassay
Henry's Law Constant: 0.0015
BCF: increases with log p
Octanol/Water Partition Coefficient: log $K_{ow} = 3.39$
Soil Sorption Partition Coefficient: $K_{oc} = 273$

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible or consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Bury residue in an authorized landfill.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Environmentally hazardous substances, solid, n.o.s.
ID: UN3077
Hazard Class: 9 - Miscellaneous hazardous material
Packing Group: III - Minor Danger
Symbols: G - Technical Name Required
Label Codes: 9 - Class 9
Special Provisions: 8, 146, B54, IB8, N20
Packaging: **Exceptions:** 155 **Non-bulk:** 213 **Bulk:** 240
Quantity Limitations: **Passenger aircraft/rail:** No limit **Cargo aircraft only:** No limit
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U072 Toxic Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser’s purposes are necessarily the purchaser’s responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser’s intended purpose or for consequences of its use.

Material Safety Data Sheet

Diesel MSDS

Synonyms: **Gas Oil, Derv, Ultra Low Sulphur Diesel, ADIO** Version of: **27.10.08** Version: **1** This sheet supersedes the one dated: **12.07.05 / 05.08 PAGE 1 of 9**

Product Labels

LABELLING (standard or EU):	Concerned
Symbol(s):	
Symbol(s):	Xn Harmful N Dangerous for the environment.
Contains:	Gasoil
R-phrases:	R-40 Limited evidence of a carcinogenic effect. R-65 Harmful: may cause lung damage if swallowed. R-66 Repeated exposure may cause skin dryness or cracking. R-51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S-phrases:	**S-36/37 Wear suitable protective clothing and gloves.** S-62 If swallowed, do not induce vomiting: seek medical advice immediately and show the container or label. S-61 Avoid release to the environment. Refer to special instructions/Safety Data Sheets. S-29 Do not empty into drains. S-2 Keep out of reach of children.

1. Identification of the Substance/Preparation and of the Company Undertaking

Name of the product:	DIESEL
Other products concerned:	DERV, ULTRA LOW SULPHUR DERV, GAS OIL CI, ULTRA LOW SULPHUR GAS OIL, MARINE GAS OIL, MARINE DIESEL OIL.
Product application:	Fuel for diesel engines and combustion turbines
Supplier:	Abbey Chemicals 27-30 North River Road, Great Yarmouth Norfolk, NR30 1SH Tel: 01493 850303 Fax: 01493 330909 www.abbey-chemicals.co.uk
Poisons Advice Centre:	NHS Direct: 0845 46 47 / Textphone: 0845 606 46 47
Burns Units:	NHS Direct: 0845 46 47 / Textphone: 0845 606 46 47
See local details at end of sheet:	

2. Composition/Information on Ingredients

PREPARATION

Chemical nature: Substance composed of paraffin hydrocarbons, naphthenic, aromatic and olefin hydrocarbons, with mainly hydrocarbons from C9 to C20 (CAS: 68334-30-5).
Contains also:
- Vegetable oil esters such as methyl ester from rapeseed oil =<5% vol (in certain cases =< 30% vol)
- Multi-purposes additives to boost performance.C.

Substances presenting a health hazard	EC No.	CAS No.	Content	Symbol(s)	R-phrases
Gasoil		68334-30-5	>90 %	Xn ,N	R-40, 65, 66, 51/53

See section 16 for explanations of R-phrases:

Additives:

1. Middle distillate flow improvers (various) up to 1000ppm. (Dispersion of Ethylene vinyl acetate in an organic solvent). CAS No. 24937-78-8.
2. Cetane improvers (Alkyl Nitrates) - up to 500ppm. CAS No. 27247-96-7 EINECS No. 269-822-7.
3. May contain Dye and Chemical Marker - Gas Oil Marker Concentrate. CAS No. 68334-30-5.
4. Antistactic Additive 1-3ppm
5. May contain a multifunctional detergent
6. Fatty Acid Methyl Ester (FAME) 5% CAS No. 67762-39-3, EINECS No. 267-015-4

3. Hazards Identification

Health effects: Prolonged or repeated contact with skin destroys the lipoacid skin layer and may cause dermatitis.
Vapours or mists are irritating for mucous membranes, notably in the eyes.
If swallowed accidentally, the product may enter the lungs due to its low viscosity and lead to the rapid development of very serious inhalation pulmonary lesions (medical survey during 48 hours).

Environmental impact: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Product classification: Category 3 carcinogen
Harmful: may cause lung damage if swallowed.
Dangerous for the environment.

4. FIRST AID MEASURES

General:	IN CASE OF SERIOUS OR PERSISTENT CONDITIONS, CONSULT A DOCTOR OR CALL FOR EMERGENCY MEDICAL AID.
Inhalation:	In case of exposure to intense concentrations of vapours, fumes or spray, transport the person away from the contaminated zone, keep warm and allow to rest. Possible irritation of the respiratory tract and the mucous membranes. If breathing has stopped, apply artificial respiration.
Ingestion:	Consult a doctor. Do not induce vomiting to avoid the risk of aspiration into the respiratory tract. Allow the person to rest. Possible risk of vomiting and diarrhoea.
Skin contact:	Immediately remove all soiled or stained clothing. Wash immediately and abundantly with soap and water. If the skin is exposed to high-pressure spray, the product may enter the human body. In all such cases the affected person must be taken to hospital, even if no sign of injury can be detected.
Eye contact:	Wash immediately in copious amounts of water, keeping eyelids apart for at least 15 minutes and consult a specialist.
Aspiration:	Aspiration of the liquid into the lungs is extremely dangerous (acute lung conditions). If the product is believed to have entered the lungs (in case of vomiting, for example), take the person to hospital for immediate care.

5. FIRE FIGHTING MEASURES

Flash point:

see heading 9 - "Physical and chemical properties"

Extinguishing media:
- suitable:
Foam, CO_2, powder, possibly water spray (preferably water containing a wetting agent).
- not recommended:
Solid water streams are prohibited as they could help to spread the flames.
Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

Specific fire-fighting methods:
Cool down any tanks and surfaces exposed to fire by spraying abundantly with water.
Isolate the source of the combustible product; allow to burn out under supervision or use appropriate fire extinguishers, as applicable.

Specific hazards:
Incomplete combustion and thermolysis may produce gases of varying toxicity such as carbon monoxide, carbon dioxide, various hydrocarbons, aldehydes and soot. These may be highly dangerous if inhaled.

Protective measures for firefighters:
Use water curtains to protect the personnel.
Insulated breathing apparatus must be worn in confined premises with heavy concentrations of fumes and gases.

6. ACCIDENTAL RELEASE MEASURES

Personal protection:
As applicable in view of the risk of exposure, wear hydrocarbon-resistant protective clothing, a mask (if inhaling vapours is a risk), gloves, goggles, and boots (see also section 8).

After spillage / leakage:
Do not allow to penetrate into sewers, rivers and ground water.
Cover discharges with foam in order to reduice the risks of ignition.
In case of spillage, contact the competent authorities if the situation cannot be brought under control rapidly and efficiently.

Spill cleanup methods:
- Recovery:
Use mechanical means such as pumps, skimmers and absorbent materials.
Never use dispersing agents.
Contain and collect the spilled product with sand or any other inert absorbent material.

Preserve the waste in closed and sealed recipients.
- Elimination:
Hand over contaminated materials to an approved collector - see also section 13. Do not discard to sewers.

Prevention of secondary risks:
Remove all sources of ignition.

7. HANDLING AND STORAGE

HANDLING:

Prevention of user exposure:	Prevent the formation of vapours, mist and aerosols. Handle in well-ventilated premises. Keep the product away from food and beverages. Operations involving the inspection, cleaning and maintenance of storage containers require the application of strict procedures and must be entrusted to qualified specialist personnel only. DO NOT SMOKE. AVOID INHALING VAPOURS. AVOID CONTACT WITH THE SKIN AND MUCOUS MEMBRANES. NEVER ATTEMPT TO PRIME THE CONTAINER SIPHON BY SUCKING WITH THE MOUTH. WEAR SUITABLE PROTECTION AND PROTECTIVE CLOTHING. Never weld, drill, grind, cut or saw any empty container.
Prevention of fire and explosion:	Arrange machinery and equipment so as to prevent the sheet of burning product from spreading (retention pits and basins, syphons in the water drainage system). Handle away from any source of ignition (open flame and sparks) and heat (hot manifolds or casings). Do not use compressed oxygen or air when transferring or pouring the products. OPERATE ONLY ON COLD AND DEGASSED RESERVOIRS IN VENTILATED PREMISES (TO AVOID RISK OF EXPLOSION).
Precautions:	Loading and unloading must be carried out at ambient temperature. To prevent risks related to static electricity build-up, ensure that the machinery, equipment and tanks are properly earthed, prohibit splash loading and ensure that the product is poured slowly, particularly at the beginning of the operation. Avoid extended and repeated contact with the skin as this may cause skin conditions, which may also be aggravated by minor injuries or by contact with soiled clothing. Remove any soiled or splashed clothing immediately. After contact with skin, wash immediately with plenty of water and soap. Avoid breathing in vapours, fumes or mists. Do not eat or drink or smoke during use. Avoid contact with strong oxidising agents. Use only hydrocarbon-resistant containers, joints, pipes etc...

STORAGE:

Technical measures:	Prevent any build-up of static electricity. Make the necessary arrangements to prevent water and soil pollution. Don't withdraw the danger labels of the containers (even if they are empty).
Storage precautions:	- Suitable: Store packaged product (drums, samples, cans...) in well-ventilated areas. STORE AT AMBIENT TEMPERATURE, away from water, moisture, heat, and any source of ignition. - To be avoided: Do not store exposed to the elements.
Incompatible products:	Dangerous reaction when in contact with strong oxidizers (herbicides etc...).
Packaging materials:	- Recommended: Use only hydrocarbon-resistant containers, joints, pipes, etc.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Technical measures:	Use the product in a properly ventilated atmosphere. When working in confined spaces (tanks, containers, etc.), ensure that there is a supply of air suitable for breathing and wear the recommended equipment.
Occupational exposure limit:	. oil mist : 10mg/m3, for 15 minutes . oil mist : 5mg/m3, for 8 hours
Respiratory protection:	In confined premises, protective respiratory equipment may need to be used.
Hand protection:	Impermeable hydrocarbon-proof gloves. - In case of splashes or limited contact : Recommended materials: neoprene > 0,5 mm, PVC > 0,2 mm of liquid-proof material / > 60 minutes (EN 374-3). - In case of prolonged or repeated contact : Recommended materials : Fluoro polymer, PVA, all layer thickness, Nitrile > 0,3 mm, neoprene / > 480 minutes (EN 374-3). For more precise details about the choice of appropriate protective glove, please contact the manufacturer.
Eye protection:	Goggles, in case of risk of splashing. (EN166) Skin and body (other than the hands) protection : Face mask, hydrocarbon-proof clothing, safety boots, as applicable.
Hygienic work practices:	Avoid contact with the skin. If the product comes into contact with the skin, wash the affected area immediately and copiously with soap and water. In case of contact with eyes, wash immediately in copious amounts of water while keeping eyelids spread apart for at least 15 minutes and consult a specialist.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Liquid
Colour:	Yellow.
Odour:	Characteristic.
Density/specific gravity:	820 - 875 kg/m^3 Temperature (°C) 15
Flash point:	> 55 °C (NF EN ISO 22719)
Auto Ignition Temperature:	> = 250 ºC (ASTM E 659)
Comments on autoignition temperature:	This value may be significantly lower in the case of contact with potentially catalytic materials (metals like copper, strongly divided materials)
Flammability limit - lower(%):	0,5
Flammability limit - upper(%):	5
Comments on explosivity:	Explosive mixtures may form in contact with air.
Temperatures at phase change:	Initial distillation point: >= 150 ° C Distillation range within: ~ 150-380 ° C
Vapour density:	> 5 (air=1)
Vapour pressure:	< 100 kPa / 10 kPa Temperature (°C) 100 / 40
Solubility:	- in water: Practically immiscible - in organic solvents: Soluble in many common solvents.
Partition coefficient (log Pow):	Log Pow = 3,9 - 6
Viscosity:	< 7 mm^2/s à 40°C
Further information:	- pH: not applicable

10. STABILITY AND REACTIVITY

Stability:	The product is stable at normal storage, handling and use temperatures. **Conditions**
to avoid:	Heat, sparks, ignition points, flames, static electricity.
Materials to avoid:	Strong oxidising agents.
Hazardous decomp. products:	Incomplete combustion and thermolysis produces potentially toxic gases such as carbon monoxide, carbon dioxide, various hydrocarbons, aldehydes and soot.

11. TOXICOLOGICAL INFORMATION

Acute toxicity / Local effect:

Inhalation, comments:	Strong concentrations of vapour, mist or spray may be irritating for the respiratory tract and for mucous membranes.
Skin contact, comments:	Not classified.
Eye contact, comments:	Not classified as irritating, but may cause a burning feeling and temporary reddening.
Ingestion, comments:	Harmful: If swallowed accidentally, the product may enter the lungs due to its low viscosity and lead to the rapid development of very serious pulmonary lesions (medical survey for 48 hours min).

CHRONIC TOXICITY OR LONG-TERM TOXICITY:

Skin contact:	Prolonged or repeated contact with the skin destroys the lipoacid skin layer and may cause dermatitis with the risk of secondary allergies.
Sensitization:	Not classified as allergenic.
Carcinogenicity:	Possible risks of irreversible effects. Certain tests on animals have shown a development of malignant skin tumours.

12. ECOLOGICAL INFORMATION

Comments about ecotoxicity:	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment (CONCAWE recommendation).
Mobility:	- Air: Having low volatility at room temperature, the product evaporates in the atmosphere and disperses to a degree, depending on local conditions. - Soil: The product may infiltrate the ground. - Water: The product spreads on the surface of the water. A small amount may dissolve.
Bioaccumulation:	The potential for bioaccumulation of the product in the environment is very low.
Persistence and degradability:	The majority of the components of the product are intrinsically biodegradable

13. DISPOSAL CONSIDERATIONS

Waste disposal: The recommanded method is recycling or incineration at an approved installation.

Disposal of contaminated packaging:
Empty packagings may contain flammable or explosive vapours.
Disposal via an authorised waste contractor.

14. TRANSPORT INFORMATION

UN Number: 1202

Proper shipping name (national):
DIESEL
FUEL

Proper shipping name (international): DIESEL
FUEL

Road (ADR) / Rail (RID):
Class: 3
Code de classification: F1
Hazard Label(s): 3
Hazard identification number: 30
Packing Group: III
Transport by barge (ADNR):
Class: 3
Code de classification: F1
Hazard Label(s): 3
Packing Group: III
Marine (IMO-IMDG):
Class: 3
Hazard Label(s): 3
Safety card: F-E, S-E
Packing Group : III
Special provisions: - ADR / RID / ADNR : 640L
UK Road Transport Class: 3
HAZCHEM code: 3/Y

15. REGULATORY INFORMATION

Symbol(s):

Symbol(s): Xn Harmful N Dangerous for the environment.

Contains: Gasoil

Risk phrases:
R-40 Limited evidence of a carcinogenic effect.
R-65 Harmful: may cause lung damage if swallowed.
R-66 Repeated exposure may cause skin dryness or cracking.
R-51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety phrases:
S-36/37 Wear suitable protective clothing and gloves.
S-62 If swallowed, do not induce vomiting: seek medical advice immediately and show the container or label.
S-61 Avoid release to the environment. Refer to special instructions/Safety Data Sheets.
S-29 Do not empty into drains.
S-2 Keep out of reach of children.

EU directives: Hazardous preparations directive 1999/45/EC modified (Directive 2001/60/EC). D. 67/548/EC modified by D. 2004/73/EC (29th ATP)

16. OTHER INFORMATION

HSE Infoline: 08701 545500 / Minicom: 02920 808537

This sheet is in compliance with the standards defined by the directives 91/155/CEE, 93/112/CEE, 2001/58/CE and the article 14 of the directive 1999/45/EC.

Explanations of R-phrases in section 2 :
R-40 Limited evidence of a carcinogenic effect.
R-65 Harmful: may cause lung damage if swallowed.
R-66 Repeated exposure may cause skin dryness or cracking.
R-51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

RECOMMENDED USES AND RESTRICTIONS ON USE:

The product is to be used exclusively for the production as fuel for diesel engines and combustion turbines

Revision date: 2007-08-07 **Supersedes**

the data sheet of: 2005-12-07 *

Information revised since the previous version of the SDS :

Safety Data Sheet status : Approved.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

2, 3, 7, 8-Tetrachlorodibenzo-*p*-dioxin
TET2190

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification 44/60

Material Name: 2, 3, 7, 8-Tetrachlorodibenzo-*p*-dioxin **CAS Number:** 1746-01-6
Chemical Formula: $C_{12}H_4Cl_4O_2$
EINECS Number: 217-122-7
ACX Number: X1002670-1
Synonyms: 2,3,7,8-CZTEROCHLORODWUBENZO-P-DWUOKSYNY; DIBENZO(B,E)(1,4)DIOXIN,2,3,7,8-TETRACHLORO-; DIBENZO-P-DIOXIN,2,3,7,8-TETRACHLORO-; DIOKSYNY; DIOXIN; DIOXIN (HERBICIDE CONTAMINANT); DIOXINE; TCDBD; 2,3,7,8-TCDD; TCDD; 2, 3, 7, 8-TETRACHLORODIBENZO-*P*-DIOXIN; 2,3,7,8-TETRACHLORODIBENZO(B,E)(1,4)DIOXAN; 2, 3, 7, 8-TETRACHLORODIBENZO-P-DIOXIN; 2,3,6,7-TETRACHLORODIBENZO-P-DIOXIN; 2,3,7,8-TETRACHLORODIBENZO(B,E)(1,4)DIOXIN; 2,3,7,8-TETRACHLORODIBENZO-1,4-DIOXIN; 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN; TETRACHLORODIBENZODIOXIN; 2,3,6,7-TETRACHLORODIBENZOIDIOXIN; TETRADIOXIN
Derivation: TCDD is not manufactured, but is formed as a by-product of chlorobenzenes, chlorophenols, and the herbicides 2, 4, 5-trichlorophenoxyacetic acid (2, 4, 5-T) and 2-(2, 4, 5-trichlorophenoxy)propionic acid (Silvex) which are produced from 2, 4, 5-trichlorophenol (TCP). 2, 4, 5-T, commonly known as Agent Orange, was the defoliant used during the Vietnam War. TCP, 2, 4, 5-T and Silvex are no longer commercially produced in the U.S. As a chemical and toxicological standard, TCDD can be prepared by catalytic condensation of potassium 2, 4, 5-trichlorophenate. TCDD has been released to the environment during the incineration of chemical wastes including chlorinated benzenes, chlorophenols, and biphenyl ethers, from the improper disposal of certain chlorinated chemical wastes, in emissions from wood burning in the presence of chlorine, in accidental fires involving transformers containing PCBs, and from the use of the herbicides 2, 4, 5-T and Silvex.
General Use: TCDD is an extremely toxic, unwanted by-product and essentially has no beneficial uses. It may be used as a research chemical.

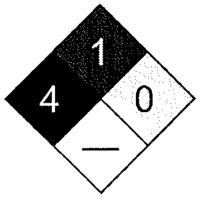
Section 2 - Composition / Information on Ingredients

Name	**CAS**	**%**
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin	1746-01-6	ca 100% wt.

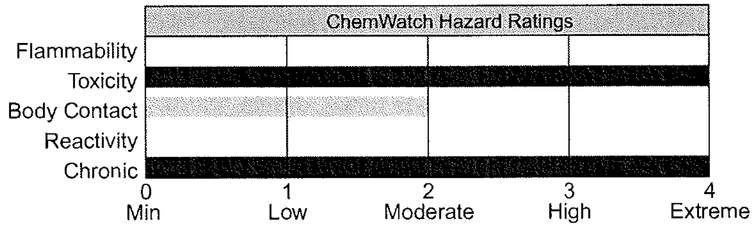
Trace Impurities: TCDD normally persists as a contaminant in TCP in variable amounts (0.07-6.2 mg/kg). Consequently, the concentrations of TCDD in different batches of Agent Orange varied greatly with an average concentration of about 2 ppm.

OSHA PEL	**NIOSH REL**	**DFG (Germany) MAK**
ACGIH TLV		TWA: 10 pg/m^3; PEAK: 80 pg/m^3; skin; measured as inhalable fraction of the aerosol.

Section 3 - Hazards Identification



Fire Diamond



HMIS
4 Health
1 Flammability
0 Reactivity

ANSI Signal Word
Danger!


Poison


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless, crystalline solid. Corrosive. Poison. Other Acute Effects: chloracne, metabolic disorders, nervous system/liver damage. Chronic Effects: teratogenesis/tumorigenesis/immunological dysfunction (animal data). Potential human carcinogen.

Potential Health Effects

Target Organs: Skin, liver, and nervous system.

Primary Entry Routes: Inhalation (dust),* skin contact, ingestion.

Acute Effects The observed health effects from clinical or epidemiological studies of populations who were occupationally and non-occupationally exposed cannot be solely attributed to TCDD because of the concurrent exposure to 2, 4, 5-T and TCP and to other herbicides as well. There is no report of human exposure to TCDD alone.

Inhalation: Shortness of breath, headaches, fatigue, severe muscle pains, weakness, and digestive disturbance. Most symptoms develop slowly, over many days.

Eye: Conjunctivitis and chemical burns.

Skin: Chemical burns. In most cases, chloracne appears within 2 to 4 weeks after initial exposure. It consists of blackheads with small, pale-yellow cysts. In severe cases, there may be papules (red spots) or even pustules (pus-filled spots). This acne-like rash appears on the cheekbones under the eyes and behind the ears in very mild cases. With increasing severity, the rest of the face and neck are affected and the outer upper arms, chest, back, abdomen, outer thighs and genitalia may be involved in varying degrees in the worst cases. In the worst cases, lesions may be active 15 or more years after the contact has ceased. Chloracne may also appear after ingestion or inhalation. Skin fragility, hirsutism (excessive growth of hair of normal or abnormal distribution), and photosensitivity may also occur.

Ingestion: Nausea, vomiting, and possible pancreatitis.

Carcinogenicity: NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Not listed; EPA - Not listed; MAK - Class A2, Unmistakably carcinogenic in animal experimentation only.

Medical Conditions Aggravated by Long-Term Exposure: Skin, liver, nervous and endocrine system disorders.

Chronic Effects: Lack of energy, loss of sex drive, personality and mood changes, numbness, weakness and pain in the legs, liver damage, chloracne, and elevated blood lipids. TCDD increased the incidence of a variety of tumors in animals, but human data is inconclusive. Little is known of the human health effects (if any) as a result of long-term exposures to low concentrations.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin Contact: *Quickly* remove contaminated clothing. Flush with water to remove solid particles; follow with a soap and water wash of exposed areas. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For an acute exposure, obtain liver function tests, CBC, prothrombin time, serum lipids, and uroporphyrins. EMG may be useful in detecting subclinical neuropathy. Current analytical techniques to detect dioxins in human tissue specimens involve gas chromatography and mass spectrometry. Chloracne may respond to topical retinoic acid, and oral tetracyclines may help secondary pustular follicles. Resistant cases may require dermabrasion or acne surgery. Isotretinoin may be tried.

Special Precautions/Procedures: Emergency personnel should protect against contamination.

Section 5 - Fire-Fighting Measures

See DOT ERG

Flash Point: None reported.

Autoignition Temperature: None reported.

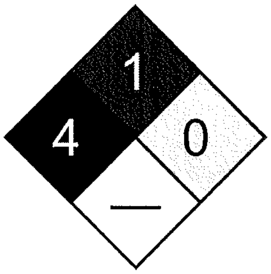
LEL: None reported.

UEL: None reported.

Extinguishing Media: Use dry chemical, carbon dioxide, water spray, or foam extinguisher.

General Fire Hazards/Hazardous Combustion Products: Toxic fumes of chlorine.

Fire-Fighting Instructions: Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.



