Risk Assessment for Air Pollution Control Permits

Joel Leon, Bureau of Technical Services

April 9, 2014

Presented by –

ACE academy

New Jersey Department of Environmental Protection

Who Has To Do Risk Assessment?

Anyone applying to the
NJDEP Division of Air Quality
for a new pre-construction permit,
or a modification (including
Operating Permits),
who lists any of the chemicals
that are on the risk screening worksheets.

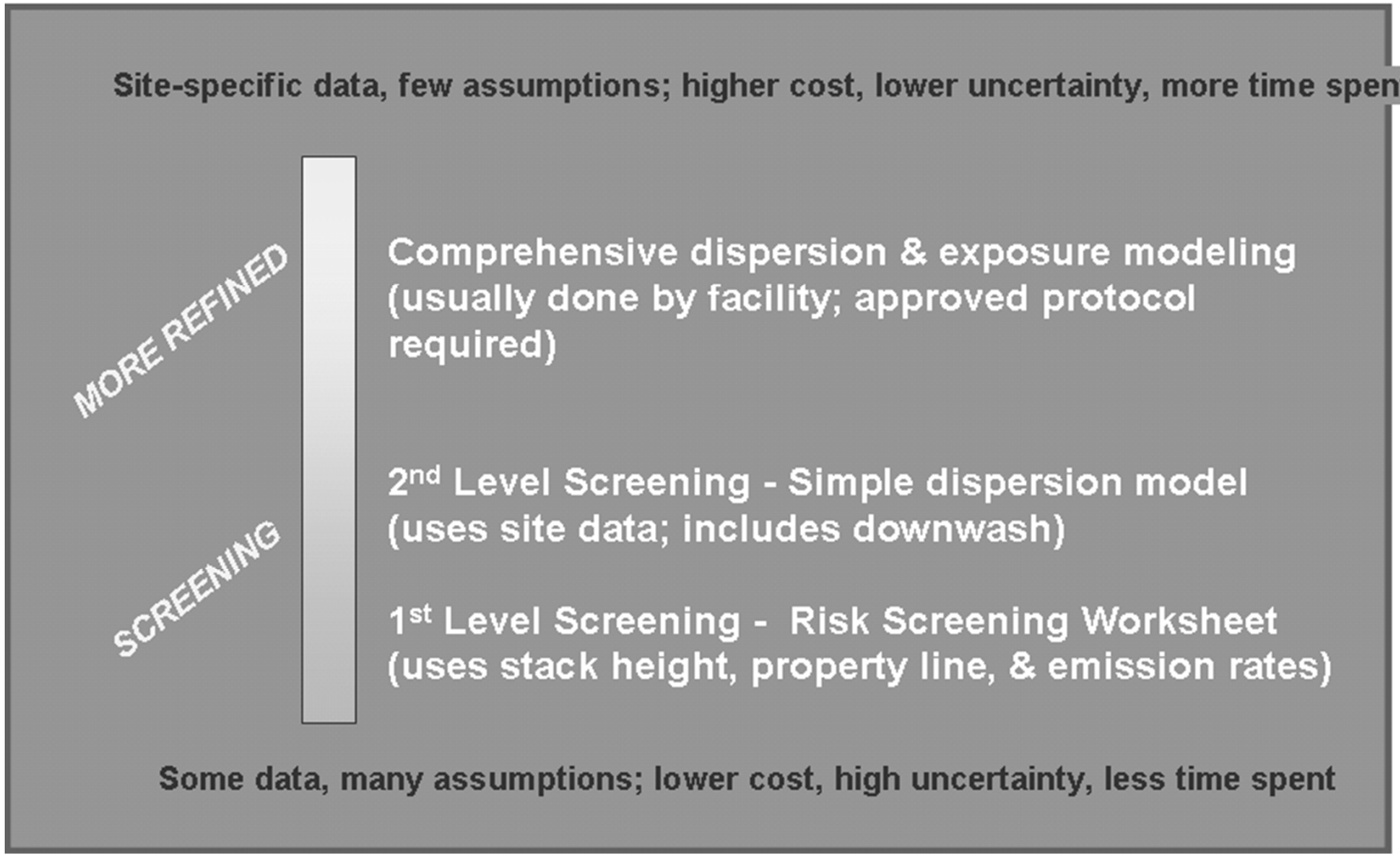
Risk Assessment Steps*

- Hazard identification
- Dose-response assessment
- Exposure assessment
- Risk characterization

*As recommended by the National Research Council, 1983

NJDEP DAQ Risk Assessment Procedures:

Tiered Approaches to the Process



Comprehensive Risk Assessment

- Focus on inhalation pathway
- Protocol approval needed
- Should be submitted with modeling document
- *Technical Manual 1003: Guidance on Risk Assessment for Air Contaminant Emissions*

Technical Manual 1003: Guidance on Risk Assessment for Air Contaminant Emissions

- Revised 12/2009
- Adobe pdf version available at www.nj.gov/dep/aqpp/techman.html

Refined Risk Assessment: Special Cases

Mercury Emitters

If emissions are over 20 lb/year,

applicant must evaluate the health risk from ingestion of fish from a local freshwater body.