Fire Diamond

Section 6 - Accidental Release Measures

See DOT ERG

Spill/Leak Procedures: Notify safety personnel of spill, evacuate all unnecessary personnel, remove heat and ignition sources, and provide adequate ventilation. Cleanup personnel should protect against skin and eye contact and dust inhalation.

Small Spills: Carefully collect and place in sealed containers for disposal.

Large Spills: For large spills, dike far ahead of liquid spill for later disposal. Do not release into sewers or waterways. Avoid generating dust. *Do not* sweep! Provide an organized procedure of containment, collection, and disposal of contaminated solutions and residues generated during cleanup. Provide separate facilities for decontamination of large equipment. Conduct repetitive wash/rinse cycles separately, either by using different locations or by spacing in time.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120). Also EPA regulations.

Section 7 - Handling and Storage

Handling Precautions: Handle with extreme caution. Take all the necessary precautions to avoid any exposure. Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in tightly closed and properly labeled containers in a cool, well-ventilated area.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Isolate work areas involving TCDD or TCDD-contaminated materials. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Consider preplacement and periodic medical examinations with emphasis on the skin, liver, nervous and endocrine systems. Regularly monitor glassware, bench tops, instruments, and tools with wipe tests (wipe with filter paper and measure amount of TCDD).

Personal Protective Clothing/Equipment: Consider disposable clothing due to the uncertainty of adequate decontamination. Wear protective clothing consisting of both outer (zippered coverall with attached hood and draw string or elastic sleeves, gloves and closure boots) and inner (cotton overalls, undershirts, undershorts, gloves, and socks) garments. For dust or particulate exposure, wear coveralls of a non-woven fabric such as Tyvek or spun bonded polyethylene. For exposure to liquids, wear coveralls, gloves, and boots made of chemically resistant materials such as Saranax coated Tyvek or butyl, nitrile, or neoprene rubber. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For situations where TCDD contamination is low (e.g., exposure to dust contaminated with low levels of TCDD), wear an air-purifying respirator until the extent and characterization of the exposure can be determined. For materials highly contaminated with TCDD, wear respirators that consist of self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive pressure mode. An alternate method utilizes a combination Type C supplied-air respirator, with full facepiece, operated in a pressure-demand mode and equipped with auxiliary positive pressure self-contained air supply. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Shower and change clothes after potential exposures or at the end of the work day. Separate contaminated work clothes from street clothes. Launder before reuse. Place disposable clothing in marked and approved containers for disposal. Remove this material from your shoes and clean personal protective equipment. To prevent cross-contact, provide segregated decontamination locations with separate, controlled, and well-marked entry/exit routes and locations. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless needles.

Physical State: Solid

Vapor Pressure (kPa): 7.4×10^{-10} mm Hg at 77 °F (25 °C)

Formula Weight: 322

Freezing/Melting Point: 581-583 °F (305-306 °C)

Water Solubility: 19.3 ng/L

Other Solubilities: *o*-dichlorobenzene (1.4 g/L); chlorobenzene (0.72 g/L); benzene (0.57 g/L); chloroform (0.37 g/L); acetone (0.11 g/L); *n*-octanol (0.05 g/L); methanol (0.01 g/L); lard oil (0.04 g/L)

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: TCDD is relatively stable toward heat, acids, and alkalis. It is changed chemically when exposed in isooctane or *n*-octanol to UV light. Hazardous polymerization cannot occur. Avoid heat and ignition sources.

Storage Incompatibilities: None reported.

Hazardous Decomposition Products: Thermal oxidative decomposition of TCDD can produce toxic fumes of chlorine. Decomposition begins at 932 °F (500 °C) and complete decomposition occurs within 21 sec at 1472 °F (800 °C).

Section 11 - Toxicological Information

Acute Oral Effects:

Rat, oral, LD_{50}: 20 μg/kg.

Mammal, oral, LD_{50}: 4200 ng/kg produced changes of the liver, kidney, ureter, bladder, and spleen.

Acute Skin Effects:

Human, skin, TD_{Lo}: 107 μg/kg produced dermatitis and allergic reaction.

Irritation Effects:

Rabbit, eye: 2 mg caused moderate irritation.

Other Effects:

Rat, oral: 6500 ng/kg/13 weeks (intermittent) caused changes in liver and thymus weight and pigmented or nucleated red blood cells.

Rat, oral: 27 μg/kg/65 weeks (continuous) caused liver and kidney tumors.

Rat, oral: 52 μg/kg/2 yr (intermittent) caused liver and thyroid tumors.

Tumorgenicity, mouse, skin: 97 μg/kg/13 weeks (intermittent) caused diffuse hepatitis (hepatocellular necrosis); changes in spleen; and death.

Human cell: 100 pmol/L caused unscheduled DNA synthesis.

Monkey, oral, TD_{Lo}: 92 ng/kg (46 weeks prior to mating, on each day during gestation, and for 17 weeks following birth) caused effects on the newborn (behavioral; delayed effects).

Human cell: 10 nmol/L caused DNA inhibition.

See *RTECS* HP3500000, for additional data.

Section 12 - Ecological Information

Environmental Fate: When released to the atmosphere, gas-phase TCDD is degraded by reaction with hydroxyl radicals and direct photolysis (half-life = 8.3 days). Particulate-phase TCDD may be physically removed from air by wet and dry deposition. TCDD may be transported long distances through the atmosphere with surface water sediments being an ultimate environmental sink of airborne particulates. TCDD will absorb to sediment and limit the overall rate by which TCDD is removed from water. TCDD near the water's surface may experience significant photodegradation. 1.5 yr is the persistence half-life of TCDD in lakes. TCDD is generally resistant to biodegradation. Photodegradation on terrestrial surfaces may be an important transformation process. During warm conditions, volatilization from soil surfaces may be a major removal mechanism. Volatilization of TCDD from dry soil surfaces is likely to be faster than from wet soil surfaces. TCDD that has been mixed into soil depths beneath the upper surface boundary will volatilize extremely slowly. On soil surfaces, persistence half-life of TCDD on soil surfaces varies from less than 1 yr to 3 yr. Half-lives in soil interiors may be as long as 12 yr. TCDD is immobile in soil and is not expected to leach. Lateral movement due to surface erosion may occur.

Ecotoxicity: No data found.

Henry's Law Constant: 1.62×10^{-5} atm m^3/mole at 25 °C (estimated)

BCF: Bioconcentration will occur in aquatic organisms. Due to TCDD's low solubility in water and lipids as well as its low partition coefficient in lipids, TCDD is not likely to accumulate in as many biological systems as DDT.

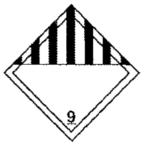
Octanol/Water Partition Coefficient: $\log K_{OW} = 7.02$

Section 13 - Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):



Shipping Name and Description: Environmentally hazardous substances, solid, n.o.s.
ID: UN3077
Hazard Class: 9 - Miscellaneous hazardous material
Packing Group: III - Minor Danger
Symbols: G - Technical Name Required
Label Codes: 9 - Class 9
Special Provisions: 8, 146, B54, IB8, N20
Packaging: **Exceptions:** 155 **Non-bulk:** 213 **Bulk:** 240
Quantity Limitations: **Passenger aircraft/rail:** No limit **Cargo aircraft only:** No limit
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a) 1 lb (0.454 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Not listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

UNLEADED GASOLINE (ALL GRADES)
MATERIAL SAFETY DATA SHEET

Petrocom Energy Group, LLC
1330 Post Oak Blvd., Suite 2350
Houston, Texas 77056
Phone: 713-418-3000
Fax: 713-418-3001

Revision Date: 03/05/2008

Section 1: Product Identification

Name:	Unleaded Gasoline
Synonyms:	Regular/Midgrade/Premium Gasoline, Motor Fuel, Reformulated Gasoline, RFG, Conventional Gasoline.
CAS No.:	86290-81-5
MSDS No.:	PEG-UNL
Use:	Motor fuel

Section 2: Product Composition

Component	CAS Number	Amount (%)
Gasoline	86290-81-5	0 – 100
Benzene	71-43-2	0 – 5
Toluene	108-88-3	0 – 30
Xylene (all isomers)	1330-20-7	0 – 25
Hexane (other isomers)	Mixture	5 – 25
n-Hexane	110-54-3	0 – 3
Cyclohexane	110-82-7	0 – 3
Octanes (all isomers)	Mixture	0 – 20
Heptane (all isomers)	142-82-5	0 – 15
Ethanol	64-17-5	0 – 10
Pentanes (all isomers)	Mixture	0 – 20
Trimethylbenzenes (all isomers)	95-63-6	0 – 5
Ethylbenzene	100-41-4	0 – 5
Cumene	98-82-8	0 – 5
Methyl Tertiary Butyl Ether (MTBE)	1634-04-4	0 – 16
Tertiary Amyl Methyl Ether (TAME)	994-05-8	0 – 6

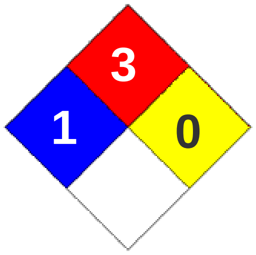
Section 3: Hazards Identification

Emergency Overview

DANGER!
Extremely Flammable liquid and vapor
Harmful if swallowed
Skin Irritant
May cause eye and respiratory irritation
Cancer Hazard – Contains material which can cause cancer

Hazard Rankings

NFPA



Physical form:	Liquid
Appearance:	Clear to amber
Odor:	Strong, Gasoline

Potential Health Effects

Eyes:	Contact with eyes may cause irritation, redness, tearing, stinging, watering and blurred vision.
Skin:	Contact with skin may cause irritation, itching, redness and skin damage. Prolonged or repeated contact may cause drying and cracking of the skin, and may also cause dermatitis and inflammation. (See also section 11).
Inhalation:	Breathing high concentration can be harmful. Throat and lung irritation may occur. Central nervous system effects including nausea, euphoria, dizziness, headache, fatigue, drowsiness or unconsciousness may occur due to long term or high concentration exposure to vapors.
Ingestion:	Toxic if swallowed. This product may cause nausea, vomiting, dizziness, drowsiness, diarrhea if swallowed. Central nervous system effects may be caused. Swallowing this product can result in severe lung damage and/or death.
Signs / Symptoms:	When overexposed to this product effects such as nausea, vomiting, blurred vision, respiratory failure, central nervous system depression, unconsciousness, tremor, death may occur.

See toxicological Information (section 11)

Section 4: First Aid Measures

Eye contact: Flush eyes immediately with fresh, cool water for at least 15 minutes. If irritation or redness or any symptoms persist, seek medical attention.

Skin contact: Remove contaminated clothes and shoes. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, wash affected area thoroughly with soap and water. If irritation or redness develops, seek medical attention.

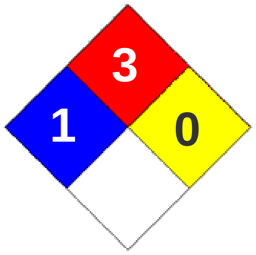
Inhalation (Breathing): If inhaled, immediately move person to fresh air. If there is difficulty breathing, give oxygen. If not breathing, immediately give artificial respiration. Seek medical attention.

Ingestion (Swallowing): This product may be harmful or fatal if swallowed. This product may cause nausea, vomiting, diarrhea and restlessness. Do not induce vomiting. Do not give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is unconscious or drowsy, place on the left side with the head down. Seek immediate medical attention.

Notes to Physician: This material sensitizes the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material.
Inhalation overexposure can produce toxic effects. Monitor respiratory distress. If difficulty in breathing evaluate upper respiratory tract inflammation, bronchitis and pneumonitis. Administer supplemental oxygen as required.
If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Cinsuder activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubtion or by placement of the body in a Trendelenburg and left lateral decubitus position.

Section 5: Fire Fighting Measures

NFPA Hazard Class: Health = 1 ; Flammability = 3 ; Instability = 0
(0 – Minimal ; 1 – Slight ; 2 – Moderate ; 3 – Serious ; 4 – Severe)



Auto – ignition temperature : >260 ˚C (500 ˚F)

Flash point **:** Closed cup: **-**43 ˚C (-45 ˚F)

Flammable limits **:** Lower: approximately 1.4%
Upper: approximately 7.6%

Products of combustion **:** Carbon monoxide, carbon dioxide, nitrogen and sulfur oxides, smoke, fumes, unburned hydrocarbons and other products of incomplete combustion.

Special properties **:** Flammable liquid! This material can be ignited by heat, sparks, flames or other sources of ignition. Vapors may travel long distances to a source where they can ignite and flash back, or explode. A mixture of vapor and air can create an explosion hazard in confined spaces. If container is not properly cooled, it can rupture n the heat of a fire.

Extinguishing media **:** Use of dry chemical, carbon dioxide, or foam is recommended to extinguish fire. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may not extinguish the fire, unless it is used by experienced fire fighters and under favorable conditions.

Protective Equipment for Fire Fighters **:** Fire fighters should wear appropriate protective equipment and self contained breathing apparatus (SCBA) with a full face piece operated in positive pressure mode.

Section 6: Accidental Release Measures

Personal precautions:	This material is extremely flammable. Eliminate all ignition sources. Keep all hot metal surfaces away from spill/release. All equipment used when handling this material must be grounded.
Spill precautions:	Stay upwind and away from spill. Notify persons down wind of the spill, isolate spill area and keep unauthorized personnel out. If it can be done with minimal risk, try to stop spill. Always wear protective equipment, including respiratory protection. Contact emergency personnel.
Environmental precautions:	Prevent spilled material from entering sewers, drains, soil, and natural waterways. Use foam or spills to minimize vapors (section 5). Spilled material may be absorbed into an appropriate absorbent material.
Methods for cleaning up:	Notify fire authorities and appropriate federal, state and local agencies. Immediate cleanup is recommended.

Section 7: Handling and Storage

Handling: Flammable liquid and vapor. To be used only as a motor fuel. Avoid inhalation of vapors and contact with skin. Wash hands thoroughly after handling this material. Use in a well ventilated area away from all ignition sources. Use product with caution around heat, sparks, static electricity and open flames. Static electricity may ignite vapors and cause fire.

Empty containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks or other ignition sources. The may explode and cause injury and/or death. Empty drums should be completely drained, properly bunged, and returned promptly to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Storage: Store in approved containers only. Keep in tightly closed containers in cool, dry, well ventilated areas. Keep isolated away from heat, sources of ignition and hot metal surfaces.

Section 8: Exposure Controls / Personal Protection

Engineering controls:	Provide ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below their occupational exposure limits. Eyewash stations and safety showers should be located near the work-station.

Personal Protection

Eye Protection:	Keep away from eyes. Safety glasses complying with approved standards should be worn. Chemical type goggles should be worn.
Skin Protection:	Keep away from skin. Skin protection should be worn. Chemical resistant, impervious gloves should be worn. Always follow good personal hygiene practices after handling the material.
Respiratory Protection:	Approved respiratory equipment must be used if a risk assessment indicates it is necessary. If workplace exposure limits for product or components are exceeded, NIOSH approved equipment should be worn.
General Protection:	Use this material in well ventilated areas. Ventilation equipment should be explosion proof also.

Component	Applicable Workplace Exposure Limits
Gasoline	ACGIH – TWA: 300 ppm (8 hours) STEL: 500 ppm (15 minutes)
Benzene	ACGIH – TWA: 0.5 ppm (8 hours) STEL: 2.5 ppm (15 minutes) OSHA – TWA: 1 ppm (8 hours) STEL: 5 ppm (15 minutes)
Toluene	ACGIH – TWA: 20 ppm (8 hours) OSHA – TWA: 200 ppm (8 hours) CEIL: 300 ppm PEAK: 500 ppm (10 minutes)
Xylene (all isomers)	ACGIH – TWA: 100 ppm (8 hours) STEL: 150 ppm (15 minutes) OSHA – TWA: 100 ppm (8 hours)
Hexane (other isomers)	ACGIH – TWA: 500 ppm (8 hours) STEL: 1000 ppm (15 minutes)
n-Hexane	ACGIH – TWA: 50 ppm (8 hours) OSHA – TWA: 500 ppm (8 hours)
Cyclohexane	ACGIH – TWA: 100 ppm (8 hours) OSHA – TWA: 300 ppm (8 hours)
Octanes (all isomers)	ACGIH – TWA: 300 ppm (8 hours) OSHA – TWA: 500 ppm (8 hours)
Heptane (all isomers)	ACGIH – TWA: 400 ppm (8 hours) STEL: 5000 ppm (15 minutes) OSHA – TWA: 500 ppm (8 hours)
Ethanol	ACGIH – TWA: 1000 ppm (8 hours) OSHA – TWA: 1000 ppm (8 hours)
Pentanes (all isomers)	ACGIH – TWA: 600 ppm (8 hours) OSHA – TWA: 1000 ppm (8 hours)
Trimethylbenzenes (all isomers)	ACGIH – TWA: 25 ppm (8 hours)
Ethylbenzene	ACGIH – TWA: 100 ppm (8 hours) STEL: 125 ppm (15 minutes) OSHA – TWA: 100 ppm (8 hours)
Cumene	ACGIH – TWA: 50 ppm (8 hours) OSHA – TWA: 50 ppm (8 hours)
Methyl Tertiary Butyl Ether (MTBE)	ACGIH – TWA: 50 ppm (8 hours)
Tertiary Amyl Methyl Ether (TAME)	ACGIH – TWA: 20 ppm (8 hours)

Section 9: Physical and Chemical Properties

Physical State: Liquid.
Color: Transparent, clear to amber liquid.
Odor: Strong. Characteristic gasoline odor.
pH: Not applicable
Boiling Point: >26 ˚C (>78 ˚F)
Melting Point: Not applicable.
Specific gravity: 0.66 to 0.75 (Water = 1)
Vapor density: 3 to 4 (Air = 1)
Vapor pressure: 220-450 mm Hg at 20˚C (68˚F) / 6-15 Reid-psia at 37.8˚C (100˚F)
Volatility: 720 – 770 g/l VOC (w/v)
Viscosity (at 40 ˚C): < 1
Flash Point: < -45 ˚F / < 43˚C
Bulk Density: 6.0 – 6.4 lbs/gal
Solubility in water: Negligible

Section 10: Stability and Reactivity

Stability: Stable. Extremely flammable liquid and vapor. Vapor can cause fire.

Conditions to avoid: Keep away from heat, flame and all other possible sources of ignition.

Materials to avoid: Keep away from strong oxidizing agents such as acids, chlorine, hydrogen peroxide and oxygen.

Hazardous decomposition products: Please refer to the combustion products identified in Section 5 of this MSDS.

Hazardous Polymerization: Not expected to occur.

Section 11: Toxicological Information

Toxicology Information

Oral toxicity: Almost non-toxic. LD 50: > 2000 mg/kg (species: rats)
Dermal toxicity: Almost non-toxic. LD 50: > 2000 mg/kg (species: rabbits)
Inhalation toxicity: Almost non-toxic. LD 50: > 5 mg/l (species: rats)
Eye irritation: Almost non-irritating. Draize score: > 6 and < 15 (species: rabbits)
Skin irritation: Irritant. Primary irritation index: > 3 and < 5 (species: rabbits)

Other data: Inhalation of high concentrations of vapors or mists may cause respiratory system irritation and damage. It may also result in the damage and depression of the central nervous system and may cause death. Prolonged contact with the material may cause severe skin irritation.

Subchronic toxicity: Dermal studies resulted in significant irritation but not systematic toxicity (species: rabbits). Inhalation exposures (90 day, approximately 1500 ppm vapor) produced light hydrocarbon nephropathy but no significant systemic toxicity (species: rats).

Neurotoxicity: Repeated and prolonged exposures to high concentrations of vapor has been reported to result in central nervous system damage and eventually, death. In a study in which ten human volunteers were exposed for 30 minutes to approximately 200, 500 or 1000 ppm concentrations of gasoline vapor, irritation of the eyes was the only significant effect observed, based on both subjective and objective assessments.
However, no persistent neurotoxic effects were observed in subchronic inhalation studies of gasoline.

Reproductive toxicity: An inhalation study with rats exposed to 0, 400 and 1600 ppm of wholly vaporized unleaded gasoline, 6 hours per day on day 6 through 16 of gestation, showed no teratogenic effects nor indication of toxicity to either the mother or the fetus. Another inhalation study in rats exposed to 3000, 6000, or 9000 ppm of gasoline vapor, 6 hours per day on day 6 through 20 of gestation, also showed no teratogenic effects nor indications of toxicity to either the mother or the fetus.

Chronic toxicity: A lifetime mouse skin painting study of unleaded gasoline applied at 50 microliters, three time weekly, resulted in some severe skin irritation and changes, but no statistically significant increase in skin cancer or cancer to any other organ. Lifetime inhalation of wholly vaporized unleaded gasoline over 2000 ppm has caused increased liver tumors in female mice and increased kidney tumors in male rats. The EPA has concluded that mechanism by which wholly vaporzied unleaded gasoline causes kidney damage is unque to the male rat. The effects in that species (kidney damage and cancer) should not be used in human risk assessment.

Other toxic effects on humans	Extremely hazardous in case of ingestion. Very hazardous in case of eye contact. Hazardous in case of skin contact. Slightly hazardous in case of inhalation.
Carcinogenic effects:	Contains material that may cause cancer depending on the level and duration of exposure.
Target organs:	Contains material that may cause damage to humans organs such as (but not limited to) blood, kidneys, lungs, liver, eye, skin, nervous system and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity:	This material may be toxic to aquatic organisms such as algae and daphnia. It has also shown to be toxic to fish.
Environmental fate:	The material is expected to be readily biodegradable. When released into the environment, some of the constituents of gasoline will volatilize and be photo degraded in the atmosphere. Following spillage, the more volatile components of gasoline will be rapidly lost, with concurrent dissolution of these and other constituents into the water. Factors such as local environmental conditions, photo-oxidation, biodegradation and adsorption onto suspended sediments, can contribute to the weathering of spilled gasoline.

Section 13: Disposal Considerations

Waste disposal:	Avoid disposal of spilled material and runoff and contact with soil, waterways, drains and sewers. Disposal of this product and any of its by products should always comply with the requirements of environmental protection and waste disposal legislation and any local authority requirements. This material would likely be identified as a federally regulated RCRA hazardous waste. See sections 7 and 8 for further information on handling, storage and personal protection. See section 9 for the material's physical and chemical properties.

Section 14: Transportation Information

This material is U.S Department of Transportation (DOT) regulated material.

Shipping name:	Gasoline, 3, UN 1203, PG II Gasohol, 3, NA 1203, PG II (for gasoline blended with less than 20% ethanol).
Hazard class:	3 DOT Class: Flammable liquid
Packing Group:	II
UN / NA Number:	UN1203 / NA1203
Emergency Response Code:	128
Label:	

Section 15: Regulatory Information

TSCA Inventory:	This product and/or its components are listed on the Toxic Substances Control Act (TSCA)
SARA 302 / 304: Emergency planning and notification	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for “Extremely Hazardous Substances” listed in 40 CFR 302.4 and CFR 355. No components were identified.
SARA 311 / 312: Hazard identification	SARA Title III requires facilities subject to this subpart to submit aggregate information on chemicals by “Hazard Category” as defined in 40 CFR 370.2. This material would be classified under: Fire, Acute (immediate) Health Hazard, Chronic (Delayed) Health Hazard.

CERCLA / SARA 313: Toxic and chemical notification and release reporting	This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372

Component	CAS Number	Amount (%)
Benzene	71-43-2	0 – 5
Toluene	108-88-3	0 – 30
Xylene (o, m, p isomers)	1330-20-7	0 – 25
n-Hexane	110-54-3	0 – 3
Cyclohexane	110-82-7	0 – 3
1, 2, 4 Trimethylbenzenes	95-63-6	0 – 5
Ethylbenzene	100-41-4	0 – 5
Cumene	98-82-8	0 – 5
Methyl Tertiary Butyl Ether (MTBE)	1634-04-4	0 – 16

California Proposition 65: This material may contain detectable quantities of the following chemicals known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):
Benzene (CAS NO. 71-43-3)
Toluene (CAS No. 108-88-3)
Ethylbenzene (CAS No. 100-41-4)
Naphthalene (CAS No. 91-20-3)

Canadian Regulations: WHMIS Hazard Class: B2 – Flammable Liquids
D2A – Very Toxic Material

Section 16: Other Information

Issue date:	March 5, 2008
Previous issue date:	No previous date
Version:	1
MSDS Code:	PEG-UNL

Legend:
ACGIH = American Conference of Governmental Industrial Hygienists
CAS = Chemical Abstracts Service Registry
CEIL = Ceiling Limit
CERCLA = The Comprehensive Environmental Response, Compensation and Liability Act
EPA = Environmental Protection Agency
NFPA = National Fire Protection Association
OSHA = Occupational Safety and Health Administration
SARA = Superfund Amendments and Reauthorization Act
STEL = Short Term Exposure Limit (15 minutes)
TWA = Time Weighted Average (8 hours)
WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer:
The information presented in this Material Safety Data Sheet (MSDS) d on data believed to be accurate as of the issuance date of this MSDS. No warranty is expressed or implied for the accuracy or completeness of the above provided information. Petrocom Energy Group, LLC does not assume any liability for any damage or injury arising out of product use by others. The end user of the product has the responsibility for evaluating the accuracy of the data, and determining the safety, toxicity and suitability of the product under any conditions.

Hexachlorobenzene
HEX1500

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Hexachlorobenzene **CAS Number:** 118-74-1
Chemical Formula: C_6Cl_6
EINECS Number: 204-273-9
ACX Number: X1003072-9
Synonyms: AI 3.01719; AMATIN; ANTICARIE; BENZENE,HEXACHLORO-; BUNT-CURE; BUNT-NO-MORE; CEKU C.B; CO-OP HEXA; ENT-1719; EPA PESTICIDE CHEMICAL CODE 061001; ESACLOROBENZENE; GRANOX; GRANOX NM; HCB; HEXA C.B; HEXA CB; HEXACHLORBENZOL; HEXACHLOROBENZENE; JULIAN'S CARBON CHLORIDE; JULIN'S CARBON CHLORIDE; NO BUNT; NO BUNT 40; NO BUNT 80; NO BUNT LIQUID; PENTACHLOROPHENYL CHLORIDE; PERCHLOROBENZENE; PHENYL PERCHLORYL; SAATBEIZFUNGIZID; SANOCID; SANOCIDE; SMUT-GO; SNIECIOTOX; VORONIT C
Derivation: Prepared by the chlorination of benzene; isolation from by-product residues of tetrachloroethylene production; reaction of hexachlorocyclohexane with chlorine or sulfuryl chloride.
General Use: Used in organic synthesis, manufacture of electrodes, dye manufacture, wood preservatives, production of aromatic fluorocarbons; to impregnate paper; as a plasticizer for polyvinyl chloride, rubber peptizing agent. Formerly used as a selective fungicide/pesticide (until 1985).

Section 2 - Composition / Information on Ingredients

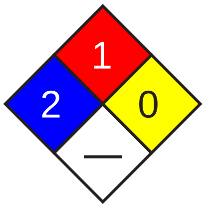
Name	CAS	%
Hexachlorobenzene	118-74-1	ca 100% wt

Trace Impurities: Polychlorinated dibenzo-*p*-dioxins and dibenzofurans; octa-chlorinated and hepta-chlorinated congeners dominate at 0.35 to 58.3 ppm.

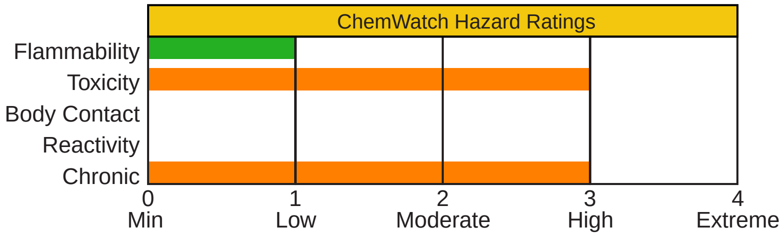
OSHA PEL	NIOSH REL	DFG (Germany) MAK
		Skin.

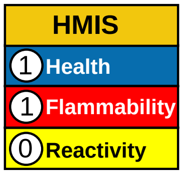
ACGIH TLV
TWA: 0.002 mg/m^3; skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Caution

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

White, crystalline solid; faint odor. Irritating to eyes/skin/respiratory tract. Chronic Effects: skin lesions, liver enlargement, neurologic disturbances. Combustible.

Potential Health Effects

Target Organs: Eyes, skin, respiratory tract, liver, kidneys.
Primary Entry Routes: Inhalation, ingestion, eye and skin contact/absorption.
Acute Effects
Inhalation: Respiratory irritation and difficulty breathing can occur.
Eye: Irritation.
Skin: Irritation; absorption through the skin can contribute to chronic effects.
Ingestion: No data found.

Carcinogenicity: NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A3, Animal carcinogen; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Chronic Effects: An incident in Turkey in the 1950's where persons ingested flour made from seed grains treated with hexachlorobenzene. Over a period of 4 to 5 years, has provided the most details on hexachlorobenzene poisoning. Victims developed porphyria cutanea tarda (severe skin reaction to sun exposure, including blistering which is initiated by prior exposure to polychlorinated hydrocarbons), enlarged liver, lymph nodes, and thyroid, painless arthritis, skin lesions, hyperpigmentation, hirsutism (abnormal hair growth), weakness, paresthesias, myotonia (muscle spasms characterized by prolonged contraction). Toxic effects were still apparent 20 years after exposure. Kidney and lung damage are also possible.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove exposed person to fresh air, monitor for respiratory distress and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain or irritation persist.

Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water followed quickly by a thorough soap and water wash. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treatment is symptomatic and supportive. Urinary metabolites found in animals include pentachlorothiophenol, pentachlorophenol, and tetrachlorohydroquinone.

Section 5 - Fire-Fighting Measures

See DOT ERG

Flash Point: 468 °F (242 °C), Closed Cup

Autoignition Temperature: None reported.

LEL: None reported.

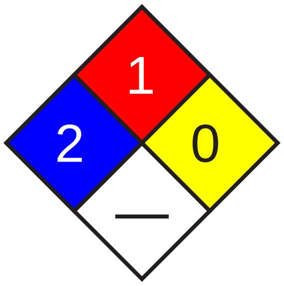
UEL: None reported.

Flammability Classification: Class IIIB Combustible Liquid

Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray, or regular foam. For large fires, use water spray, fog, or regular foam.

General Fire Hazards/Hazardous Combustion Products: Carbon oxide(s), hydrogen chloride, phosgene, and chlorine gas.

Fire-Fighting Instructions: If possible without risk, move containers from fire area. If impossible, apply cooling water to container sides until well after fire is out. Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing provides only limited protection.



Fire Diamond

Section 6 - Accidental Release Measures

See DOT ERG

Spill/Leak Procedures: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off all ignition sources. Cleanup personnel should protect against inhalation and skin/eye contact.

Small Spills: *Do not* sweep! Carefully scoop up or vacuum (with HEPA filter) and place in suitable containers.

Large Spills: Flush spill with water to containment area for later reclamation or disposal. *Do not* release into sewers or waterways.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use with adequate ventilation to control airborne hazards and wear appropriate PPE. Never eat, drink, or smoke in work areas. Practice good personal hygiene after using hexachlorobenzene, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec. 10).

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all equipment used with and around hexachlorobenzene. Where possible, enclose processes to prevent dust dispersion into work area. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove hexachlorobenzene from your shoes and clean personal protective equipment. Discard heavily contaminated shoes. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: White, needle-like crystals with a faint odor.

Physical State: Solid

Vapor Pressure (kPa): 1 mm Hg at 237 °F (114 °C); 1.09 x 10- 5 mm Hg at 68 °F (20 °C)

Formula Weight: 284.8

Density: 1.5691 at 74.5 °F (23.6 °C)

Boiling Point: 613 to 619 °F (323 to 326 °C), *sublimes*

Freezing/Melting Point: 448 °F (231 °C)

Critical Temperature: 1025 °F (552 °C)

Critical Pressure: 28.1 atm

Water Solubility: 0.035 ppm

Other Solubilities: Soluble in benzene, chloroform, carbon disulfide, and ether. Slightly soluble in alcohol and carbon tetrachloride.

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Hexachlorobenzene stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization does not occur. Exposure to heat, ignition sources and dimethyl formamide.

Storage Incompatibilities: Contact with dimethylformamide causes a violent reaction above 149 °F (65 °C).

Hazardous Decomposition Products: Thermal oxidative decomposition of hexachlorobenzene can produce carbon oxide(s), hydrogen chloride, and chlorine gas.

Section 11 - Toxicological Information

Acute Oral Effects:

Rat, oral, LD_{50}: 10 g/kg.

Acute Inhalation Effects:

Rat, inhalation, LC_{50}: 3600 mg/m^3.

Rabbit, inhalation, LC_{50}: 1800 mg/m^3.

Other Effects:

Rat, oral: 1596 mg/kg administered for 28 continuous days produced changes in liver and kidney weight.

Rat, oral: 6450 mg/kg administered from the 1st to 22nd day of pregnancy and on the 21st day post-pregnancy resulted in specific developmental abnormalities of the blood and lymphatic systems including the spleen and bone marrow.

Rat, oral: 40 mg/kg administered from the 10th to 13th day of pregnancy caused specific developmental abnormalities of the musculoskeletal system.

Rat, oral: 2738 mg/kg administered for 2 continuous years produced kidney tumors and leukemia.

Rat, oral: 1050 mg/kg administered for 30 continuous weeks caused liver tumors, and affected body biochemistry including porphyrin and bile pigments.

Rat, oral: 250 mg/kg administered intermittently for 5 weeks caused changes in liver weight, urine composition, and serum composition.

See *RTECS* DA2975000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Hexachlorobenzene is very persistent in the environment. If released to land, hexachlorobenzene will absorb strongly to soil and is not expected to leach to groundwater. Half-life = 1530 days. In water, it will partition from the water column to sediment or suspended particles. Volatilization is rapid (half-life = 8 hr) but if suspended matter is plentiful, persistence in water can occur. In air, hexachlorobenzene is expected to exist primarily in the vapor phase. Degradation is slow via reaction with hydroxyl radicals (half-life is 2 years). Long-range global transport is possible. It can also be removed from air via wet and dry deposition.

Ecotoxicity: *Pimephales promelas* (fathead minnow), LC_{50} = 22 mg/L/96 hr; *Micropterus salmoides* (large mouth bass), LC_{50} = 12 mg/L/96 hr.

Henry's Law Constant: 0.03 to 0.07

Octanol/Water Partition Coefficient: log K_{ow} = 5.31

Section 13 - Disposal Considerations

Disposal: Hexaxchlorobenzene is a potential candidate for rotary kiln incineration in an incinerator equipped with an appropriate scrubber. Irradiation via UV light has degraded hexachlorobenzene into carbon dioxide, hydrogen chloride, and chlorine gas. Studies show that hexachlorobenzene can be dechlorinated at a rate of 13.6 µmol/L/day in fresh anaerobic digester sludge following a lag of ~7 days. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Hexachlorobenzene
ID: UN2729
Hazard Class: 6.1 - Poisonous materials
Packing Group: III - Minor Danger
Symbols:
Label Codes: 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: IB3
Packaging: **Exceptions:** 153 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
- **RCRA 40 CFR:** Listed U127 Toxic Waste
- **CERCLA 40 CFR 302.4:** Listed per RCRA Section 3001, per CWA Section 307(a) 10 lb (4.535 kg)
- **SARA 40 CFR 372.65:** Listed
- **SARA EHS 40 CFR 355:** Not listed
- **TSCA:** Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Hydrex

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name	**Hydrex 6149**
Version #	01
Revision date	07-19-2011
CAS #	Mixture
Product use	Wastewater Flocculant
Manufacturer	
Supplier	Crown Solutions
Address	945 South Brown School Road Vandalia, OH 45377 United States of America
Contact Person	Hydrex Product Manager
Telephone	+1 (800) 875-4075
Fax	+1 (937) 890-9925
e-mail	crown.msds@veoliawater.com
Global Emergency Contact	+1-760-476-3962 (Code: 333239)

2. Hazards Identification

Emergency overview	DANGER EXTREMELY FLAMMABLE SOLID. Spontaneously flammable in air. Pyrophoric - catches fire if exposed to air. Will be easily ignited by heat, spark or flames. High concentrations of dust may form explosive mixture with air. Corrosive. Causes skin and eye burns. Exposure to powder or dusts may be irritating to eyes, nose and throat.
OSHA regulatory status	This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).
Potential health effects	
Routes of exposure	Inhalation. Ingestion. Skin contact. Eye contact.
Eyes	Causes eye burns. Risk of serious damage to eyes. Do not get this material in contact with eyes.
Skin	Causes skin burns. Dust or powder may irritate the skin. Do not get this material in contact with skin.
Inhalation	Causes burns. Dust may irritate respiratory system. Prolonged inhalation may be harmful. Do not breathe dust/fume/gas/mist/vapors/spray.
Ingestion	Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract. May cause irritation. Do not ingest.
Potential environmental effects	Components of this product are hazardous to aquatic life. May cause long-term adverse effects in the environment.

3. Composition / Information on Ingredients

The manufacturer lists no ingredients as hazardous according to OSHA 29 CFR 1910.1200.

4. First Aid Measures

First aid procedures	
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.
Skin contact	Remove and isolate contaminated clothing and shoes. Immediately flush skin with plenty of water. Get medical attention immediately. For minor skin contact, avoid spreading material on unaffected skin. Wash clothing separately before reuse.

Inhalation	Do not use mouth-to-mouth method if victim inhaled the substance. Move to fresh air. Call a physician if symptoms develop or persist.
Ingestion	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Rinse mouth thoroughly. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Product is not considered toxic in small amounts.
Notes to physician	In case of shortness of breath, give oxygen. Keep victim warm.
General advice	Immediate medical attention is required. In case of shortness of breath, give oxygen. Keep victim warm. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire Fighting Measures

Flammable properties	Flammable by OSHA criteria. Heat may cause the containers to explode. Runoff to sewer may cause fire or explosion hazard.
Extinguishing media	
Suitable extinguishing media	Water. Extinguish with foam, carbon dioxide, dry powder or water fog.
Unsuitable extinguishing media	Do not use a solid water stream as it may scatter and spread fire.
Protection of firefighters	
Specific hazards arising from the chemical	Fire may produce irritating, corrosive and/or toxic gases. Material can be slippery when wet.
Protective equipment and precautions for firefighters	Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Structural firefighters protective clothing will only provide limited protection.
Fire fighting equipment/instructions	In case of fire and/or explosion do not breathe fumes. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions. ALWAYS stay away from tanks engulfed in flame. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. Move containers from fire area if you can do so without risk. In the event of fire, cool tanks with water spray. For massive fire in cargo area, use unmanned hose holder or monitor nozzles, if possible. If not, withdraw and let fire burn out.
Specific methods	In the event of fire and/or explosion do not breathe fumes. Cool containers exposed to flames with water until well after the fire is out.

6. Accidental Release Measures

Personal precautions	Keep unnecessary personnel away. Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep people away from and upwind of spill/leak. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering them. Avoid inhalation of dust from the spilled material.
Environmental precautions	Prevent further leakage or spillage if safe to do so. Do not contaminate water.
Methods for containment	ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). If sweeping of a contaminated area is necessary use a dust suppressant agent which does not react with the product. Prevent entry into waterways, sewer, basements or confined areas.
Methods for cleaning up	Should not be released into the environment. Collect dust using a vacuum cleaner equipped with HEPA filter. Avoid dust formation. Following product recovery, flush area with water. For waste disposal, see section 13 of the MSDS. DO NOT GET WATER on spilled material or inside containers.

7. Handling and Storage

Handling	Will ignite if exposed to intensive heat or open air. DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Do not smoke. All equipment used when handling the product must be grounded. Do not get this material in contact with eyes. Do not get this material in contact with skin. Do not get this material on clothing. Use only in area provided with appropriate exhaust ventilation. Wash thoroughly after handling. Avoid release to the environment. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust from this material. Use mechanical ventilation in case of handling which causes formation of dust. Material can be slippery when wet.
Storage	The pressure in sealed containers can increase under the influence of heat. Keep away from heat and sources of ignition. This material can accumulate static charge which may cause spark and become an ignition source. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Keep in an area equipped with sprinklers. Keep out of the reach of children. Store in cool, dry place. Keep at temperature not exceeding 32 °C.

8. Exposure Controls / Personal Protection

Engineering controls	If engineering measures are not sufficient to maintain concentrations of dust particulates below the OEL, suitable respiratory protection must be worn. Additional area ventilation or local exhaust may be required to maintain air concentrations below recommended exposure limits.
Personal protective equipment	
Eye / face protection	Do not get in eyes. Provide an emergency eye wash fountain and quick drench shower in the immediate work area. Contact lenses should not be worn when working with this chemical! Wear safety glasses with side shields (or goggles).
Skin protection	Do not get this material in contact with skin. Do not get this material on clothing. Structural firefighters protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations. Use chemical splash goggles and face shield (ANSI Z87.1 or approved equivalent). Chemical resistant gloves.
Respiratory protection	Do not breathe dust/fume/gas/mist/vapors/spray. Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits. No specific recommendation made, but protection against nuisance dust must be used when the general level exceeds 10 mg/m3.
General hygiene considerations	When using, do not eat, drink or smoke. Do not breathe dust. Do not get in eyes. Do not get this material in contact with skin. Do not get this material on clothing. Handle in accordance with good industrial hygiene and safety practice.

9. Physical & Chemical Properties

Appearance	Powder.
Physical state	Solid.
Color	White
Vapor pressure	Not applicable.
Boiling point	Not applicable.
Melting point/Freezing point	Not applicable.
Specific gravity	0.6 - 0.9
Flash point	Not applicable.
Auto-ignition temperature	Not applicable.
Partition coefficient (n-octanol/water)	1
Other data	
Density	0.75 g/cm3
pH in aqueous solution	5 - 7

10. Chemical Stability & Reactivity Information

Chemical stability	Risk of explosion. Risk of ignition.
Conditions to avoid	Exposure to air. Avoid spread of dust. Heat, flames and sparks. Avoid contact with oxidizing agents.

Incompatible materials	Not available.
Hazardous decomposition products	No hazardous decomposition products are known. Upon decomposition, product emits acrid dense smoke with carbon dioxide, carbon monoxide, trace oxides of nitrogen and sulfur, and water.
Possibility of hazardous reactions	Hazardous polymerization does not occur.

11. Toxicological Information

Toxicological data

Product	Test Results
Hydrex 6149 (Mixture)	Acute Oral LD50 Rat: > 5000 mg/kg Chronic Oral Presumed Non-Toxic Dog: 12.00 months Non-Toxic Chronic Oral Presumed Non-Toxic Rat: 2.00 years Non-Toxic

* Estimates for product may be based on additional component data not shown.

Sensitization	Not a skin sensitizer.
Acute effects	Causes burns. No known chronic or acute health risks.
Chronic effects	At the concentrations used in this material, the components are not expected to cause dermal sensitization based on testing of similar formulations and/or the components.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
Skin corrosion/irritation	Hazardous by OSHA criteria. Not expected to be hazardous by OSHA criteria.

12. Ecological Information

Ecotoxicological data

Product	Test Results
Hydrex 6149 (Mixture)	LC50 Algae: > 100 mg/l 72.00 hours LC50 Daphnia: > 100 mg/l 48.00 hours LC50 Rainbow Trout: > 100 mg/l 96.00 hours

* Estimates for product may be based on additional component data not shown.

Ecotoxicity	Components of this product are hazardous to aquatic life.
Environmental effects	Harmful to aquatic organisms.
Bioaccumulation	The product is not bioaccumulating.
Bioaccumulative potential	The product is not bioaccumulating.
Persistence and degradability	The product is not readily biodegradable. Transformation due to hydrolysis not expected to be significant.
Bioaccumulation / Accumulation	The product is not bioaccumulating.
Partition coefficient	1
Environmental fate	
Bioaccumulation	The product is not bioaccumulating.

13. Disposal Considerations

Disposal instructions	Consult authorities before disposal. Incinerate the material under controlled conditions in an approved incinerator. Do not incinerate sealed containers. Do not allow this material to drain into sewers/water supplies. If discarded, this product is considered a RCRA ignitable waste, D001. Dispose in accordance with all applicable regulations.
Contaminated packaging	Recycle empty drums at an appropriate facility in accordance with current applicable laws and regulations, and product characteristics at time of disposal. Ensure drums are tightly sealed.
Waste codes	D001: Waste Flammable material with a flash point <140 F

14. Transport Information

DOT

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2)

Not regulated

DEA Essential Chemical Code Number

Not regulated

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Not regulated

DEA Exempt Chemical Mixtures Code Number

Not regulated

CERCLA (Superfund) reportable quantity

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance No

Section 311 hazardous chemical No

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

16. Other Information

Further information HMIS® is a registered trade and service mark of the NPCA.

HMIS® ratings

Health: 0
Flammability: 0
Physical hazard: 0

NFPA ratings	Health: 0 Flammability: 0 Instability: 0
Disclaimer	Veolia Water Solutions & Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Solutions & Technologies' requirement.
Issue date	07-19-2011

Section 1 - Chemical Product and Company Identification 54/60

Material Name: Lead **CAS Number:** 7439-92-1
Chemical Formula: Pb
Structural Chemical Formula: Pb
EINECS Number: 231-100-4
ACX Number: X1000227-2
Synonyms: C.I. 77575; C.I. PIGMENT METAL 4; GLOVER; KS-4; LEAD; LEAD FLAKE; LEAD INORGANIC; LEAD METAL; LEAD S2; LEAD SZ; OLOW; OMAHA & GRANT; PB-S 100; PLUMBUM
General Use: Used as a construction material in chemical reaction equipment (tank piping,etc.); manufacture of tetraethyl lead; pigments for paints.
Used in pottery glazes, glass, ceramics, bearing metal and alloys, solder and other lead alloys.
Also used in metallurgy of steel and other metals, cable sheathing, storage batteries, radiation shielding and ammunition.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
lead	7439-92-1	>99

OSHA PEL
TWA: 0.05 mg/m^3; as Pb inorganic.

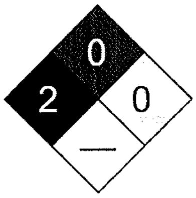
ACGIH TLV
TWA: 0.05 mg/m^3.

NIOSH REL
TWA: 0.05 mg/m^3.

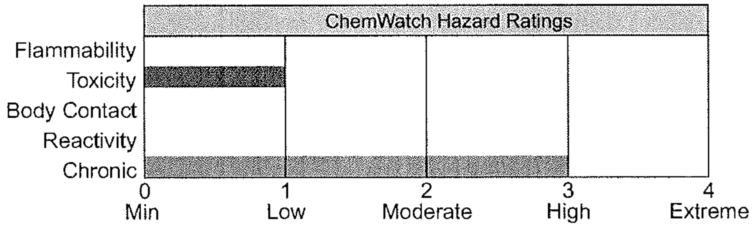
IDLH Level
100 mg/m^3 (as Pb).

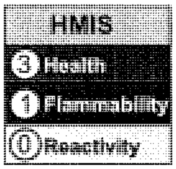
DFG (Germany) MAK
TWA: 0.1 mg/m^3; PEAK: 8 mg/m^3; measured as inhalable fraction of the aerosol; Excluding lead arsenate and lead chromate.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Danger!

Poison

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Bluish-white, silvery, or gray metal. Cumulative poison. Chronic Effects: severe neurological effects, blood/kidney damage, sterility, decreased fertility, developmental damage to fetus. Possible cancer hazard.

Potential Health Effects

Target Organs: blood, central nervous system (CNS), peripheral nervous system, kidneys, gastrointestinal (GI) tract
Primary Entry Routes: inhalation, ingestion
Acute Effects
Inhalation: The dust may be discomforting to the upper respiratory tract and may be harmful if inhaled.
Eye: The dust may be discomforting to the eyes.
Skin: The material may be mildly discomforting to the skin.
Prolonged exposure may cause skin reactions.
Skin absorption is not considered a significant route of exposure.
Ingestion: The material is moderately discomforting to the gastrointestinal tract and may be harmful if swallowed.
In rats intestinal lead absorption is bidirectional and does not follow a linear relationship with oral dose.