Fish ingestion model available from BTS.

Refined Risk Assessment: Special Cases

Hazardous Waste Combustors

USEPA requires multi-pathway risk assessment, based on "Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities"

available at
www.epa.gov/epawaste/hazard/tsd/td/combustion.htm

NJDEP
Division of Air Quality
Risk Screening

A short-cut for determining potential risk for the thousands of Air Pollution Control Permits processed every year.

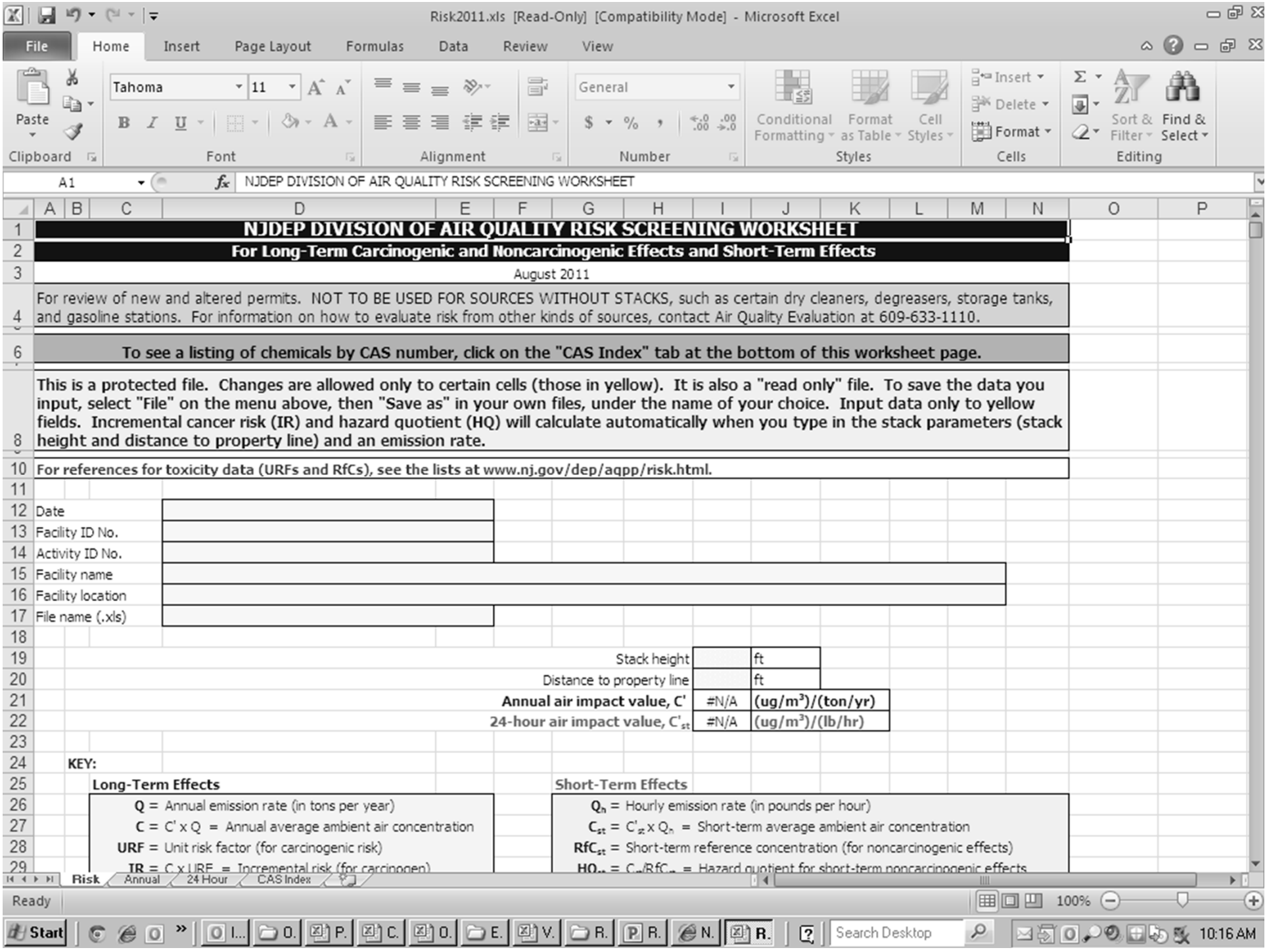
Risk Screening Worksheet - 2 Different Evaluations (in one Excel spreadsheet)