Acute effects of exposure are generally minor because of its relative insolubility and physical form. Unusual instances of exposure have been reported in inadequately ventilated indoor firing ranges (as fume), in the application of surma, a mascara-like cosmetic agent, to the conjunctival surfaces in Asian countries and in lead-smelting and associated occupations.

In humans lead metabolism fits into a three compartment model. The first compartment in which lead has a half-life of about 35 days includes the blood; it receives blood from the gut and delivers some of it to the urine and communicates with the other two pools. The second compartment in which lead has a similar half-life includes the soft tissues which contain about half the blood level; they share lead with hair, nails, sweat, saliva, bile and other digestive secretions. The skeleton is the third compartment and contains the vast bulk of the total body burden, possesses a very long half-life and demonstrates a difference between the dense and less dense components to bind lead.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Not listed.

Chronic Effects: Symptoms of exposure include headache, fatigue, sleep disturbances, abdominal pains and decreased appetite. Overexposure to lead in the form of dust has toxic effects on the lungs and kidneys and on the nervous system resulting in mental disturbances and anemia.

Skin absorption is not considered to be a significant route of exposure.

Worker exposure to lead must be kept to a minimum, especially in cases where lead is worked at temperatures whereby lead vapors are evolved e.g. metal refining.

Lead is an accumulative poison and exposure even to small amounts can raise the body's content to toxic levels.

Potential adverse effects on the offspring of pregnant workers have been cited in the literature.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Rinse mouth out with plenty of water.

Seek medical attention if irritation or discomfort persist.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: 1.Gastric acids solubilize lead and its salts and lead absorption occurs in the small bowel.

2.Particles of less than 1um diameter are substantially absorbed by the alveoli following inhalation.

3.Lead is distributed to the red blood cells and has a half-life of 35 days.

It is subsequently redistributed to soft tissue & bone-stores or eliminated.The kidney accounts for 75% of daily lead loss; integumentary and alimentary losses account for the remainder.

4.Neurasthenic symptoms are the most common symptoms of intoxication.

Lead toxicity produces a classic motor neuropathy.

Acute encephalopathy appears infrequently in adults.

Diazepam is the best drug for seizures.

5.Whole-blood lead is the best measure of recent exposure; free erythrocyte protoporphyrin (FEP) provides the best screening for chronic exposure. Obvious clinical symptoms occur in adults when whole-blood lead exceeds 80 ug/dL.

6.British Anti-Lewisite is an effective antidote and enhances fecal and urinary excretion of lead. The onset of action of BAL is about 30 minutes and most of the chelated metal complex is excreted in 4-6 hours, primarily in the bile.

Adverse reaction appears in up to 50% of patients given BAL in doses exceeding 5 mg/kg. CaNa2EDTA has also been used alone or in concert with BAL as an antidote.

D-penacillamine is the usual oral agent for mobilization of bone lead; its use in the treatment of lead poisoning remains investigational.

2-3-dimercapto-1-propanesulfonic acid (DMPS) and dimercaptosuccinic acid (DMSA) are water soluble analogues of BAL and their effectiveness is undergoing review.

As a rule, stop BAL if lead decreases below 50 ug/dL; stop CaNa2EDTA if blood lead decreases below 40 ug/dL or urinary lead drops below 2 mg/24 hrs.

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

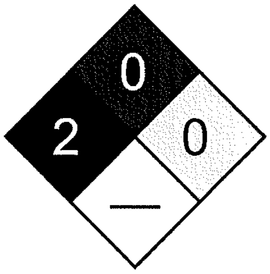
Determinant	Index	Sampling Time	Comments

Lead in blood	50 ug/100 mL	Not Critical	B
Lead in urine	150 ug/gm creatinine	Not critical	B
Zinc Protoporphyrin in blood	250 ug/100 mL erythrocytes OR 100 ug/100 mL blood	After 1 month exposure	B

B: Background levels occur in specimens collected from subjects NOT exposed.

Section 5 - Fire-Fighting Measures

Flash Point: Not available; probably noncombustible
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: There is no restriction on the type of extinguisher which may be used.
General Fire Hazards/Hazardous Combustion Products: Noncombustible.
Not considered to be a significant fire risk; however, containers may burn.
Moderate fire hazard, in the form of dust, when exposed to heat or flames.
Decomposition products may include toxic lead dust and lead oxide fumes.



Fire Diamond

Fire Incompatibility: Incompatible with strong acids, oxidants, ammonium nitrate, chlorine trifluoride and sodium azide.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Use fire fighting procedures suitable for surrounding area.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
If safe to do so, remove containers from path of fire.
Cool fire-exposed containers with water spray from a protected location.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes.
Wear protective clothing, gloves, safety glasses and dust respirator.
Use dry clean-up procedures and avoid generating dust.
Vacuum up.
Place spilled material in clean, dry, sealable, labeled container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Control personal contact by using protective equipment and dust respirator.
Prevent spillage from entering drains, sewers or waterways.
Recover product wherever possible. Avoid generating dust. Sweep / shovel up.
If required, wet with water to prevent dusting.
Put residues in labeled plastic bags or other containers for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Limit all unnecessary personal contact.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling.

Work clothes should be laundered separately.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Check that containers are clearly labeled.

Packaging as recommended by manufacturer.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.

If risk of overexposure exists, wear NIOSH-approved dust respirator.

Correct fit is essential to obtain adequate protection.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Impervious gloves; rubber gloves.

Rubber boots.

Protective footwear.

Respiratory Protection:

Exposure Range >0.05 to 0.5 mg/m^3: Air Purifying, Negative Pressure, Half Mask

Exposure Range >0.5 to 2.5 mg/m^3: Air Purifying, Negative Pressure, Full Face

Exposure Range >2.5 to 50 mg/m^3: Powered Air Purifying Respirator, Half or Full Facepiece or Hood

Exposure Range >50 to 100 mg/m^3: Supplied Air Respirator with Full Facepiece, Hood, Helmet, or Suit, operated in a Positive Pressure Mode

Exposure Range >100 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: magenta (P100)

Note: (29CFR 1910.1025) for general industry

Other: Overalls. Eyewash unit. Skin cleansing cream.

Provide adequate ventilation in warehouse or closed storage areas.

General and local exhaust ventilation usually required to maintain airborne dust levels to safety levels.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Bluish-white, silvery-gray metal. Malleable, lustrous when freshly cut and tarnishes when exposed to air. Reacts with strong acids like nitric acid, sulphuric or hydrochloric acid. Attacked by water in presence of oxygen. Poor electrical conductor. Lead fumes are formed at temperatures above 500-700 °C.

Physical State: Divided solid

Vapor Pressure (kPa): 0.24 at 1000 °C

Vapor Density (Air=1): Not applicable

Formula Weight: 207.19

Specific Gravity (H_2O=1, at 4 °C): 11.34

Evaporation Rate: Not applicable

pH: Not applicable

pH (1% Solution): Not applicable.

Boiling Point: 1740 °C (3164 °F)

Freezing/Melting Point: 327.4 °C (621.32 °F)

Volatile Component (% Vol): Not applicable

Water Solubility: Insoluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Hazardous polymerization will not occur. Stable under normal storage conditions.

Storage Incompatibilities: Avoid storage with strong acids, oxidants, ammonium nitrate, chlorine trifluoride and sodium azide.

Section 11 - Toxicological Information

Toxicity

Oral (woman) TD_{Lo}: 450 mg/kg/6 years

Inhalation (human) TC_{Lo}: 0.01 mg/m^3

WARNING: Lead is a cumulative poison and has the potential to cause abortion and intellectual impairment to unborn children of pregnant workers.

Irritation

Nil Reported

See *RTECS* OF 7525000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released or deposited on soil, it will be retained in the upper 2-5 cm of soil, especially soils with at least 5% organic matter or a pH 5 or above. Leaching is not important under normal conditions although there is some evidence to suggest that it is taken up by some plants. Generally, the uptake from soil into plants is not significant. It is expected to slowly undergo speciation to the more insoluble sulfate, sulfide, oxide, and phosphate salts. It enters water from atmospheric fallout, runoff or wastewater; little is transferred from natural ores. It is a stable metal and adherent films of protective insoluble salts form that protect the metal from further corrosion. That which dissolves tends to form ligands. It is effectively removed from the water column to the sediment by adsorption to organic matter and clay minerals, precipitation as insoluble salt (the carbonate or sulfate, sulfide), and reaction with hydrous iron and manganese oxide. Under most circumstances, adsorption predominates. It does not appear to bioconcentrate significantly in fish but does in some shellfish such as mussels. When released to the atmosphere, it will generally be in dust or adsorbed to particulate matter and subject to gravitational settling and be transformed to the oxide and carbonate.

Ecotoxicity: LC_{50} Japanese quail (Coturnix japonica), males or females, 14 days old, oral (5-day ad libitum in diet) >5,000 ppm; at 1000, 2236 & 5000 onset of toxic signs began at 7, 7 & 7 days and remissed at 11, 11 & 12 days, respectively, no mortality was observed; control references were dieldrin & dicrotophos; corn oil diluent was added to diet at ratio of 2:98 by wt; (extreme concentrations: 1,000-5,000 ppm)

BCF: freshwater fish 1.38 to 1.65

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: None

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a) 10 lb (4.535 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Section 1 - Chemical Product and Company Identification 44/60

Material Name: Mercury **CAS Number:** 7439-97-6

Chemical Formula: Hg

EINECS Number: 231-106-7

ACX Number: X1002555-9

Synonyms: COLLOIDAL MERCURY; HYDRARGYRUM; KWIK; LIQUID SILVER; MERCURE; MERCURIO; MERCURY; MERCURY (ELEMENTAL); MERCURY METAL: COLLOIDAL MERCURY; MERCURY,METALLIC; METALLIC MERCURY; QUECKSILBER; QUICK SILVER; QUICKSILVER; QUICKSILVER SYNONYMS OF; RTEC

Derivation: Obtained by roasting cinnabar (mercury sulfide) and purified by distillation, or as a by-product of gold mining.

General Use: Used in agricultural poisons, anti-fouling paint, dental amalgams, mining amalgamation (to remove gold and other metals from ore), thermometers, barometers, dry cell batteries, chlorine and caustic soda production, electrical apparatus, and as a neutron absorber in nuclear power plants.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Mercury		ca 100% wt

OSHA PEL
Ceiling: 0.1 mg/m^3.

OSHA PEL Vacated 1989 Limits
TWA: 0.05 mg/m^3; STEL: 0.1 mg/m^3.

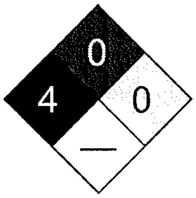
ACGIH TLV
TWA: 0.025 mg/m^3; skin.

NIOSH REL
Hg Vapor: TWA: 0.05 mg/m^3; skin. Other: Ceiling 0.1 mg/m^3; skin.

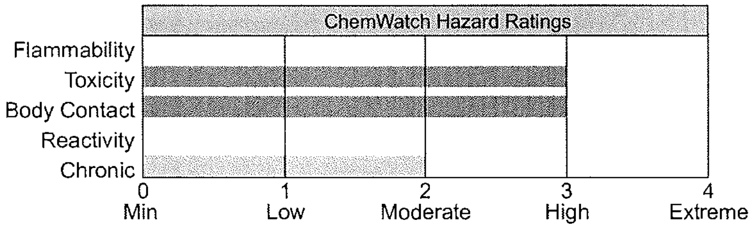
IDLH Level
10 mg/m^3 (as Hg).

DFG (Germany) MAK
TWA: 0.1 mg/m^3; PEAK: 0.8 mg/m^3; danger of sensitization of the skin.

Section 3 - Hazards Identification



Fire Diamond



HMIS
4 Health
0 Flammability
0 Reactivity

ANSI Signal Word
Danger!

Poison Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Heavy silver-white liquid metal; odorless. Corrosive. Poison. Other Acute Effects: irreversible nervous system damage.

Potential Health Effects

Target Organs: Central nervous system, eyes, skin, respiratory system, liver, kidneys.

Primary Entry Routes: Inhalation, eye and skin contact/absorption.

Acute Effects The onset of signs and symptoms usually is prompt, but may be delayed up to 12 hr.

Systemic Effects by all routes: Nausea, vomiting, abdominal pain, diarrhea, excessive salivation, sweating, headache, giddiness, vertigo (dizziness), weakness, blurring or dimness of vision, miosis or mydiasis (dilatation of the pupils), tearing, bradycardia (slow heart beat), tachycardia (fast heart beat), cardiac irregularities (arrhythmias, complete heart block), loss of muscle coordination, slurred speech, muscle twitching (particularly tongue and eyelids), generalized profound weakness, confusion, disorientation, drowsiness, difficulty in breathing, excessive secretion of saliva and mucus, cyanosis, rales, high blood pressure, random jerky movements, incontinence, convulsions, coma, and death due to respiratory paralysis.

Inhalation: Exposure to high vapor concentrations can cause severe respiratory damage. Other symptoms include wakefulness, muscle weakness, anorexia, headache, ringing in the ear, headache, diarrhea, liver changes, fever, gingivitis, chest pain, difficulty breathing, cough, inflammation of the mouth (stomatitis), salivation, bronchitis, and pneumonitis. Acrodynia (pink or Swifts disease), characterized by redness and peeling of the skin on the toes and fingers, was commonly seen in children in the 1950s and is still *infrequently* seen in workers.

Eye: Irritation and corrosion.

Skin: Skin can become severely irritated if allowed to remain in contact with mercury. Skin absorption will occur at 2.2% of the rate of absorption through the lungs.

Ingestion: Mercury generally passes through the digestive tract uneventfully. However, large amounts may get caught up in the intestine and require surgical removal. If an abscess or other perforation is present along the digestive tract, absorption into the blood stream with subsequent mercury poisoning is possible.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: Central nervous system disorders.

Chronic Effects: Chronic exposure appears more common than acute and is primarily associated with central nervous system damage which can be permanent (ex. paresthesia of the hands, lips, feet). Early signs of toxicity include weakness, fatigue, anorexia, weight loss, and gastrointestinal disturbances. If exposure levels are high, characteristic tremors of the fingers, eyelids, and lips occur with progression to generalized tremors of the entire body. Psychic disorders are noticeable and characterized by behavior and personality changes, increased excitability, memory loss, insomnia, and depression. In severe cases, delirium and hallucinations may occur. Kidney damage is observed with oliguria (decreased urine output) progressing to anuria (urine cessation) and may require dialysis. The cornea and lens of the eyes may take on a brownish discoloration and the extraocular muscles may be damaged. This syndrome has been termed *Asthenic-Vegetative Syndrome* or *Micromercurialism.* Chronic symptoms occur increasingly with exposures to 0.1 mg/m^3 or higher. *Mutation:* Aneuploidy and other chromosomal aberrations have been observed in the lymphocytes from whole blood cultures in workers exposed to mercury. *Reproductive:* Mercury has been detected in stillborn babies of women treated with mercury for syphilis. In a study of six men acutely exposed (occupationally) to mercury levels as high as 44 mg/m^3, all suffered impaired sexual function. Repeated skin contact may cause allergic dermatitis in some individuals.

Note: Spilled mercury will release sufficient vapor over time to produce chronic poisoning.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water and then wash exposed area with soap. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. In general, mercury will pass through the digestive tract uneventfully.

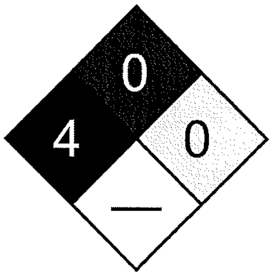
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: BEI: *blood* (15 µg/L), *urine*: (35 µg/g creatinine). Extremely high urine levels of 0.5 to 0.85 mg Hg/L are indicative of polyneuropathy. 0.4 to 22 µg/L is reported to be the human lethal blood level. Obtain urinalysis including at a minimum: albumin, glucose, and a microscopic examination of centrifuged sediment. Use BAL or 2, 3-dimercaptosuccinic acid as chelators. *Do not* use calcium sodium EDTA because of nephrotoxicity. An electromyograph may determine extent of nerve dysfunction. It has been noted that exposure to mercury may predispose persons to development of carpal tunnel syndrome.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
Autoignition Temperature: Nonflammable
LEL: None reported.
UEL: None reported.
Extinguishing Media: Use agents suitable for surrounding fire.
General Fire Hazards/Hazardous Combustion Products: Toxic mercury vapor and mercuric oxide.
Fire-Fighting Instructions: Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

See DOT ERG



Fire Diamond

Section 6 - Accidental Release Measures

See DOT ERG

Spill/Leak Procedures: Keep a mercury spill kit readily available in areas where mercury is used. Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind.
Small Spills: Small and Large Spills: Follow instructions on mercury spill kit. Most kits come with an aspiration-driven vacuum trap with a mercury "sweeper" (copper or copper-plated brush). Wash spill area with a dilute calcium sulfide or nitric acid solution. If spill cannot be taken up readily, dust the top of the spill with flowers of sulfur or preferably, calcium polysulfide. This will produce a surface coating of mercury sulfide which will reduce mercury vapor dispersion into the air.
Large Spills: No data found.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use appropriate PPE when working with mercury. *Do not* use on porous work surfaces (wood, unsealed concrete, etc.) to prevent spills from lodging in cracks.
Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.
Recommended Storage Methods: Store in a cool, dry, well-ventilated area away from heat and incompatibles (Sec. 10). Store on non- porous floors and wash them regularly with a dilute calcium sulfide solution. Because mercury will form amalgamations with most metals except iron, metal shelves should be painted with a sufficiently thick coating to prevent this from happening.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Wherever possible, enclose processes to prevent mercury vapor dispersion into work area. Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.
Administrative Controls: Consider pre-placement and periodic medical exams of exposed workers with emphasis on the skin, eyes, central nervous system, liver, and kidneys.
Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets made of butyl rubber, nitrile rubber, fluorocarbon rubber, neoprene rubber, polyvinyl chloride, chlorinated polyethylene, or polycarbonate to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.
Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For <= 0.5 mg/m^3, use any chemical cartridge respirator with cartridges providing protection against mercury and equipped with an ESLI (end of service life indicator), any SCBA, or any SAR (supplied-air respirator). For <= 1.25 mg/m^3, use any SAR operated in continuous-flow mode, any PAPR (powered, air-purifying respirator) with an ESLI. For <= 2.5 mg/m^3, use any SCBA or SAR with a full facepiece, any SAR with a tight-fitting facepiece and operated in continuous-flow mode, or any chemical cartridge respirator with a full facepiece, chemical cartridges providing protection against mercury, and equipped with an ESLI. For <=28 mg/m^3, use any SAR operated in pressure- demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA with full facepiece and operated in pressure-demand or other positive pressure mode. *Warning! Air- purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Silvery-white, odorless.
Physical State: Liquid metal
Vapor Pressure (kPa): 0.0018 mm Hg at 77 °F (25 °C)
Formula Weight: 200.59
Density: 13.534 g/cm^3 at 77 °F (25 °C)
Boiling Point: 674.09 °F (356.72 °C)
Freezing/Melting Point: -37.97 °F (-38.87 °C)
Viscosity: 15.5 mP at 77 °F (25 °C)
Surface Tension: 484 dyne/cm at 77 °F (25 °C)
Critical Temperature: 2664 °F (1462 °C)
Critical Pressure: 1587 atm
Water Solubility: 0.28 μmol/L at 77 °F (25 °C)
Other Solubilities: Soluble in boiling sulfuric acid, nitric acid (reacts); slightly in lipids, and 2.7 mg/L in pentane. Insoluble in alcohol, ether, cold sulfuric acid, hydrogen bromide, and hydrogen iodide.

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Mercury does not tarnish at ordinary temperatures but when heated to near its boiling point, it slowly oxidizes to mercuric oxide. Hazardous polymerization does not occur. Exposure to high temperatures, metal surfaces or incompatibles.

Storage Incompatibilities: Mercury forms alloys (amalgamates) with most metals except iron. It is incompatible with oxidizers such as bromine, 3-bromopropyne, methylsilane + oxygen, chlorine, chlorine dioxide, nitric acid, or peroxyformic acid; tetracarbonyl nickel + oxygen, alkynes + silver perchlorate, ethylene oxide, acetylenic compounds (explosive), ammonia (explosive), boron phosphodiiodide, methyl azide, nitromethane, and ground sodium carbide.

Hazardous Decomposition Products: Thermal oxidative decomposition of mercury can produce mercuric oxide.

Section 11 - Toxicological Information

Acute Oral Effects:
Man, oral, TD_{Lo}: 43 mg/kg caused tremor and jaundice or other liver changes.
Acute Inhalation Effects:
Woman, inhalation, TC_{Lo}: 150 $\mu g/m^3$/46 days caused anorexia, diarrhea, and wakefulness.
Man, inhalation, TC_{Lo}: 44300 $\mu g/m^3$/8 hr caused muscle weakness, liver changes, and increased body temperature.
Acute Skin Effects:
Man, skin, TD_{Lo}: 129 mg/kg for 5 continuous hours caused ringing in the ears, headache, and allergic dermatitis.
Other Effects:
Rat, inhalation: 1 mg/m^3/ 24 hr for 5 continuous weeks caused proteinuria.
Rat, inhalation: 890 ng/m^3/24 hr for 16 weeks prior to mating had an effect on spermatogenesis.

See *RTECS* OV4550000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Mercury is expected to volatilize rapidly when deposited on soil surfaces. Once in the air, it can be transported long distances before being redeposited on soil or in water. In water, mercury appears to bind to particulates where it eventually becomes deposited on the bed sediment. In general, mercury entering the environment can be deposited and revolatilized several times.

Ecotoxicity: Catfish, LC_{50} = 0.35 mg/L/96 hr; mollusk (*Modiolus carvalhoi*), LC_{50} = 0.19 ppm/96 hr: tadpole (*Rana hexadactyla*), LC_{50} = 0.051 ppm/96 hr. Mercury is transformed to methyl mercury by bacteria in the environment and undergoes bioaccumulation readily. BCF for freshwater fish = 63,000; for saltwater fish = 10,000; and for marine and freshwater invertebrates = 100,000.

Section 13 - Disposal Considerations

Disposal: Incineration is *not* an appropriate disposal method. Wastewater may be treated by addition of chlorine to oxidize the mercury to its ionic state. The water can then be passed through an absorbent (an activated charcoal concentrate with a sulfur coating or peanut shell charcoal) to collect the ionic mercury, followed by distillation to recover the mercury. Sodium borohydride, a reducing agent, can be used to precipitate mercury from waste solutions. Bioremediation, using *Pseudomonas putida*, has also been suggested. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Mercury
ID: UN2809
Hazard Class: 8 - Corrosive material
Packing Group: III - Minor Danger
Symbols: A W
Label Codes: 8 - Corrosive
Special Provisions:
Packaging: **Exceptions:** 164 **Non-bulk:** 164 **Bulk:** 240
Quantity Limitations: **Passenger aircraft/rail:** 35 kg **Cargo aircraft only:** 35 kg
Vessel Stowage: **Location:** B **Other:** 40, 97

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U151 Toxic Waste
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001, per CWA Section 307(a), per CAA Section 112 1 lb (0.454 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

Polychlorinated Biphenyls (PCBs)
POL2140

Section 1 - Chemical Product and Company Identification 54/60

Material Name: Polychlorinated Biphenyls (PCBs) **CAS Number:** 1336-36-3
Chemical Formula: Unspecified or Variable
Structural Chemical Formula: $(C_{12}H_{10-x})Cl_x$
EINECS Number: 215-648-1
ACX Number: X1004032-9
Synonyms: AROCLOR; AROCLOR 1221; AROCLOR 1232; AROCLOR 1242; AROCLOR 1248; AROCLOR 1254; AROCLOR 1260; AROCLOR 1262; AROCLOR 1268; AROCLOR 2565; AROCLOR 4465; AROCLOR 5442; 1,1'-BIPHENYL,CHLORO DERIVS; BIPHENYL,POLYCHLORO-; CHLOPHEN; CHLOREXTOL; CHLORINATED BIPHENYL; CHLORINATED DIPHENYL; CHLORINATED DIPHENYLENE; CHLORO 1,1-BIPHENYL; CHLORO 1,1-BIPHENYL-; CHLORO BIPHENYL; CLOPHEN; CLOPHEN A 60; DYKANOL; EPA PESTICIDE CHEMICAL CODE 017801; FENCLOR; FENCLOR 42; INERTEEN; KANECHLOR; KANECHLOR 300; KANECHLOR 400; MONTAR; MONTER; NOFLAMOL; PCB; PCBS; PHENOCHLOR; PHENOCLOR; POLYCHLORINATED BIPHENYL; POLYCHLORINATED BIPHENYLS; POLYCHLORINATED BIPHENYLS (PCBS); POLYCHLOROBIPHENYL; PYRALENE; PYRANOL; SANTOTHERM; SANTOTHERM FR; SOVOL; THERMINOL; THERMINOL FR-1
General Use: Used as dielectric fluids in transformers and capacitors. Prior to 1972, were used as hydraulic and other industrial fluids (e.g., in vacuum pumps, as lubricants and cutting oils), in paints, inks and fire retardants.
Also used in heat transfer systems; gas-transmission turbines; carbonless reproducing paper; adhesives; as plasticizer in epoxy paints; fluorescent light ballasts; wax extenders; coolants; dedusting agents; pesticide extenders; surface treatment and coatings; sealants; caulking material.
This is one of a group of once widely used industrial chemicals whose high stability contributed both to their commercial usefulness and the long term deleterious environmental health effects. Consequently their use has been phased out. Their manufacture in the U.S.A. was discontinued in 1977.

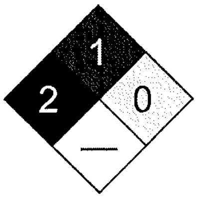
Section 2 - Composition / Information on Ingredients

Name	CAS	%
polychlorinated biphenyls (PCB's)	1336-36-3	100

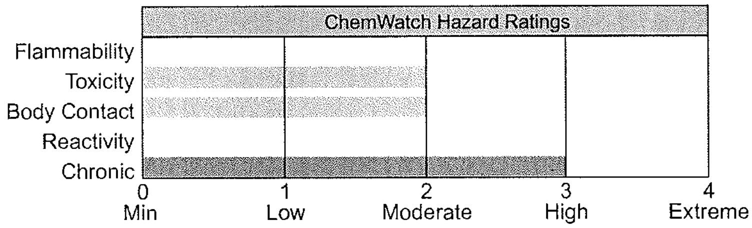
OSHA PEL **NIOSH REL**

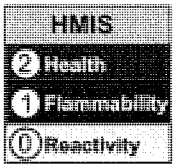
ACGIH TLV

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Warning!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Oily liquid, white crystalline solid, or hard resin. Severely irritating. Suspect cancer hazard. Chronic Effects: chloracne, GI disturbances, neurological symptoms, liver enlargement, menstrual changes, bronchitis, possible reproductive/teratogenic effects.

Potential Health Effects

Target Organs: skin, liver, eyes, mucous membranes, respiratory system
Primary Entry Routes: inhalation, skin contact, ingestion

Acute Effects

Inhalation: Not normally a hazard due to nonvolatile nature of product. Inhalation of vapor is more likely at higher than normal temperatures.

The vapor/mist is discomforting and may be extremely toxic if inhaled.

Eye: The vapor/liquid is moderately discomforting and may be harmful to the eyes.

Skin: The liquid is harmful to the skin, it is rapidly absorbed and is capable of causing skin reactions.

Exposure to material may result in a dermatitis, described as chloracne, a persistent acneiform characterized by comedones (white-, and black- heads), keratin cysts, and inflammed papules with hyperpigmentation and an anatomical distribution frequently involving the skin under the eyes and behind the ears. It occurs after acute or chronic exposure to a variety of chlorinated aromatic compounds by skin contact, ingestion or inhalation and may appear within days and months following the first exposure. Other dermatological alterations including hypertrichosis (the growth of excess hair), an increased incidence of actinic or solar elastosis (the degeneration of elastic tissue within muscles or loss of dermal elasticity produced by the effects of sunlight), and Peyrone's disease (a rare progressive scarring of the penile membrane).

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The material is moderately discomforting to the gastrointestinal tract and may be harmful if swallowed in large quantity.

Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Digestion may lead to nausea, vomiting, abdominal pain, anorexia, jaundice and liver damage, coma and death.

Headache, dizziness, lethargy, depression, nervousness, loss of libido, muscle, joint pains may be found.

Symptoms appear after a latent period of 5 to 6 months.

PCB's may appear in breast milk of exposed mothers and in newborn infants.

Carcinogenicity: NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2A, Probably carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Not listed.

Chronic Effects: People occupationally exposed to PCB's have relatively high PCB residue levels in blood plasma.

Symptoms include chloracne dermatitis and degreasing the skin, pigmentation of skin and nails, excessive eye discharge, swelling of eyelids, transient visual disturbances, distinctive hair follicles, edema of the face and hands.

In common with other polyhalogenated aromatic hydrocarbons, the chlorinated biphenyls exhibit dioxin-like behavior.

Polyhalogenated aromatic hydrocarbons (PHAHs) comprise two major groups.

The first group represented by the halogenated derivatives of dibenzodioxins (the chlorinated form is PCDD), dibenzofurans (PCDF) and biphenyls (PCB) exert their toxic effect (as hepatoxicants, reproductive toxicants, immunotoxicants and procarcinogens) by interaction with a cytostolic protein known as the Ah receptor. In guinea pigs the Ah receptor is active in a mechanism which "pumps" PHAH into the cell whilst in humans the reverse appears to true. This, in part, may account for species differences often cited in the literature. This receptor exhibits an affinity for the planar members of this group and carries these to the cellular nucleus where they bind, reversibly, to specific genomes on DNA.

This results in the regulation of the production of certain proteins which elicit the toxic response. The potency of the effect is dependent on the strength of the original interaction with the Ah receptor and is influenced by the degree of substitution by the halogen and the position of such substitutions on the parent compound.

The most potent molecule is 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) while the coplanar PCBs (including mono-ortho coplanars) possess approximately 1% of this potency. Nevertheless, all are said to exhibit "dioxin-like" behavior and in environmental and health assessments it has been the practice to assign each a TCDD-equivalence value.

The most subtle and important biological effects of the PHAHs are the effects on endocrine hormones and vitamin homeostasis. TCDD mimics the effect of thyroxin (a key metamorphosis signal during maturation) and may disrupt patterns of embryonic development at critical stages. Individuals from exposed wildlife populations have been observed to have altered sexual development, sexual dysfunction as adults and immune system suppression.

Immunotoxic effects of the PHAHs (including the brominated congener, PBB) have been the subject of several studies. No clear pattern emerges in human studies however with T-cell numbers and function (a blood marker for immunological response) increasing in some and decreasing in others.

Three incidences have occurred which have introduced abnormally high levels of dioxin or dioxin-like congeners to humans. The explosion at a trichlorophenol-manufacturing plant in Seveso, Italy distributed TCDD across a large area of the country-side, whilst rice-oil contaminated with heat-transfer PCBs (and dioxin-like contaminants) has been consumed by two groups, on separate occasions (one in Yusho, Japan and another in Yu-cheng, Taiwan). The only symptom which can unequivocally be related to all these exposures is the development of chloracne, a disfiguring skin condition, following each incident. Contaminated oil poisonings also produced eye-discharge, swelling of eyelids and visual disturbances. The Babies born up to 3 years after maternal exposure (so-called "Yusho-babies") were characteristically brown skinned, colored gums and nails and (frequently) produced eye-discharges. Delays in intellectual development have been noted. It has been estimated that Yu-cheng patients consumed an average level of 0.06 mg/kg body weight/day total PCB and 0.0002 mg/kg/day of PCDF before the onset of symptoms after 3 months. When the oil was withdrawn after 6 months they had consumed 1 gm total PCB containing 3.8 mg PCDF.

Preliminary data from the Yusho cohort suggests a six-fold excess of liver cancer mortality in males and a three-fold excess in women.

Recent findings from Seveso indicate that the biological effects of low level exposure (BELLEs), experienced by a cohort located at a great distance from the plant, may be hormetic, i.e. may be protective AGAINST the development of cancer.

TCDD induces carcinogenic effects in the laboratory in all species, strains and sexes tested. These effects are dose-related and occur in many organs.

Exposures as low as 0.001 ug/kg body weight/day produce carcinoma.

Several studies implicate PCBs in the development of liver cancer in workers as well as multi-site cancers in animals.

The second major group of PHAH consists of the non-planar PCB congeners which possess two or more ortho-substituted halogens. These have been shown to produce neurotoxic effects which are thought to reduce the concentration of the brain neurotransmitter, dopamine, by inhibiting certain enzyme-mediated processes.

The specific effect elicited by both classes of PHAH seems to depend on the as much on the developmental status of the organism at the time of the exposure as on the level of exposure over a lifetime.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. DO NOT induce vomiting. Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink. Transport to hospital or doctor without delay.

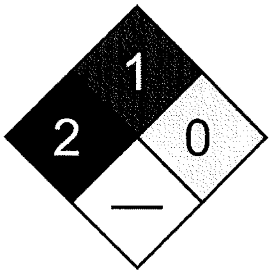
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically. If large amounts are ingested, gastric lavage is suggested. For splash in the eyes, a petrolatum-based ophthalmic ointment may be applied to the eye to relieve the irritating effects of PCBs.
If electrical equipment arcs over, PCB dielectric fluids may decompose to produce hydrogen chloride (HCl), a respiratory irritant. [Monsanto] Preplacement and annual medical examinations of workers, with emphasis on liver function, skin condition, reproductive history, is recommended.

Section 5 - Fire-Fighting Measures

See DOT ERG

Flash Point: > 141 °C
Autoignition Temperature: 240 °C
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: Foam.Alcohol stable foam.
Dry chemical powder.
General Fire Hazards/Hazardous Combustion Products: Noncombustible liquid.
POLLUTANT -contain spillage.
Decomposes on heating and produces acrid black soot and toxic fumes of aldehydes, hydrogen chloride (HCl), chlorides and extremely toxic polychlorinated dibenzofuran (PCDF), polychlorinated dibenzodioxin (PCDD).
Fire Incompatibility: Reacts vigorously with chlorine (Cl2).
Fire-Fighting Instructions: POLLUTANT -contain spillage. Noncombustible.
Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
Use fire fighting procedures suitable for surrounding area.
Cool fire-exposed containers with water spray from a protected location.
Avoid spraying water onto liquid pools.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.



Fire Diamond

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: POLLUTANT -contain spillage. Clean up all spills immediately.
Environmental hazard - contain spillage.
Avoid breathing vapors and contact with skin and eyes.
Wear protective clothing, impervious gloves and safety glasses.
Contain spill with sand, earth or vermiculite.
Wipe up and absorb small quantities with vermiculite or other absorbent material.
Place spilled material in clean, dry, sealable, labeled container.
Large Spills: POLLUTANT -contain spillage. Clear area of personnel.
Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
Stop leak if safe to do so.
Contain spill with sand, earth or vermiculite.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect residues and seal in labeled drums for disposal.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
If equipment is grossly contaminated, decontaminate and destroy.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Do not allow clothing wet with material to stay in contact with skin Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Avoid all personal contact, including inhalation.
Wear protective clothing and gloves when handling containers.
Avoid physical damage to containers.
Use in a well-ventilated area and Use only in completely enclosed system.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Wash hands with soap and water after handling.
Work clothes should be laundered separately: NOT at home.
Recommended Storage Methods: Packaging as recommended by manufacturer.
Check that containers are clearly labeled.
Metal can or metal drum or Steel drum with plastic liner.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Provide adequate ventilation in warehouse or closed storage areas.
If inhalation risk of overexposure exists, wear NIOSH-approved organic-vapor respirator.
In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; chemical goggles.
Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Impervious gloves or Viton gloves or Polyethylene gloves or PVC gloves.
Protective footwear.
Other: Impervious protective clothing. Overalls. Impervious apron.
Eyewash unit.
Ensure there is ready access to a safety shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless to yellow-green, mobile oily to viscous liquid, or sticky to hard resin, or white crystalline solid, depending on degree of chlorination. Slightly soluble in glycerol and glycols. Soluble in organic solvents and lipids. Viscosity range: 71 - 2500 Saybolt unit sec. at 38 °C. PCBs are resistant to chemical and biological degradation and because of their solubility in fats and oils they tend to be concentrated in living organisms. The highly chlorinated PCBs are retained in animal's bodies longer and seems to delay the excretion of the lower chlorinated PCB's. They have become widely dispersed in the world-wide environment and in the food-chain since their introduction in 1929. They are now recognized internationally to be a major environmental pollutant, their persistence causing ecological damage via water pollution. Consequently loss of PCBs to the environment is to be avoided at all costs.

Physical State: Liquid
Vapor Pressure (kPa): Negligible
Formula Weight: 188.66 - 395
Specific Gravity (H_2O=1, at 4 °C): 1.18 - 1.8
Evaporation Rate: Non Vol. at 38 °C
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 340 °C (644 °F) to 375 °C (707 °F)
Decomposition Temperature (°C): 375-550
Water Solubility: Solubility in water extremely low

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers. Segregate from chlorine.
Avoid contamination of water, foodstuffs, feed or seed.

Section 11 - Toxicological Information

Toxicity
Oral (human) LD_{Lo}: 500 mg/kg
Oral (rat) LD_{50}: 3980 mg/kg

Irritation
Nil reported

See *RTECS* TQ1350000, for additional data.

Section 12 - Ecological Information

Environmental Fate: PCBs are mixtures of different congeners of chlorobiphenyl and the relative importance of the environmental fate mechanisms generally depends on the degree of chlorination. In general, the persistence of PCBs increases with an increase in the degree of chlorination. Mono-, di- and trichlorinated biphenyls (Aroclor 1221 and 1232) biodegrade relatively rapidly, tetrachlorinated biphenyls (Aroclors 1016 and 1242) biodegrade slowly, and higher chlorinated biphenyls (Aroclors 1248, 1254, and 1260) are resistant to biodegradation. Although biodegradation of higher chlorinated congeners may occur very slowly on an environmental basis, no other degradation mechanisms have been shown to be important in natural water and soil systems; therefore, biodegradation may be the ultimate degradation process in water and soil.

If released to soil, PCBs experience tight adsorption with adsorption generally increasing with the degree of chlorination. PCBs will generally not leach significantly in aqueous soil systems; the higher chlorinated congeners will have a lower tendency to leach than the lower chlorinated congeners. In the presence of organic solvents PCBs may leach quite rapidly through soil. Vapor loss from soil surfaces appears to be an important fate mechanism with the rate of volatilization decreasing with increasing chlorination. Although the volatilization rate may be low, the total loss by volatilization over time may be significant because of persistence and stability. Enrichment of the low Cl PCBs occurs in the vapor phase relative to the original Aroclor; the residue will be enriched in the PCBs containing high Cl content.

If released to water, adsorption to sediment and suspended matter will be an important fate process; PCB concentrations in sediment and suspended matter have been shown to be greater than in the associated water column. Although adsorption can immobilize PCBs (especially the higher chlorinated congeners) for relatively long periods of time, eventual resolution into the water column has been shown to occur. The PCB composition in the water will be enriched in the lower chlorinated PCBs because of their greater water solubility, and the least water soluble PCBs (highest Cl content) will remain adsorbed. In the absence of adsorption, PCBs volatilize relatively rapidly from water. However, strong PCB adsorption to sediment significantly competes with volatilization, with the higher chlorinated PCBs having longer half-lives than the lower chlorinated PCBs. Although the resulting volatilization rate may be low, the total loss by volatilization over time may be significant because of persistence and stability. PCBs have been shown to bioconcentrate significantly in aquatic organisms. If released to the atmosphere, PCBs will primarily exist in the vapor-phase; the tendency to become associated with the particulate-phase will increase as the degree of chlorination of the PCB increases. The dominant atmospheric transformation process is probably the vapor-phase reaction with hydroxyl radicals which has estimated half-lives ranging from 12.9 days for monochlorobiphenyl to 1.31 years for heptachlorobiphenyl. Physical removal from the atmosphere, which is very important environmentally, is accomplished by wet and dry deposition.

Ecotoxicity: Aquatic toxicity: 0.278 ppm/96 hr/bluegill/TL_m/fresh water 0.005 ppm/336-1080 hr/pinfish/TL_m/salt water; Waterfowl toxicity: LD_{50} 2000 ppm (mallard duck); Food chain concentration potential: High
Henry's Law Constant: $5 \text{ x}10^{-5}$
BCF: bioconcentrate in tissue
Biochemical Oxygen Demand (BOD): very low
Soil Sorption Partition Coefficient: $K_{OC} = 510$ to $1.33 \text{ x}10^{4}$

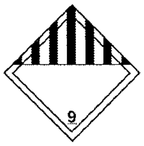
Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Due to their environmental persistence and potential health hazards, PCBs cannot be disposed of in landfills or dumped at sea. The only environmentally acceptable method for the disposal of PCBs is by high temperature incineration.
All wastes and residues containing PCB's (e. g. , wiping cloths, absorbent material, used disposable protective gloves, contaminated clothing, etc.) should be collected, placed in proper containers, labelled and disposed of in accordance with applicable regulations.

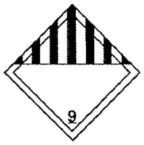
Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.



Shipping Name and Description: Polychlorinated biphenyls, liquid
ID: UN2315
Hazard Class: 9 - Miscellaneous hazardous material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 9 - Class 9
Special Provisions: 9, 81, 140, IB3, T4, TP1
Packaging: **Exceptions:** 155 **Non-bulk:** 202 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 100 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:** 95



Shipping Name and Description: Polychlorinated biphenyls, solid
ID: UN2315
Hazard Class: 9 - Miscellaneous hazardous material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 9 - Class 9
Special Provisions: 9, 81, 140, IB7
Packaging: **Exceptions:** 155 **Non-bulk:** 212 **Bulk:** 240
Quantity Limitations: **Passenger aircraft/rail:** 100 kg **Cargo aircraft only:** 200 kg
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per CWA Section 307(a) 1 lb (0.454 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

OSI
MARINE AND FRESHWATER
SURVEY SERVICES

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129 MILL ROCK ROAD EAST
OLD SAYBROOK, CT 06475
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11 July 2011

Mr. Coleman King
ARCADIS US, INC.
10 Friends Lane, Suite 200
Newtown, PA 18940

Via E-Mail @ Coleman.King@arcadis-us.com

**SUBJECT: ACOUSTIC MONITORING PROGRAM
PASSAIC RIVER, NEWARK, NJ**

Dear Mr. King:

Ocean Surveys, Inc. (OSI) is pleased to submit the following cost estimate and scope of work to conduct an acoustic monitoring program on the Passaic River in the vicinity of the Lister Avenue project site in Newark, NJ. This work will be completed for ARCADIS/Tierra to measure the range of noise propagation both laterally and longitudinally along the river. The acoustic monitoring program will involve real-time measurements of ambient and dredging related underwater noise in both the near field and far field environments throughout various phases of the tide. Data will be collected over three trips to the project site including one trip prior to and two trips during dredging activities.

To conduct this program, OSI will provide a 21-foot twin outboard survey vessel and a two-person field team. The vessel will be configured with a DGPS receiver interfaced to a HYPACK navigation system and an acoustic monitoring system.

All OSI personnel assigned to conduct field work on the project will be certified in accordance with OSHA CFR 1910.120 for work at hazmat sites. We assume that the level of personal protection equipment will be modified Level D or lower. We have also assumed that ARCADIS will provide the applicable site-specific health and safety plan. The following paragraphs outline OSI's technical approach and cost proposal for the acoustic monitoring program.

PROPOSED SCOPE OF WORK

OSI proposes to collect underwater acoustic (noise) data in real-time within the Passaic River adjacent to the 80 Lister Ave project site. This data will be completed over three trips to the site. The first will be to record ambient sounds levels within the river. The second and third trips will record acoustic data during dredging activities. Each trip will include three surveys over difference phases of the tidal cycle (maximum flood, high slack, maximum ebb, and/or low slack) on each of two consecutive days for a total of six surveys per trip. It is recommended that the three surveys conducted during each survey day be completed over the same three tidal phases for each trip for direct comparison.

To collect this data, OSI will operate a commercial grade hydrophone deployed off the side of the survey vessel. The signal from the hydrophone will pass through a preamplifier to increase the range and clarity of the acoustic signals. Due to the significant currents at this site and the amount of noise generated by the vessel's hull and engine during anchoring, the survey vessel will drift along a series of transects along both the near and far shorelines (Figure 1). The transects will extend from approximately 600 feet upriver to nearly 800 feet down river of the project site including a stretch of about 800 feet directly in front of the dredging activities.

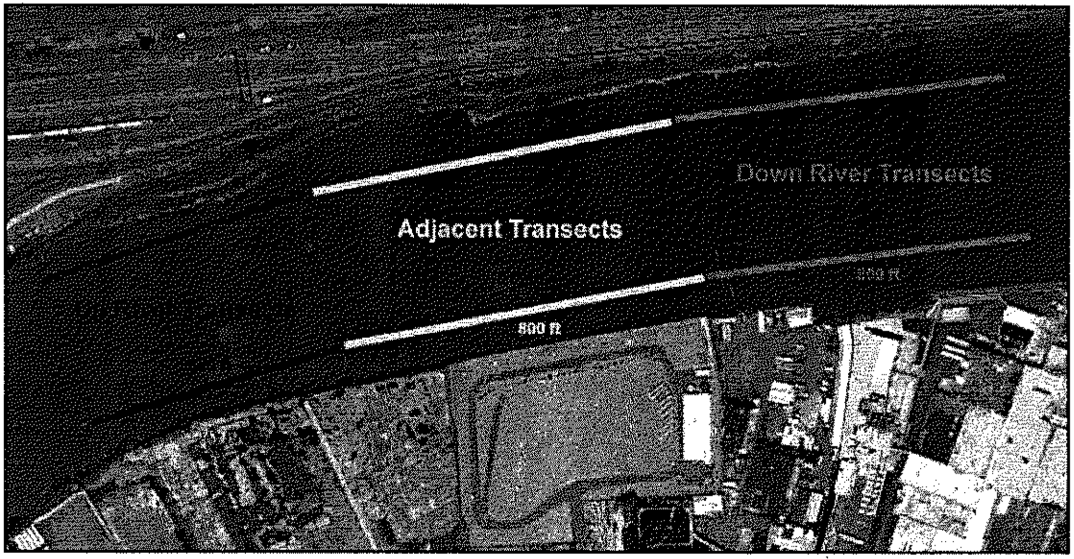


Figure 1. Transect layout.

During each drift, the field crews will attempt to collect acoustic data in short bursts at approximately 100 foot intervals along the transects. The acoustic files will be sufficient in length to record some form of dredging activity in each file. However, it is expected that the noise from the dredging activity will be irregular in magnitude and somewhat unpredictable. During periods of slack water, the survey vessel will motored along each transect, stop at 100 foot intervals, turn off engines, and record the acoustic data.

DATA PROCESSING & DELIVERABLES

OSI will deliver three letter reports accompanied by the project data within 30 days following the completion of each field trip. These reports will include a detailed schedule of operations, data collection and processing procedures, along with all project graphics and digital data files. Sound data will be presented as both raw data files (WAV format or as otherwise specified) and as spectral density plots. All positioning data will be referenced to the New Jersey State Plane-North America Datum 1983 (NAD83), in feet.

PROJECT COST

The following rates shown in Table 1 reflect the technical approach outlined above and are provided on a lump sum basis in accordance to our standard conditions of service (attached).