LONG-TERM RISK

- Emissions in tons/year
- Annual average ambient air concentration
- Incremental cancer risk AND noncancer hazard quotient

SHORT-TERM RISK

- Emissions in pounds/hour
- 1-, 8-, or 24-hour average ambient air concentration
- Short-term hazard quotient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A1
NJDEP DIVISION OF AIR QUALITY RISK SCREENING WORKSHEET
NJDEP DIVISION OF AIR QUALITY RISK SCREENING WORKSHEET
For Long-Term Carcinogenic and Noncarcinogenic Effects and Short-Term Effects
August 2011
For review of new and altered permits. NOT TO BE USED FOR SOURCES WITHOUT STACKS, such as certain dry cleaners, degreasers, storage tanks, and gasoline stations. For information on how to evaluate risk from other kinds of sources, contact Air Quality Evaluation at 609-633-1110.
To see a listing of chemicals by CAS number, click on the "CAS Index" tab at the bottom of this worksheet page.
This is a protected file. Changes are allowed only to certain cells (those in yellow). It is also a "read only" file. To save the data you input, select "File" on the menu above, then "Save as" in your own files, under the name of your choice. Input data only to yellow fields. Incremental cancer risk (IR) and hazard quotient (HQ) will calculate automatically when you type in the stack parameters (stack height and distance to property line) and an emission rate.
For references for toxicity data (URFs and RfCs), see the lists at www.nj.gov/dep/aqpp/risk.html.
Date
Facility ID No.
Activity ID No.
Facility name
Facility location
File name (.xls)
Stack height
ft
Distance to property line
ft
Annual air impact value, C'
#N/A
(ug/m3)/(ton/yr)
24-hour air impact value, C'st
#N/A
(ug/m3)/(lb/hr)
KEY:
Long-Term Effects
Q = Annual emission rate (in tons per year)
C = C' x Q = Annual average ambient air concentration
URF = Unit risk factor (for carcinogenic risk)
IR = C x URF = Incremental risk (for carcinogen)
Short-Term Effects
Qh = Hourly emission rate (in pounds per hour)
Cst = C'st x Qh = Short-term average ambient air concentration
RfCst = Short-term reference concentration (for noncarcinogenic effects)
HQst = Cst/RfCst = Hazard quotient for short-term noncarcinogenic effects
Risk
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CAS Index
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Determining Air Concentrations Without Doing Dispersion Modeling

To determine air concentrations, you need:

- **Stack height** (feet)
- **Distance to property line** (feet)

Type into proper cells in worksheet, and “air impact values” will pop up in subsequent cells (no need for look-up tables)

- **Emission rates** (chemical-specific) in tons/year & pounds/hour

Determining Cancer Risk

For each chemical:

Air concentration x unit risk factor

= incremental cancer risk

Determining Noncancer Risk (Long-Term and Short-Term)

For each chemical:

Air concentration / reference concentration

= hazard quotient

Risk Screening Guidelines for Air Toxics

Cancer Risk

- Total cancer risk less than or equal to 1 x 10^{-6} (one in a million) is considered negligible.
- Total cancer risk greater than 1 x 10^{-6} is referred for further evaluation.

Noncancer Risk

- Total hazard index less than or equal to 1 is considered negligible.
- Total hazard index greater than 1 is referred for further evaluation.

2nd-Level Risk Screening

- Done by NJDEP/BTS
- Applicant must submit detailed plot plan and other information (see “Risk Screening Policy and Second-Level Risk Screening” at www.nj.gov/dep/aqpp/risk.html)

Electronic copies of the risk screening spreadsheet (in Excel) and other related materials (in Adobe pdf format)

are available on-line on the NJDEP Air Quality Permitting Program website:

www.state.nj.us/dep/aqpp/risk.html


NJDEP Air Quality Permitting Program (AQPP) - Windows Internet Explorer
http://www.nj.gov/dep/aqpp/
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Favorites
NJDEP Air Quality Permitting Program (AQPP)
NJ Home | Services A to Z | Departments/Agencies | FAQs
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Department of Environmental Protection
AQPP Air Quality Permitting Program
NJDEP Home | DEP Online | AQPP Home | Radius | Radius FAQ | Contact AQPP
Air Permit Information
Applications & Forms
General Permits
Online Permitting Help
Permitting Guidance
Public Notices
RADIUS Information
RADIUS
RADIUS FAQ
RADIUS Reference Tables
Program Information
Annual Combustion Adjustment
AQ Forecast for Emergency Gen.
MACT
Risk Assessment Guidance
State of the Art
The Air Quality Permitting Program is responsible for permitting and testing stationary sources of air pollution (e.g., factories, power plants, etc.) - both old sources (those already constructed) and newer facilities - to ensure they do not adversely affect air quality in your neighborhood or anywhere in the state.
To accomplish this, the staff of the AQPP reviews air pollution
Program Update
Radius 4.0 Reference Tables Updated 4/13
Update Now NEW
GP-009A Now Available
Revisions to Rules to address PM-2.5
electronic Netting Analysis Tool (eNAT)