Table 1. Project Costs

Task	Unit	Rate	Est. Quantity	Cost
Acoustic Monitoring Survey (assumes 2 days of operations per trip)	Lump Sum Per Trip	$17,900	3	$53,700
Additional Survey Days (includes field time and data processing)	Per Day	$6,000	As Incurred	-
Standby	Per Day	$2,850	As Incurred	-
Shared Mobilization Discount	Lump Sum Per Trip	$2,200	As Incurred	-
Client Supplied Vessel Discount	Per Day	$200	As Incurred	-
			Acoustic Monitoring Program	**$53,700**

This service and associated fee proposal are offered based on the following assumptions:

- OSI personnel will have unrestricted access to the study area. The site will be free of floating obstructions such as moored vessels/barges, debris booms, etc. If impediments to the survey operation are encountered the area will be left un-surveyed. If requested, the field crew will stand by while the obstruction is moved (at the standby rate detailed below);
- Acoustic monitoring survey operations will be conducted for a period of two 10 hour days of operation. Survey operations will be conducted during daylight hours. If additional survey days are required the above per day rate would apply. This would include one 10 hour day of operations and additional data processing.

Standby days will be charged to time when operations are prevented or conditions occur that are beyond OSI's control including, but not limited to, adverse weather and/or sea conditions, lack of access to Client designated operating sites, lack or deficiency in Client provided services, etc. For budgeting purposes, OSI recommends adding a contingency of 10% ($5,370) to cover unforeseen delays caused by site access, weather, sea conditions, etc.

If ARCADIS chooses to merge any of the three survey trips with another survey conducted by OSI at this site, the shared costs in mobilization of $2,200 can be discounted from the overall per trip rate of $17,900. In addition, if ARCADIS chooses to provide a vessel to OSI for the acoustic surveys, OSI can discount the per trip costs by $400 (or $200 per day).

This offer is valid through December 31, 2011. If ARCADIS wishes to authorize OSI to proceed with this work, a purchase order referencing to the OSI/ARCADIS Master Service Agreement may be executed. OSI can typically be in the field approximately two weeks following receipt of this form. We look forward to providing these services in support of this project. If you have any questions, or I can be of assistance, please contact me or Ken Cadmus.

Sincerely,

George Reynolds

George G. Reynolds
Vice President

For Ken Cadmus
Manager – Coastal Science

OSI
MARINE AND FRESHWATER
SURVEY SERVICES

OCEAN SURVEYS, INC.
129 MILL ROCK ROAD EAST
OLD SAYBROOK, CT 06475
TEL. (860) 388-4631 FAX (860) 388-5879
www.oceansurveys.com

June 21, 2011

Mr. Coleman P. King
ARCADIS US, INC.
10 Friends Lane, Suite 200
Newtown, PA 18940

SUBJECT: HYDROGRAPHIC CONDITION SURVEYS, PASSAIC RIVER REMEDIAL WORK AREA, NEWARK, NJ

Dear Mr. King:

Ocean Surveys Inc. (OSI) is pleased to provide this quotation to conduct multiple single beam hydrographic condition surveys of the Passaic River Remedial Work Area adjacent to the 80-120 Lister Avenue site. We understand that the site will be separated from the Passaic River by means of a steel sheet cofferdam and that the enclosure measures approximately 150 feet x 750 feet. Transect spacing is anticipated to be approximately 20 feet to 25 feet.

As an option we have also included pricing to perform the pre-construction survey employing multibeam technology. We understand that for the pre-construction survey the survey area will be unencumbered by floating equipment or booms.

This proposal includes pricing for OSI to provide all personnel and equipment required to perform the single beam surveys from either an OSI or 3rd party vessel. For either approach we have assumed that ARCADIS will provide crane service for launching the survey vessel and/or equipment into the enclosure.

Based on past experience, we recommend using the OSI survey vessel which is customized for the task and maintained specifically for conducting survey work. We respectfully suggest that a dredger's support skiff may not always be: 1) available on OSI's schedule, or 2) maintained with the intention of providing reliable, repeatable, support for the survey task. Also, utilization of the OSI survey vessel will likely be logistically simpler as the OSI field team will be autonomous, not reliant on the support of the dredger except for launch and recovery of the survey vessel in/out of the enclosure.

All OSI personnel assigned to the project will be 40-hour HAZWOPR trained and certified with appropriate 8-hour refresher training updates. Each of the OSI field team will be a participant in OSI's HAZWOPR medical monitoring program.

Automated soundings will be acquired within vessel accessible areas as close to shore and structures as safe navigation practices allow into a depth of approximately 2.0 feet of water at the time of the survey. Depending on the requirements of the project, the OSI field team will be prepared to extend survey transects into shallow water or areas not accessible to the survey vessel transducer, i.e. inside corners of the sheet pile cofferdam, by means of manual "hand" soundings.

Instrumentation

To perform each single beam hydrographic survey we would plan to mobilize a field crew, equipped with the following or equivalent instrumentation: Trimble RTK GPS positioning system, an Innerspace Model 448 single beam echosounder, the HYPACK trackline control and hydrographic data logging system and a tide staff.

To conduct the single beam surveys we would plan to use a 14-foot jon boat powered with an 8-15 hp outboard motor. However, based on the plans (skiff.pdf) provided in your e-mail of December 9, 2010, we do not see any problems with adapting our equipment to the 3rd party vessel offered by ARCADIS.

To perform the optional pre-construction multibeam survey, we would plan to mobilize a field crew equipped with a 24' twin outboard survey vessel equipped with the following or equivalent instrumentation: RTK GPS positioning system (POS-MV), HYPACK trackline control and hydrographic data logging system, Reson 8125 multibeam echo sounder, Applanix POS-MV heading and orientation system, and a Sea-Bird sound velocity system. The proposed system is the same as that employed during OSI's design survey performed on behalf of Tierra/ARCADIS in May of 2009 (See OSI Drawing No. 09ES026).

Survey vessel navigation, trackline control, and position fixing for the sounding survey along with all other project tasks will be accomplished employing a Trimble RTK GPS positioning system interfaced with the HYPACK hydrographic software package. The HYPACK system incorporates a portable personal computer supporting multiple input/output ports and color display monitors. Operationally, the system receives vessel latitude and longitude position data from the shipboard RTK GPS unit, converts these data to the state plane coordinate system and subsequently stores this information on computer disk. Prior to the survey, a digitized representation of shoreline features, control points, and pre-selected survey tracklines is prepared and can be graphically displayed on the computer monitor. While surveying, the current position of the survey vessel is superimposed on the graphics screen augmented by a text display of parameters such as vessel speed, heading, course to steer, event, time, etc. The combination of a graphic display supported by numeric values provides real-time navigation data to the helmsman as the vessel is maneuvered along the intended survey trackline.

Precision water depth measurements will be obtained by employing an Innerspace 448 survey grade echosounder or Reson multibeam echosounder. Both instruments are microprocessor controlled and are capable of producing precise, high-resolution depth measurements. During survey operations, digital depths output from either echosounder are merged with navigation data via the HYPACK navigation program, which subsequently computes the precise position of each sounding. All values are saved on computer disk for post-processing.

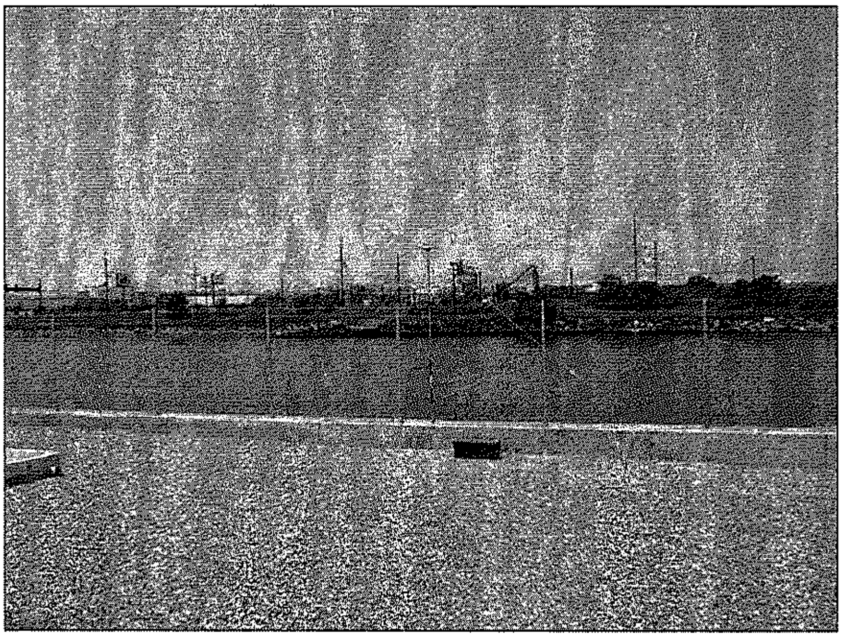
The single beam sounding system incorporates calibration capability for local water mass speed of sound. Calibration of the single beam system for local water mass speed of sound is accomplished by means of "bar checks" performed throughout the survey day. The bar check procedure consists of lowering an acoustic target on a measured sounding line to the maximum (practical) project depth. The speed of sound control is then adjusted such that the reflection from the disk is printed precisely at this known depth on the recorder. The acoustic target is raised to successively shallower depths and calibration readings at these depths are similarly recorded. Employing the bar check procedure, observed changes in water column sound speed (as a result of changing tidal/temperature conditions, etc.) are documented. Variations that exist in the resultant velocity information are subsequently incorporated into the hydrographic data analysis procedure to yield maximum accuracy in the resulting depth data.

For the multibeam system, calibration for local water mass speed of sound is accomplished utilizing a Sea-Bird SBE19. Employing this system, the water column velocity profile data will be monitored and all observed changes in sound speed (as a result of changing flow conditions, etc.) documented. Variations that exist in the velocity profile data are subsequently incorporated into the hydrographic data analysis procedure to yield maximum accuracy in the resulting depth data. A bar check will be employed to confirm proper operation of the multibeam system.

Survey Control

In order to achieve the level of precision navigation required for this type of survey it is necessary to deploy a land based RTK GPS reference station in the vicinity of the survey area. This system transmits correction factors to the vessel mounted RTK GPS system resulting in accurate vessel and acoustic sounding positioning as well as real-time water level determination at the location of the survey vessel.

Assuming that the survey disk(s) still exist and ARCADIS is able to secure permission, the RTK GPS base station will be installed on the concrete capped seawall on the Lister Ave. property. OSI has occupied the survey disk (see photo below) during past projects in the vicinity of the Lister Ave. property. A second disk on the wall will be used to confirm the proper operation of the RTK GPS system.



However, if the Lister Ave. GPS station installation/checkpoint is not an option, it is our understanding that your firm will provide at least two horizontal/vertical control points referenced to the project datum and grid system located near the shoreline of the study area. These points need to have a clear view of the sky (i.e. at least 30° above the horizon in all directions). One XYZ point needs to be located in a secure area allowing for unattended operation of the RTK GPS base station. The second XYZ point should be established on a piling or bulkhead nearby the secure point such that a direct measurement can be made from the temporary point to the water surface.

Data Products

On completion of each hydrographic data acquisition effort, the single beam data will be processed and water level corrected while the field team is still on site. A preliminary contour plan will be delivered prior to demobilization of each survey. The preliminary product will be delivered on removable media or

CD-ROM in .DXF format. The location for the onsite data processing will be largely weather dependant, i.e. the field team will not risk ruining the processing computer in the rain when the data processing could be done in a more appropriate location such as the cabin of the dredge support vessel, the survey support vehicle, or the Lister Ave. warehouse.

Upon return to OSI's Old Saybrook office, interim survey preliminary data will be subjected to QA/QC analysis and final deliverables prepared. For either survey method, final products will include a contour plan and ASCII listing of X,Y,Z data points employed in creating the contour plan. The graphic deliverable will be a 1" to 30' contour plan. Contour interval will be 1 foot. The extremely detailed multibeam contour plan will be underlain by a colorized, shaded relief display similar to that included in OSI Drawing 10ES026)

Final products will be shipped within five business days of the completion of field work for each survey and will include two paper copies of the project drawing and a CD containing the AutoCAD drawing file and ASCII X,Y,Z listing.

This quote is based on the following assumptions:

- OSI personnel will have unrestricted access to the study area and shoreside control points.
- The site will be free of floating obstructions such as moored vessels/barges, debris booms, etc. If impediments to the survey operation are encountered, the area will be left un-surveyed. If requested, the field crew will stand by while the obstruction is moved.
- ARCADIS will be responsible for any required access, permissions, permits, notifications, etc., for the hydrographic survey.
- ARCADIS will provide two control points as detailed above.
- Survey operations will be conducted on a continuous basis (i.e., 10 hrs per day, 7 days/week) following mobilization until completion of each survey.
- Survey operations will be conducted during daylight hours.
- Survey operations will be conducted when the site and local boat ramp are ice free.

OSI will provide these services in accordance with our Conditions of Service (copy attached for your reference) for the following rates. This offer is valid for 90 days.

Definitions

- Mobilization/Demobilization (Lump Sum, Per Mobilization)
  Includes all in-house planning/preparation and personnel/equipment/travel expenses to and from the project launch ramp or staging area but does not include on-site meetings, vessel setup, vessel launch, crane service, travel between the launch site to the study area, project survey plan finalization or other requested or required on-site activities.

- Operating Day (up to 10-hrs/day)
  Includes all personnel, equipment and per diem expenses. Day rate charges will commence on the arrival of the survey crew at the project boat ramp or meeting place and will include all onsite activities such as project meetings, launch, and recovery of the survey vessel, RTK GPS base station deployment and recovery, travel between the launch area and survey area, instrument tuning, calibration procedures, HASP compliance, onsite data processing, etc. Day rate charges will terminate on the crew's departure from the project launch ramp after completion of all survey/sampling operations.

- Overtime (Per Hour)
  If requested, will be @ 1/10th the daily rate for up to two additional hours/day. Time worked beyond two (2) overtime hours per day will be worked only by mutual consent of Client and OSI and will be billed at 1.25 x the task-specific hourly rate.

- Standby Days (Per Day)
  Includes all personnel, equipment and per diem expenses and applies to time when a full day's operation is prevented or conditions occur that are beyond OSI's control including, but not limited to, adverse weather and/or sea conditions, lack of access to Client designated survey areas, lack or deficiency in Client provided services, etc. This rate will apply to any <u>full</u> day that the OSI field team is required to take part in project related safety/orientation meetings.

- Single Beam Data Products (Lump Sum, Per Survey)
  Covers interim survey final data products described above. Assumes data processing tasks are completed at OSI's Old Saybrook office.

- Multibeam Data Products (Lump Sum, Per Survey)
  Covers interim survey final data products described above. Assumes data processing tasks are completed at OSI's Old Saybrook office.

- Additional Data Processing or Plotting Services if required (Per Hour)
  Assumes that all tasks are completed in OSI's Old Saybrook offices.

- Project Control Research, Logistical and Home Office Support (Per Hour)
  Assumes that all tasks are completed in OSI's Old Saybrook offices.

For planning purposes, assuming our field team has unlimited access to the survey area/control stations and assuming favorable weather conditions, we believe that each single beam survey could be completed in 1-2 days and the optional pre-construction multibeam survey could be completed in 2-2.5 days which includes setup and recovery of the GPS reference station, onsite mobilization/demobilization of the survey vessel and onsite data processing.

Estimated Budget - Single Beam Survey Using OSI Vessel (Per Mobilization)

Task	Unit	Unit Rate	Estimated Total Units			Extension		
Mobilization/Demobilization	Lump Sum	$ 2,415	1			$2,415		
Operating Day	Per Day	$ 2,935	1	to	2	$ 2,935	to	$ 5,870
Overtime	Per Hour	$ 295	As incurred			$ -	to	$ -
Standby	Per Day	$ 2,645	As incurred			$ -	to	$ -
Final Data Processing & Presentation	Lump Sum	$ 1,010	1			$1,010		
Additional Data Processing or Plotting Services	Per Hour	$ 100	As requested			$ -		
Estimated Budget - Single Beam Survey Using OSI Vessel						$ 6,360	to	$ 9,295

Estimated Budget - Single Beam Survey Using 3rd Party Vessel (Per Mobilization)

Task	Unit	Unit Rate	Estimated Total Units			Extension		
Mobilization/Demobilization	Lump Sum	$ 2,405	1			$2,405		
Operating Day	Per Day	$ 2,845	1	to	2	$ 2,845	to	$ 5,690
Overtime	Per Hour	$ 285	As incurred			$ -	to	$ -
Standby	Per Day	$ 2,610	As incurred			$ -	to	$ -
Final Data Processing & Presentation	Lump Sum	$ 1,010	1			$1,010		
Additional Data Processing or Plotting Services	Per Hour	$ 100	As requested			$ -		
Estimated Budget - Single Beam Survey Using 3rd Party Vessel						$ 6,260	to	$ 9,105

Estimated Budget - Pre-construction Multibeam Survey (Per Mobilization)

Task	Unit	Unit Rate	Estimated Total Units			Extension		
Mobilization/Demobilization	Lump Sum	$ 3,985	1			$3,985		
Operating Day	Per Day	$ 5,995	2	to	2.5	$ 11,990	to	$ 14,988
Overtime	Per Hour	$ 600	As incurred			$ -	to	$ -
Standby	Per Day	$ 4,870	As incurred			$ -	to	$ -
Final Data Processing & Presentation	Lump Sum	$ 1,010	1			$1,010		
Additional Data Processing or Plotting Services	Per Hour	$ 100	As requested			$ -		
Estimated Budget - Multibeam Survey Using OSI Vessel						$ 16,985	to	$ 19,983

For planning purposes, we will make a good faith effort to mobilize to the project site within 5 business days of each requested survey.

~~If ARCADIS wishes to authorize OSI to proceed with this work, the attached Agreement may be executed~~ All terms and conditions are in accordance with the national agreement AUS-NATMSA-OSI-100507 between Ocean Surveys, Inc. and ARCADIS U.S., Inc. and the client requirements located in Schedule D - Client Flowdown Provisions

We are looking forward to supporting ARCADIS on this project. If you have any questions or if I can be of any assistance, please do not hesitate to contact me.

Sincerely,

George Reynolds

George Reynolds
Vice President

GGR/lf
Enclosures

ARCADIS SUBMITTAL # PC-FIO-009

ARCADIS US, INC
SUBMITTAL FORM

To Mr. Matthew Bowman, Construction Manager
Arcadis Us, Inc
251 E. Ohio Street, Suite 800
Indianapolis, IN 46204

Submittal No. 352023-01-A
Date of Submittal: January 5, 2012
Contractor: Weeks
Contract No.: B0009964.001
Subject of Submittal: Dredge Equipment

Specification No. 352023.13
Par. No. 1.4.1.2
Drawing No. N/A

WE ARE SENDING YOU ATTACHED THE FOLLOWING: (Indicate All Applicable Items)

☐ Shop Drawings
☐ Sample
☐ Progress Schedules
☐ O&M Manual
☐ Testing Procedure
☐ Contact List
☒ First Submission
☐ Second Submission
☐ Third Submission
☐ ______ Submission

DESCRIPTION (Itemize All Components)	NO. OF COPIES
Dredge Equipment	1
and sequence	

Complete either (a) or (b) and ©, in the case of technical Submittals or Progress Schedule Submittals:

a (X) The Contractor verified that the material, equipment, or other item contained in this Submittal meets all the requirements specified, shown,, or indicated in the Contract Documents with no exceptions.

b ( ) The Contractor has verified that the material, equipment, or other item contained in this Submittal meets all requirements specified, shown, or indicated in the Contract Documents except for variances identified in the following attached documents:

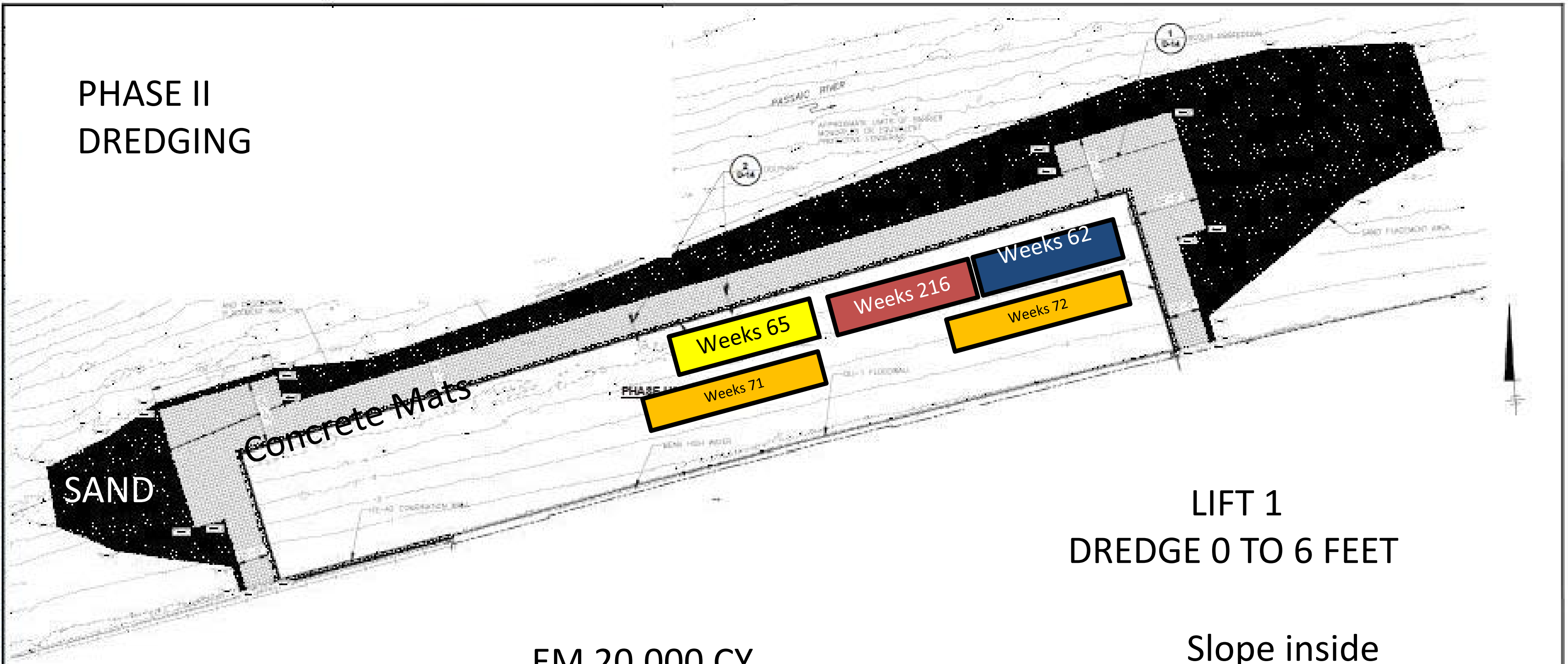
c (X) The Contractor has stamped or written its approval on each Shop Drawing sheet, or cover sheet in the case of other Submittals, certifying that the Contractor has satisfied its responsibilities with respect to the review of the submission including, but not limited to, the requirements of Article 6 of the General Conditions.

Signed (By the Contractor): Claude Dion

Claude Dion

ARCADIS
TIERRA SOLUTIONS, INC.
LOWER PASSAIC RIVER, NEWARK, NJ

PHASE II
DREDGING



LIFT 1
DREDGE 0 TO 6 FEET

EM 20,000 CY

Slope inside enclosure is approximately 6%

Weeks 62	104 X 40 X 8 Deck Barge with Screen Pump/Excavator CAT 345
Weeks 65	135 X 50 X 11.5 Deck Barge 385 CAT Excavator
Weeks 71-72	100 X 37 X 12.75 Hopper Barge (DOS)
Weeks 216	90 X 30 X 9.25 Deck Barge with Rail Oversize Mat.

ROBERT ROMAGNOLI

ARCADIS

ARCADIS U.S., INC.

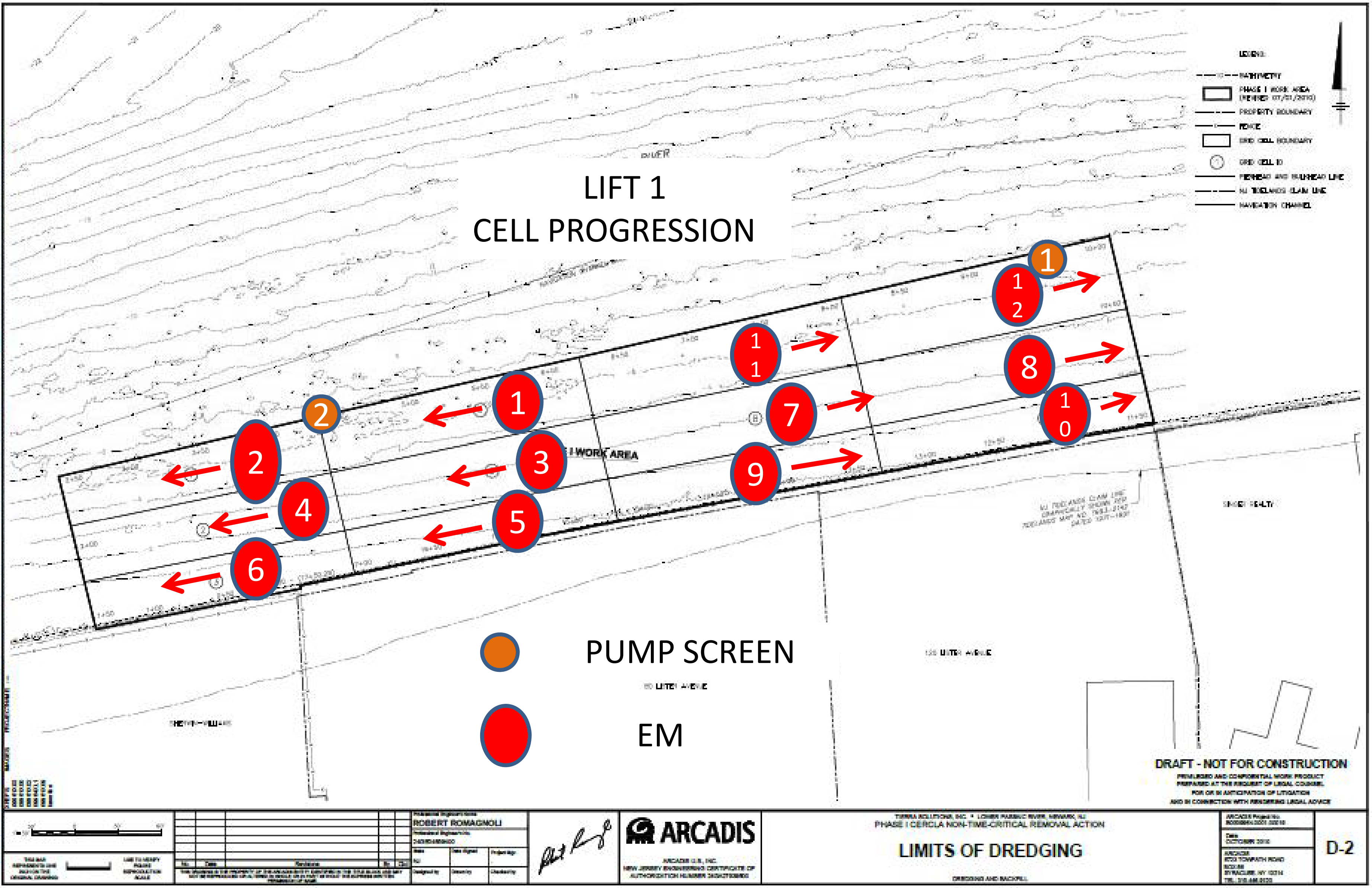
TIERRA SOLUTIONS, INC. • LOWER PASSAIC RIVER, NEWARK, NJ
PHASE I CERCLA NON-TIME-CRITICAL REMOVAL ACTION

ENCLOSURE SCOUR PROTECTION
PLAN AND SECTIONS

DREDGING AND BACKFILL

D-14

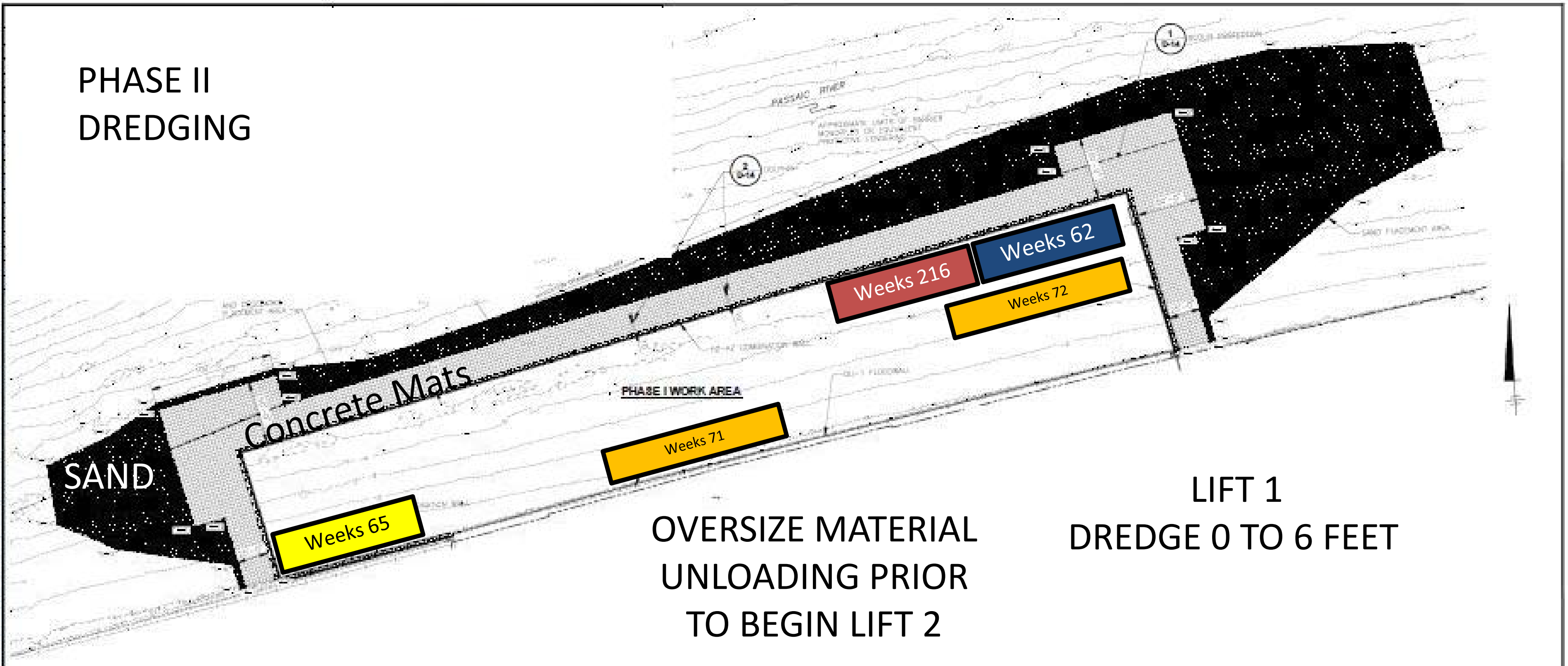
LIFT 1
CELL PROGRESSION



● PUMP SCREEN

● EM

PHASE II
DREDGING



OVERSIZE MATERIAL
UNLOADING PRIOR
TO BEGIN LIFT 2

LIFT 1
DREDGE 0 TO 6 FEET

Weeks 62	104 X 40 X 8 Deck Barge with Screen Pump/Excavator CAT 345
Weeks 65	135 X 50 X 11.5 Deck Barge 385 CAT Excavator
Weeks 71-72	100 X 37 X 12.75 Hopper Barge (DOS)
Weeks 216	90 X 30 X 9.25 Deck Barge with Rail Oversize Mat.

ROBERT ROMAGNOLI

ARCADIS

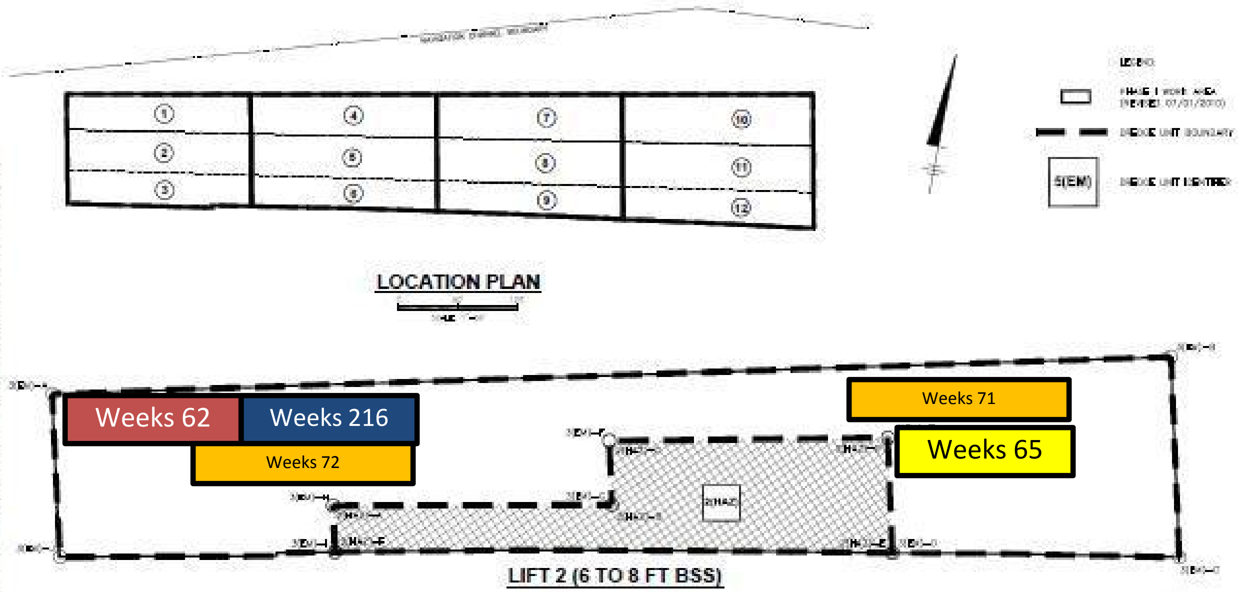
ARCADIS U.S., INC.
NEW JERSEY ENGINEERING CERTIFICATE OF
AUTHORIZATION NUMBER [illegible]

TIERRA SOLUTIONS, INC. • LOWER PASSAIC RIVER, NEWARK, NJ
PHASE I CERCLA NON-TIME-CRITICAL REMOVAL ACTION

ENCLOSURE SCOUR PROTECTION
PLAN AND SECTIONS

DREDGING AND BACKFILL

D-14



EM 5,333 CY
HAZ MAT 1,333 CY

1. DREDGE HAZ MAT (SHADE AREA)
2. SURVEY
3. UNLOAD OVERSIZE MATERIAL
4. DECONTAMINATE EQUIPMENT (HAZMAT)
5. DREDGE EM MATERIAL (WHITE AREA)
6. GO TO NEXT LIFT

LIFT 2
(2’ INCREMENT)
FROM ELEVATION 6 TO 8 FEET

ROBERT ROMAGNOLI

ARCADIS

ARCADIS U.S., INC.
NEW JERSEY ENGINEERING CERTIFICATE OF AUTHORIZATION NUMBER [illegible]

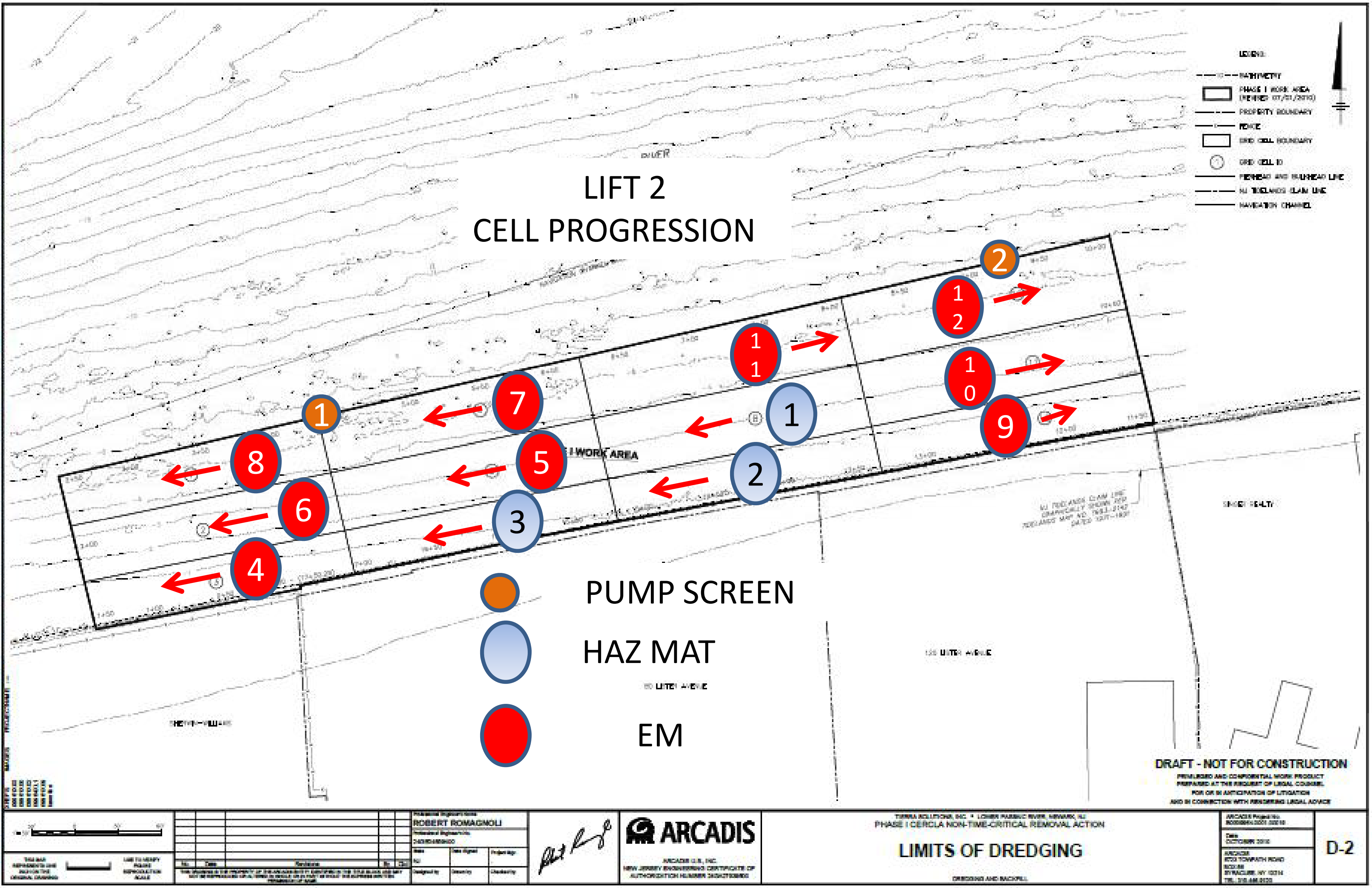
TIERRA SOLUTIONS, INC. • LOWER PASSAIC RIVER, NEWARK, NJ
PHASE I CERCLA NON-TIME-CRITICAL REMOVAL ACTION

SEQUENCE OF REMOVAL FOR LIFTS 2, 3, AND 4

DREDGING AND BACKFILL

Date
OCTOBER 2010

D-6

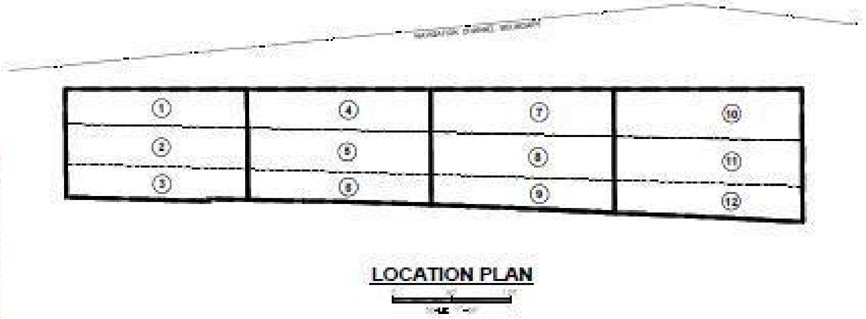


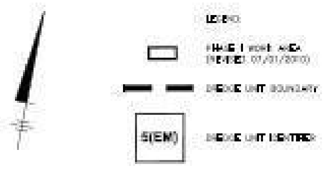
LIFT 2
CELL PROGRESSION

● PUMP SCREEN

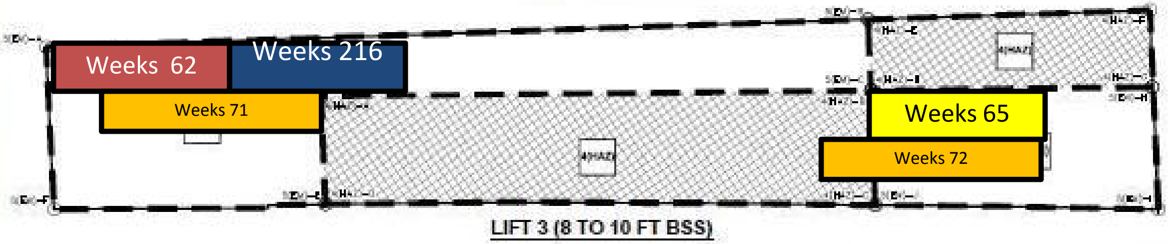
● HAZ MAT

● EM





1. DREDGE HAZ MAT (SHADE AREA)
2. SURVEY
3. UNLOAD OVERSIZE MATERIAL
4. DECONTAMINATE EQUIPMENT (HAZMAT)
5. DREDGE EM MATERIAL (WHITE AREA)
6. GO TO NEXT LIFT



EM 4,333 CY
HAZ MAT 2,333 CY

LIFT 3
(2' INCREMENT)
FROM ELEVATION 8 TO 10 FEET

ROBERT ROMAGNOLI

ARCADIS

ARCADIS U.S., INC.
NEW JERSEY ENGINEERING CERTIFICATE OF AUTHORIZATION NUMBER

TIERRA SOLUTIONS, INC. • LOWER PASSAIC RIVER, NEWARK, NJ
PHASE I CERCLA NON-TIME-CRITICAL REMOVAL ACTION

SEQUENCE OF REMOVAL FOR LIFTS 2, 3, AND 4

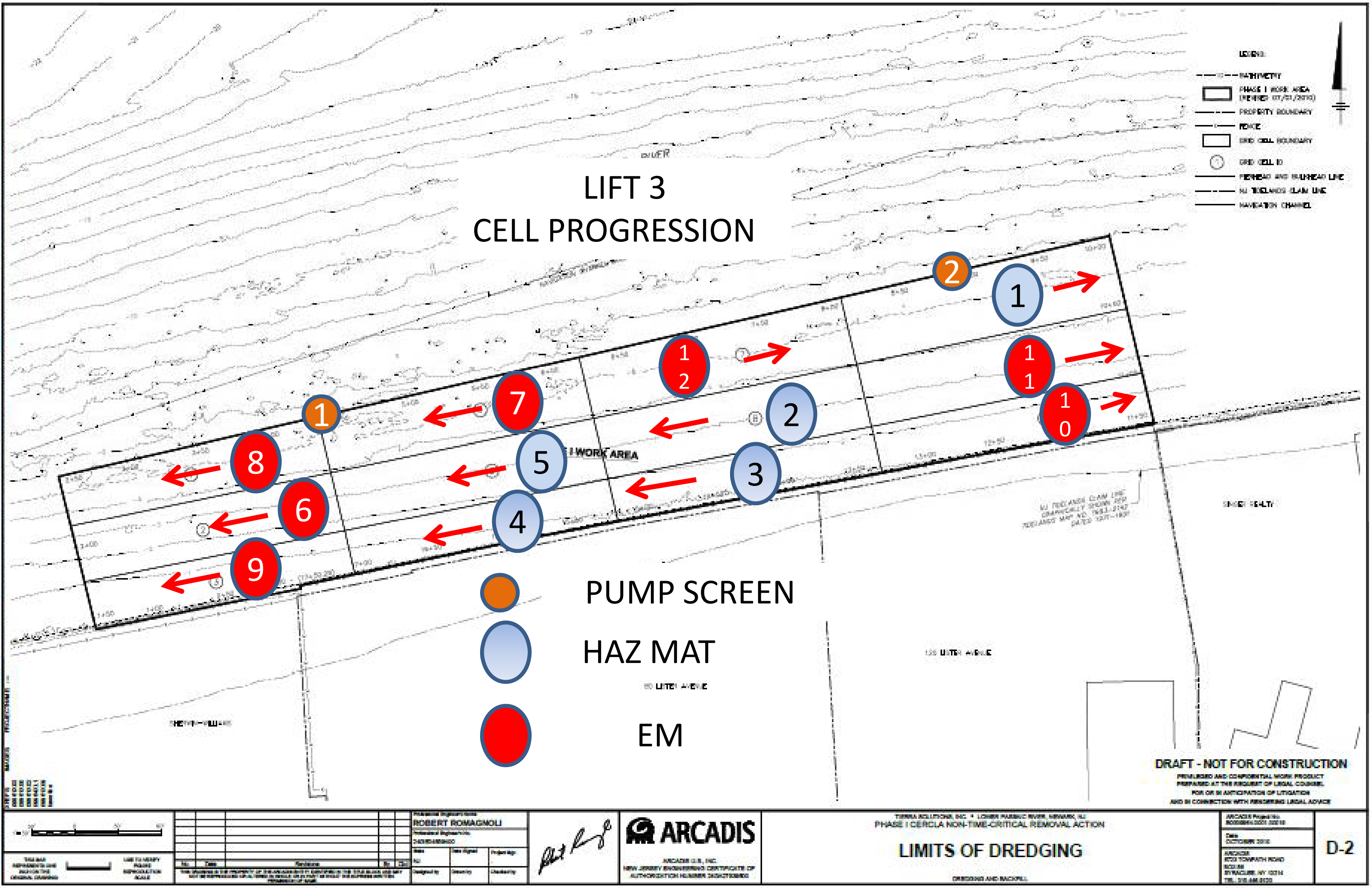
DREDGING AND BACKFILL

Date
OCTOBER 2010

ARCADIS
6723 TOWPATH ROAD
BOX 66
SYRACUSE, NY 13214

D-6

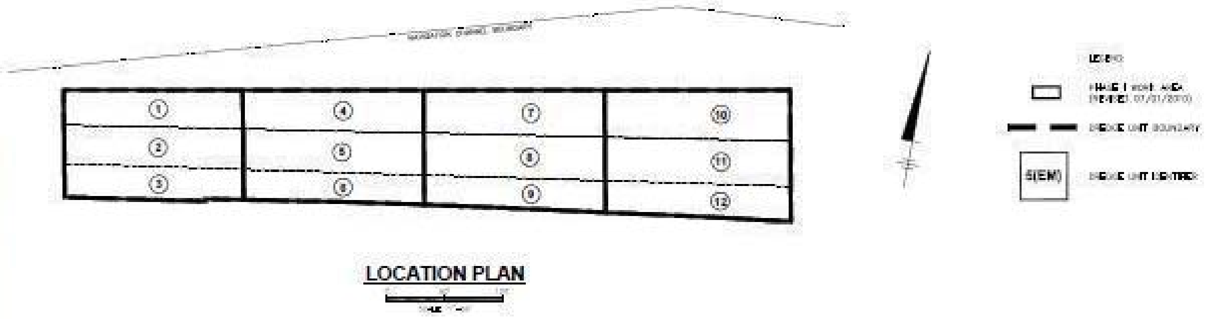
LIFT 3
CELL PROGRESSION



● PUMP SCREEN

● HAZ MAT

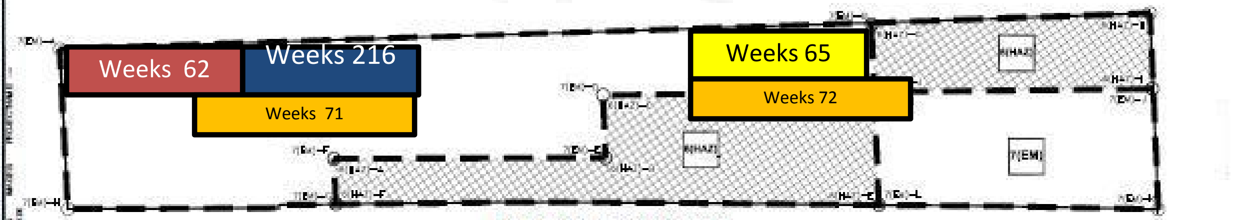
● EM



LIFT 4
(2' INCREMENT)
FROM ELEVATION 10 TO 12 FEET

EM 4,833 CY
HAZ MAT 1,833 CY

1. DREDGE HAZ MAT (SHADE AREA)
2. SURVEY
3. UNLOAD OVERSIZE MATERIAL
4. DECONTAMINATE EQUIPMENT (HAZMAT)
5. DREDGE EM MATERIAL (WHITE AREA)
6. GO TO BACKFILL