AQPP Implementation Plan (Revised 2/11/2013)
Application Checklist for Air Permits
Amended Fee Schedule Commences 1/1/2010
Help for Printing Certificates, Paying Renewals and Processing General Permits
Transferring Ownership of Air Preconstruction Permits
Revised PM-2.5 Permitting and Modeling Procedures
Other Programs of Interest
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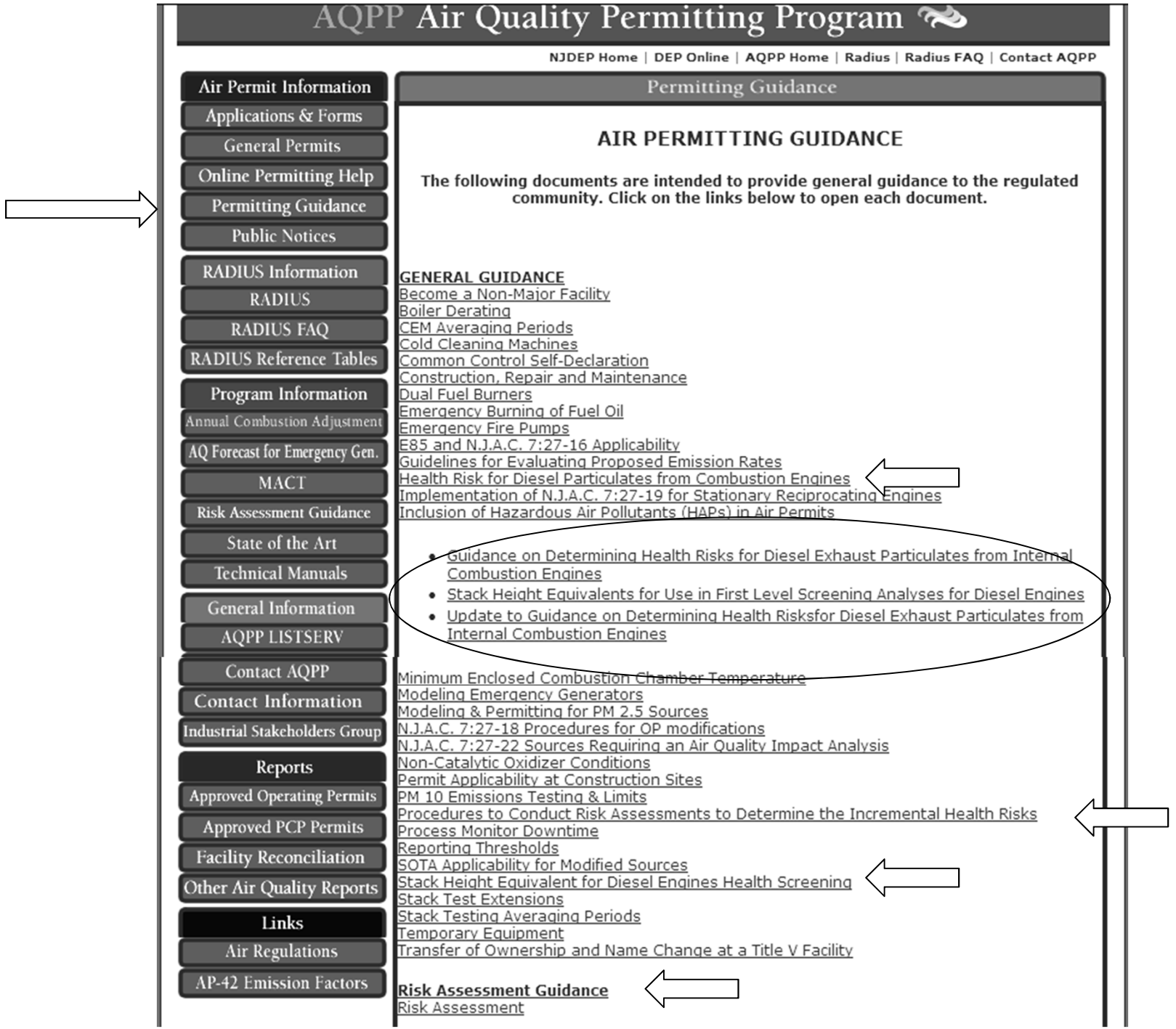
AQPP Air Quality Permitting Program
NJDEP Home | DEP Online | AQPP Home | Radius | Radius FAQ | Contact AQPP
Air Permit Information
Applications & Forms
General Permits
Online Permitting Help
Permitting Guidance
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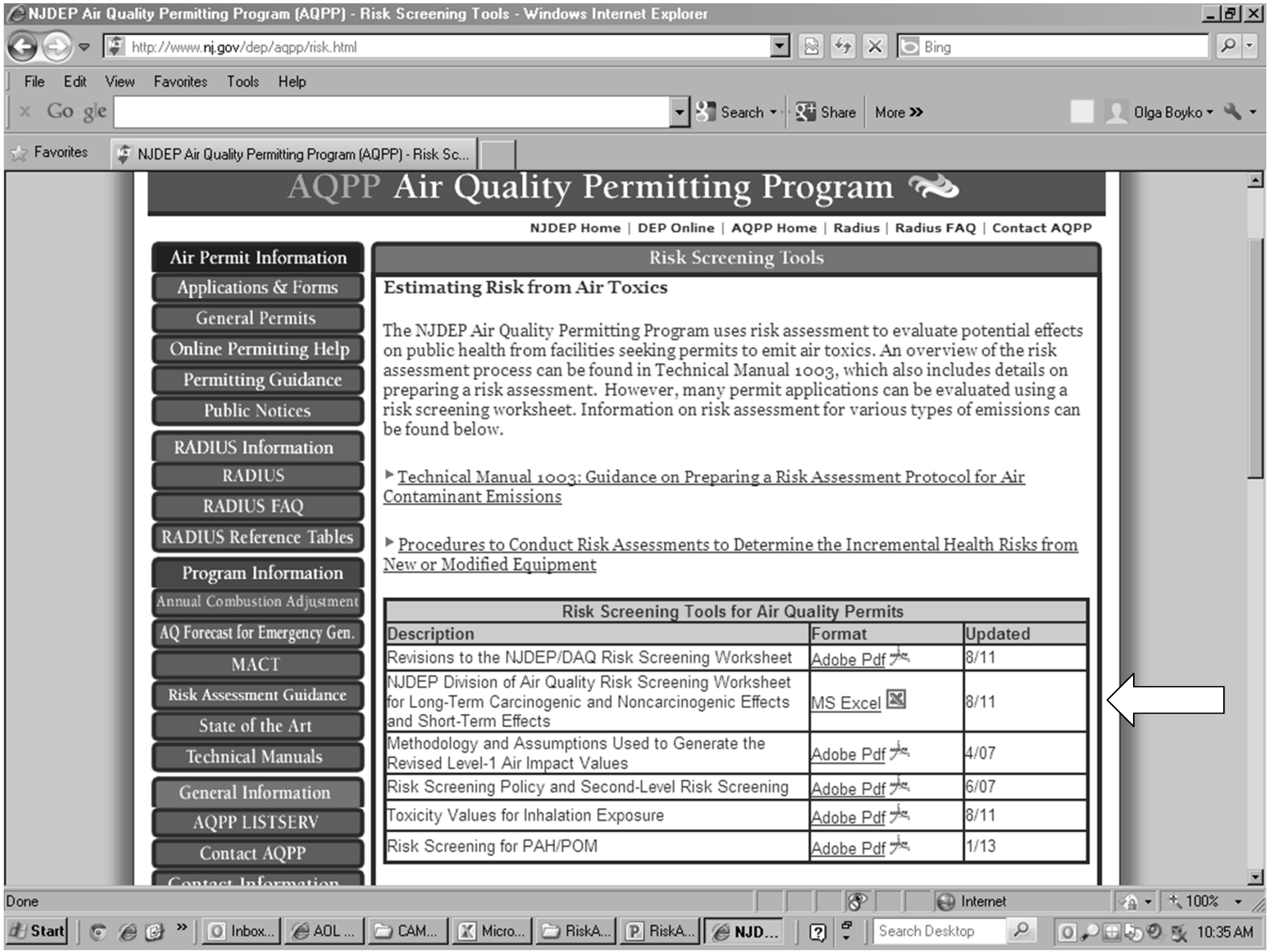
Contact Information
Industrial Stakeholders Group
Reports
Approved Operating Permits
Approved PCP Permits
Facility Reconciliation
Other Air Quality Reports
Links
Air Regulations
AP-42 Emission Factors
Permitting Guidance
AIR PERMITTING GUIDANCE
The following documents are intended to provide general guidance to the regulated community. Click on the links below to open each document.
GENERAL GUIDANCE
Become a Non-Major Facility
Boiler Derating
CEM Averaging Periods
Cold Cleaning Machines
Common Control Self-Declaration
Construction, Repair and Maintenance
Dual Fuel Burners
Emergency Burning of Fuel Oil
Emergency Fire Pumps
E85 and N.J.A.C. 7:27-16 Applicability
Guidelines for Evaluating Proposed Emission Rates
Health Risk for Diesel Particulates from Combustion Engines
Implementation of N.J.A.C. 7:27-19 for Stationary Reciprocating Engines
Inclusion of Hazardous Air Pollutants (HAPs) in Air Permits
Guidance on Determining Health Risks for Diesel Exhaust Particulates from Internal Combustion Engines
Stack Height Equivalents for Use in First Level Screening Analyses for Diesel Engines
Update to Guidance on Determining Health Risksfor Diesel Exhaust Particulates from Internal Combustion Engines
Minimum Enclosed Combustion Chamber Temperature
Modeling Emergency Generators
Modeling & Permitting for PM 2.5 Sources
N.J.A.C. 7:27-18 Procedures for OP modifications
N.J.A.C. 7:27-22 Sources Requiring an Air Quality Impact Analysis
Non-Catalytic Oxidizer Conditions
Permit Applicability at Construction Sites
PM 10 Emissions Testing & Limits
Procedures to Conduct Risk Assessments to Determine the Incremental Health Risks
Process Monitor Downtime
Reporting Thresholds
SOTA Applicability for Modified Sources
Stack Height Equivalent for Diesel Engines Health Screening
Stack Test Extensions
Stack Testing Averaging Periods
Temporary Equipment
Transfer of Ownership and Name Change at a Title V Facility
Risk Assessment Guidance
Risk Assessment