LIFT 4 (10 TO 12 FT BSS)

ROBERT ROMAGNOLI

ARCADIS

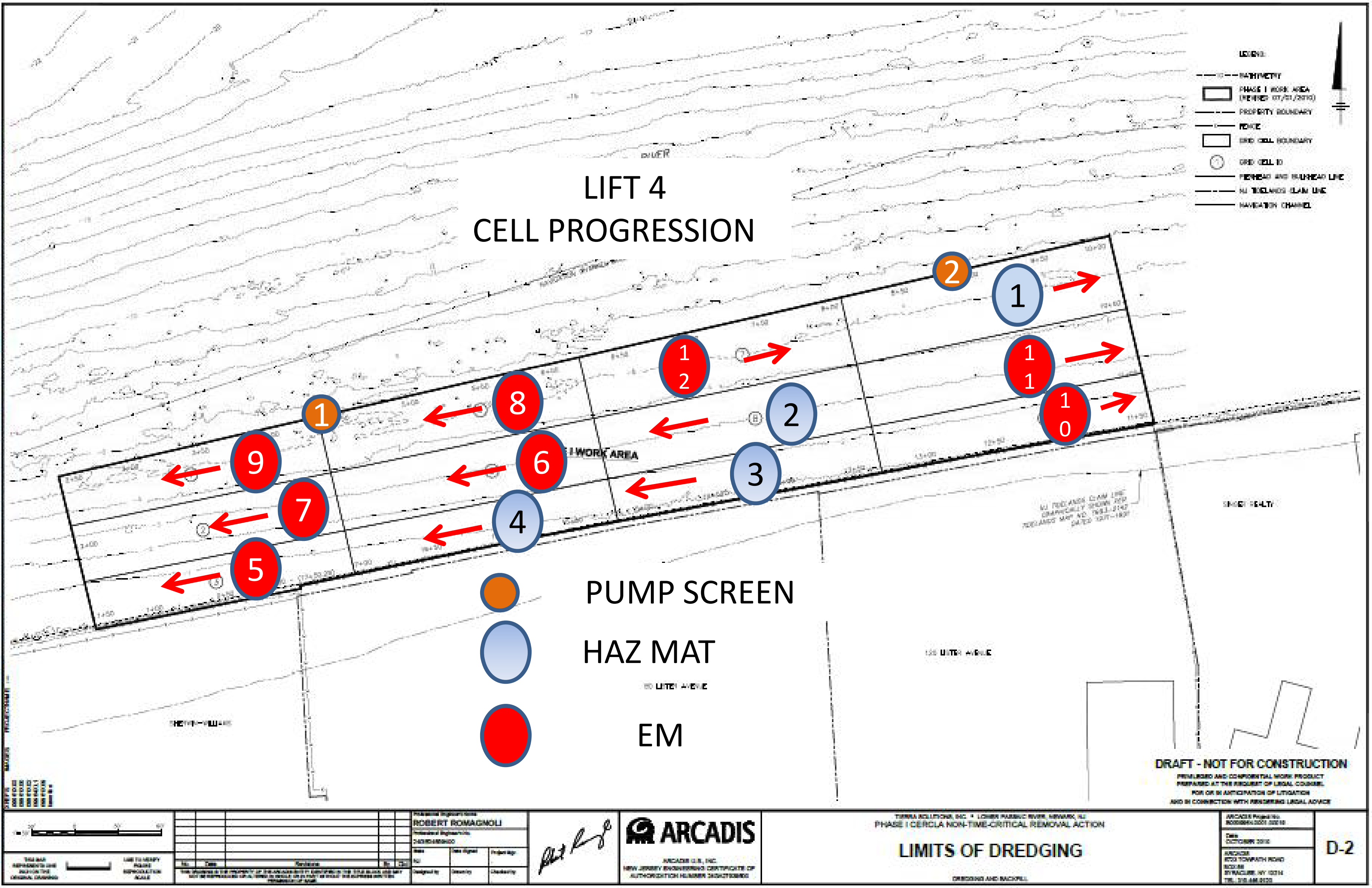
TIERRA SOLUTIONS, INC. • LOWER PASSAIC RIVER, NEWARK, NJ
PHASE I CERCLA NON-TIME-CRITICAL REMOVAL ACTION

SEQUENCE OF REMOVAL FOR LIFTS 2, 3, AND 4

DREDGING AND BACKFILL

D-6

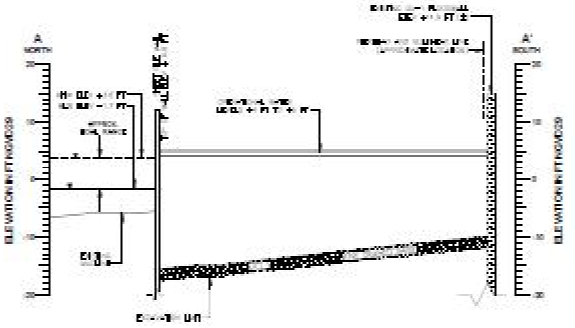
LIFT 4
CELL PROGRESSION



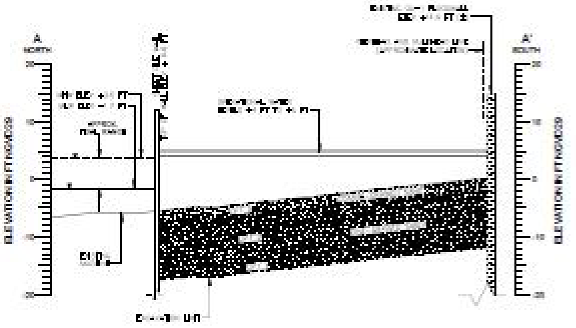
● PUMP SCREEN

● HAZ MAT

● EM



INITIAL 2-FT LIFT OF BACKFILL MATERIAL



FINAL 2-FT LIFT OF BACKFILL MATERIAL

PHASE III
BACKFILL

FIRST 2’ LIFT FINE GRAINED SAND MITIGATE MIXING AND RESUSPENSION
SECOND LIFT 8’ FINE GRAINED SAND
LAST LIFT 2’ COARSE GRAINED SAND

NOTES:
1. ELEVATIONS REPORTED IN FT REFERENCE NGVD29.
2. THESE DATUM COMPARISONS ARE VALID FOR THE PHASE I WORK AREA OF THE PASSAIC RIVER.

FT NGVD29 (MHW)
FT NGVD29 (MSL)
FT NGVD29 (MLW)

3. SURVEY ELEVATIONS AND THE PIERHEAD AND BULKHEAD LINES WERE PROVIDED BY [illegible] CONSULTING, LLC DATED 10/31/2008
4. INITIAL 2-FT LIFT WILL BE PLACED IN A MANNER TO MITIGATE MIXING WITH AND RESUSPENSION OF UNDERLYING SEDIMENTS AS DESCRIBED IN THE SPECIFICATIONS

DRAFT - NOT FOR CONSTRUCTION
PRIVILEGED AND CONFIDENTIAL WORK PRODUCT
PREPARED AT THE REQUEST OF LEGAL COUNSEL
FOR OR IN ANTICIPATION OF LITIGATION
AND IN CONNECTION WITH RENDERING LEGAL ADVICE

ROBERT ROMAGNOLI

ARCADIS
ARCADIS U.S., INC.
NEW JERSEY ENGINEERING CERTIFICATE OF AUTHORIZATION NUMBER [illegible]

TIERRA SOLUTIONS, INC. • LOWER PASSAIC RIVER, NEWARK, NJ
PHASE I CERCLA NON-TIME-CRITICAL REMOVAL ACTION

BACKFILL DETAILS AND NOTES

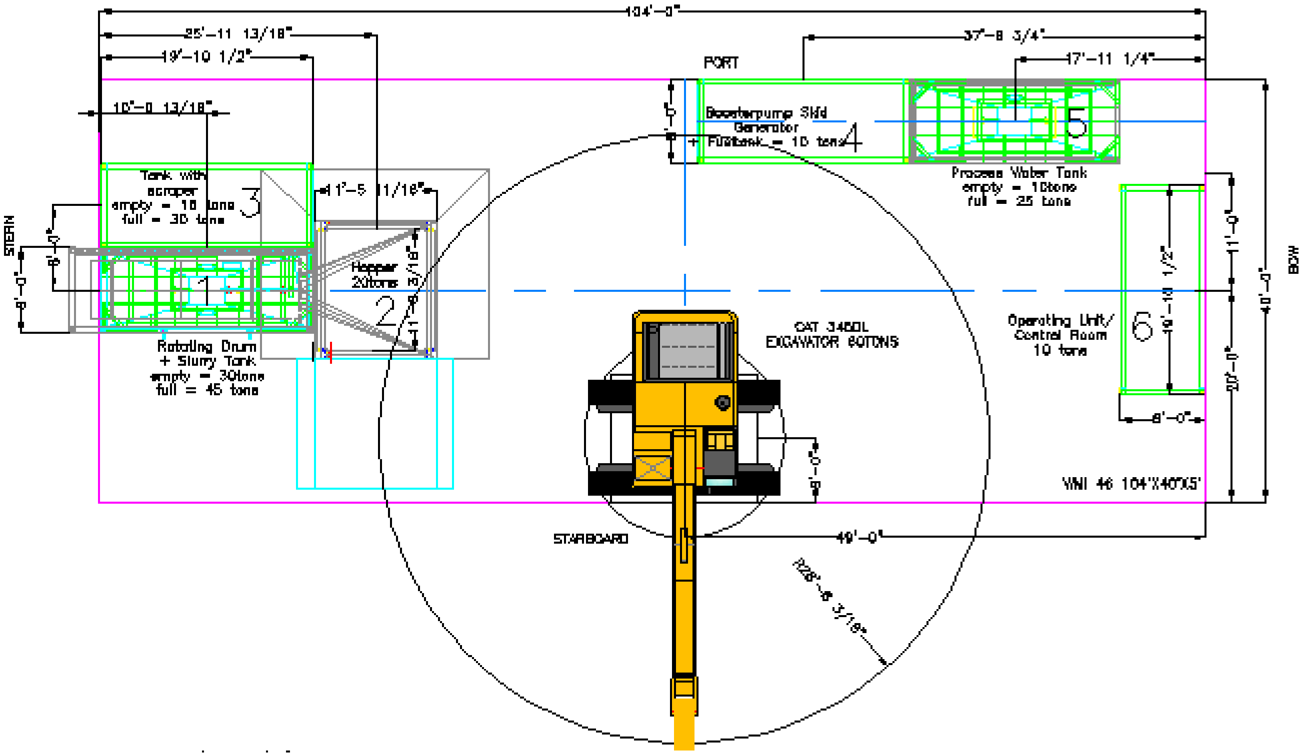
DREDGING AND BACKFILL

Date
OCTOBER 2010

ARCADIS
6723 TOWPATH ROAD
BOX 66
SYRACUSE, NY 13214
TEL. 315.446.9120

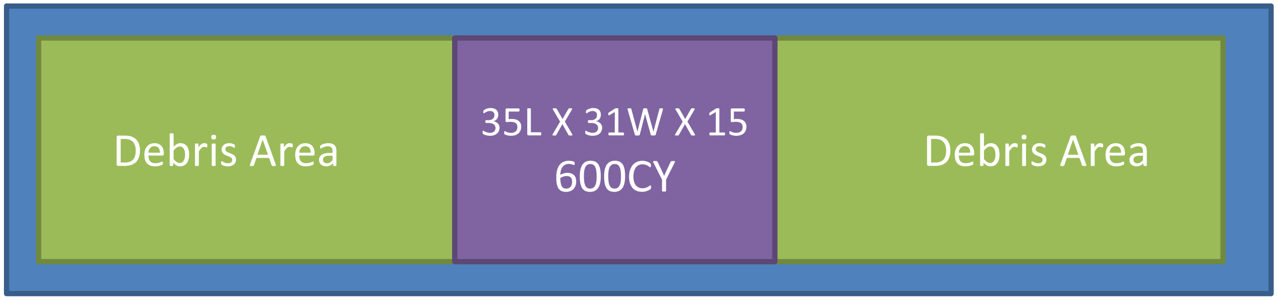
D-12

Unloading Barge, Screen, and Pump



DOS BARGE

140 X 37 X 12.75



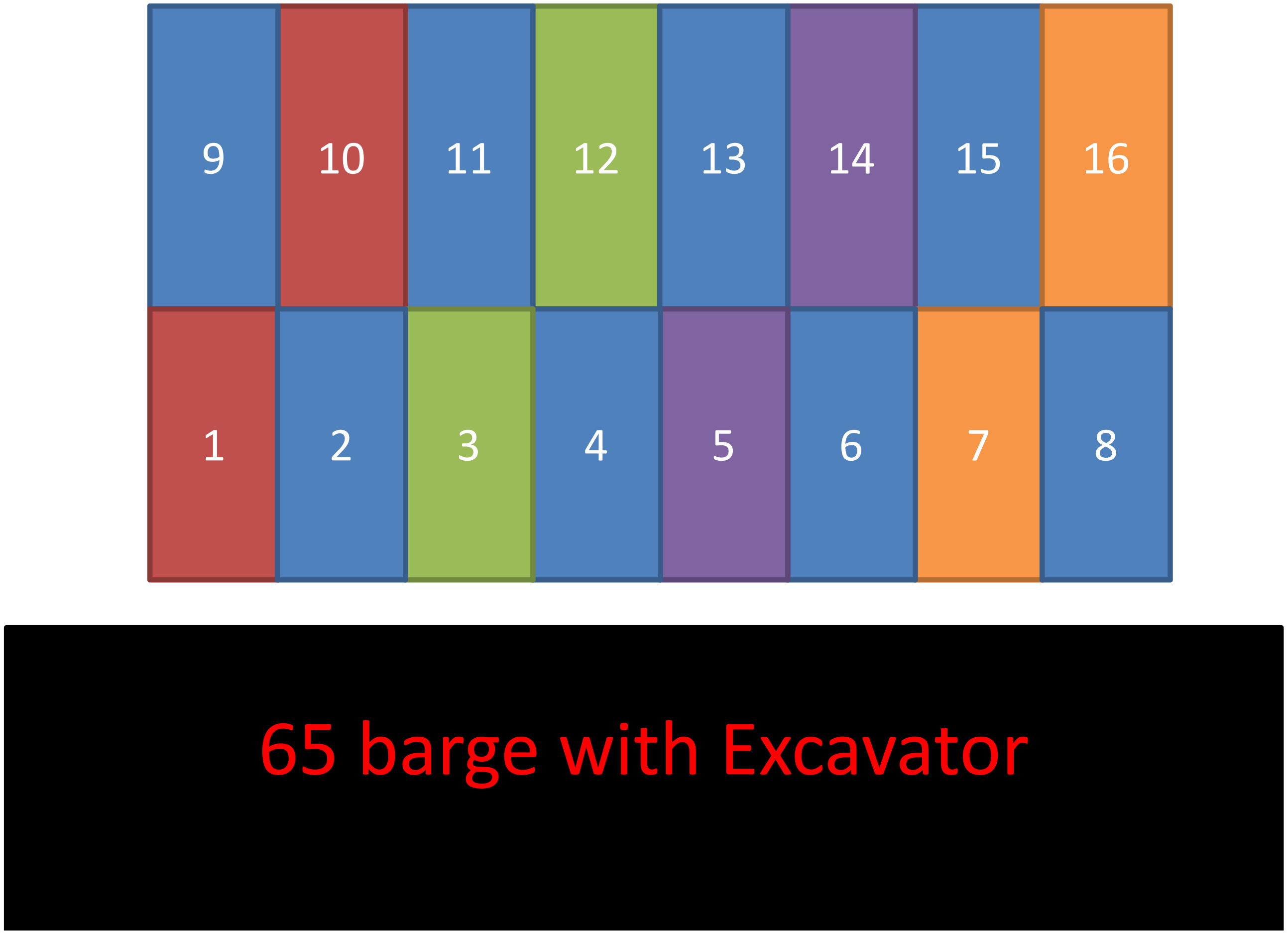
Debris Area

35L X 31W X 15
600CY

Debris Area

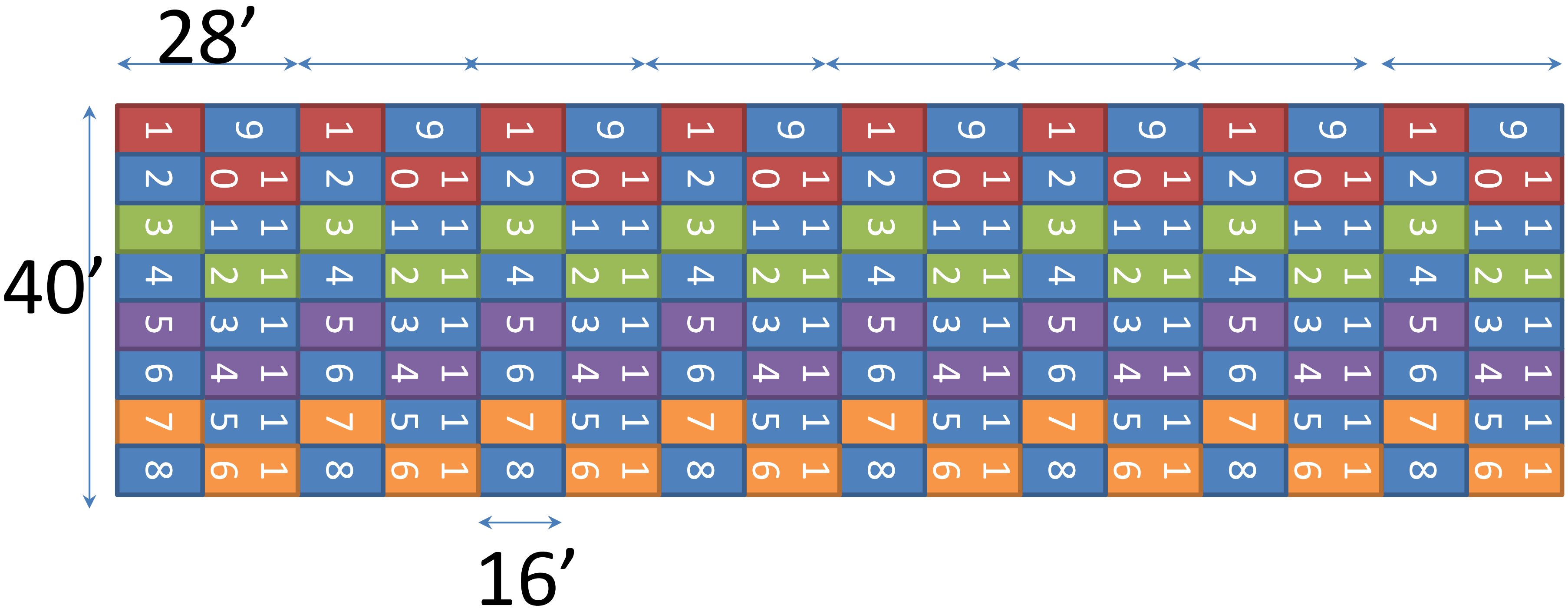
Horizontal Profiling Bucket

Two Bucket Length Pattern
40’wide x 28’long



Typical Cell Movement

Longitudinal Movement between 7-9 times

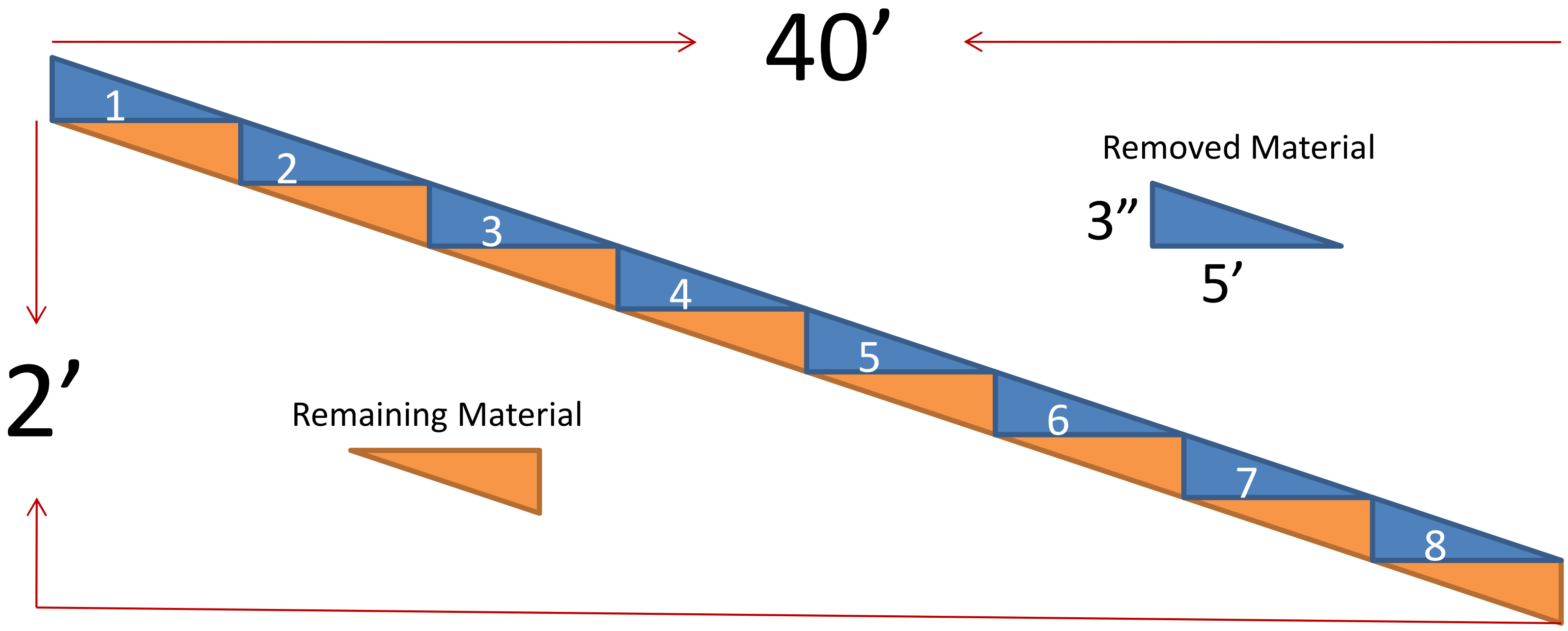


1	9	1	9	1	9	1	9	1	9	1	9	1	9	1	9
2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10
3	11	3	11	3	11	3	11	3	11	3	11	3	11	3	11
4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12
5	13	5	13	5	13	5	13	5	13	5	13	5	13	5	13
6	14	6	14	6	14	6	14	6	14	6	14	6	14	6	14
7	15	7	15	7	15	7	15	7	15	7	15	7	15	7	15
8	16	8	16	8	16	8	16	8	16	8	16	8	16	8	16

Weeks dredge will dig bucket 1 to 16 from the same position. The dredge will dig approximately 1’ depth and dig to final elevation which is approximately 1’ depth for a total of 2’ prior to move to the next set of bucket. This operation will be throughout the cell.

5 % Contour Slope of Bucket Pattern

6’ Wide Bucket



Equipment Tie-up Points