NJDEP Air Quality Permitting Program (AQPP) - Risk Screening Tools - Windows Internet Explorer
http://www.nj.gov/dep/aqpp/risk.html
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Risk Screening Tools
Estimating Risk from Air Toxics
The NJDEP Air Quality Permitting Program uses risk assessment to evaluate potential effects on public health from facilities seeking permits to emit air toxics. An overview of the risk assessment process can be found in Technical Manual 1003, which also includes details on preparing a risk assessment. However, many permit applications can be evaluated using a risk screening worksheet. Information on risk assessment for various types of emissions can be found below.
Technical Manual 1003: Guidance on Preparing a Risk Assessment Protocol for Air Contaminant Emissions
Procedures to Conduct Risk Assessments to Determine the Incremental Health Risks from New or Modified Equipment
Risk Screening Tools for Air Quality Permits
Description | Format | Updated
Revisions to the NJDEP/DAQ Risk Screening Worksheet | Adobe Pdf | 8/11
NJDEP Division of Air Quality Risk Screening Worksheet for Long-Term Carcinogenic and Noncarcinogenic Effects and Short-Term Effects | MS Excel | 8/11
Methodology and Assumptions Used to Generate the Revised Level-1 Air Impact Values | Adobe Pdf | 4/07
Risk Screening Policy and Second-Level Risk Screening | Adobe Pdf | 6/07
Toxicity Values for Inhalation Exposure | Adobe Pdf | 8/11
Risk Screening for PAH/POM | Adobe Pdf | 1/13
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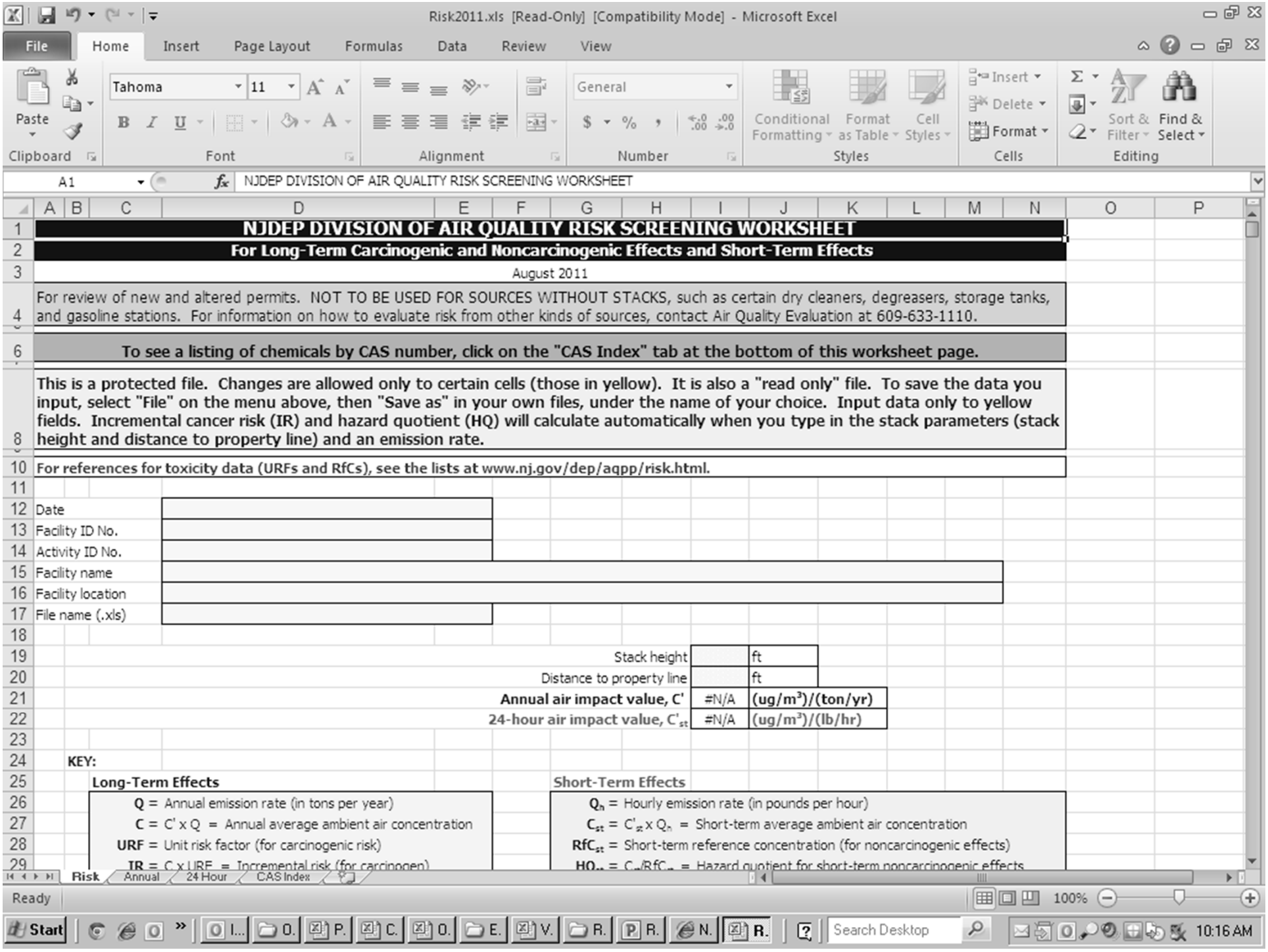
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NJDEP DIVISION OF AIR QUALITY RISK SCREENING WORKSHEET
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Date
Facility ID No.
Activity ID No.
Facility name
Facility location
File name (.xls)
Stack height
ft
Distance to property line
ft
Annual air impact value, C'
#N/A
(ug/m3)/(ton/yr)
24-hour air impact value, C'st
#N/A
(ug/m3)/(lb/hr)
KEY:
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RfCst = Short-term reference concentration (for noncarcinogenic effects)
HQst = Cst/RfCst = Hazard quotient for short-term noncarcinogenic effects
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Note “Air impact value” cells (I21 & I22)

A1 — NJDEP DIVISION OF AIR QUALITY RISK SCREENING WORKSHEET

Facility location		
File name (.xls)		
Stack height		ft
Distance to property line		ft
Annual air impact value, C'	#N/A	**(ug/m³)/(ton/yr)**
24-hour air impact value, C'st	#N/A	**(ug/m³)/(lb/hr)**

KEY:

Long-Term Effects

Q = Annual emission rate (in tons per year)
C = C' x Q = Annual average ambient air concentration
URF = Unit risk factor (for carcinogenic risk)
IR = C x URF = Incremental risk (for carcinogen)
RfC = Reference concentration (for noncarcinogenic effects)
HQ = C/RfC = Hazard quotient (for noncarcinogenic risk)

Short-Term Effects

Q_h = Hourly emission rate (in pounds per hour)
C_{st} = C'_{st} x Q_h = Short-term average ambient air concentration
RfC_{st} = Short-term reference concentration (for noncarcinogenic effects)
HQ_{st} = C_{st}/RfC_{st} = Hazard quotient for short-term noncarcinogenic effects

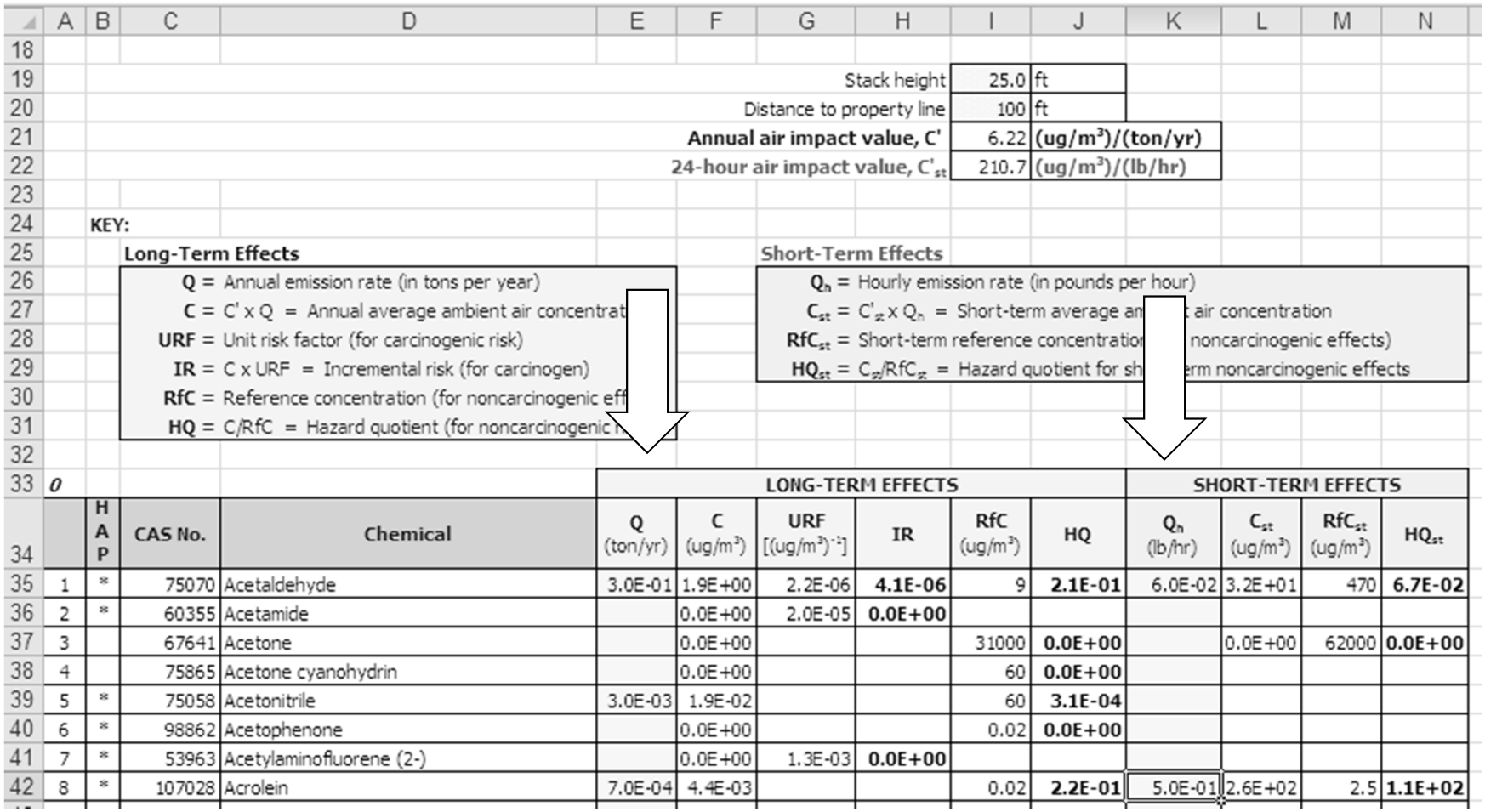
0

				LONG-TERM EFFECTS						SHORT-TERM EFFECTS			
	HAP	CAS No.	Chemical	Q (ton/yr)	C (ug/m³)	URF [(ug/m³)⁻¹]	IR	RfC (ug/m³)	HQ	Q_h (lb/hr)	C_{st} (ug/m³)	RfC_{st} (ug/m³)	HQ_{st}
1	*	75070	Acetaldehyde		#N/A	2.2E-06	**#N/A**	9	**#N/A**		#N/A	470	**#N/A**
2	*	60355	Acetamide		#N/A	2.0E-05	**#N/A**						
3		67641	Acetone		#N/A			31000	**#N/A**		#N/A	62000	**#N/A**
4		75865	Acetone cyanohydrin		#N/A			60	**#N/A**				
5	*	75058	Acetonitrile		#N/A			60	**#N/A**				
6	*	98862	Acetophenone		#N/A			0.02	**#N/A**				
7	*	53963	Acetylaminofluorene (2-)		#N/A	1.3E-03	**#N/A**						
8	*	107028	Acrolein		#N/A			0.02	**#N/A**		#N/A	2.5	**#N/A**
9	*	79061	Acrylamide		#N/A	1.0E-04	**#N/A**	6	**#N/A**				
10	*	79107	Acrylic acid		#N/A			1	**#N/A**		#N/A	6000	**#N/A**

Type in stack height (I19) & distance to property line (I20)

16	Facility location													
17	File name (.xls)													
18														
19								Stack height	25.0	ft				
20								Distance to property line	100	ft				
21								**Annual air impact value, C'**	6.22	**(ug/m³)/(ton/yr)**				
22								**24-hour air impact value, C'_{st}**	210.7	**(ug/m³)/(lb/hr)**				
23														
24		**KEY:**												
25		**Long-Term Effects**						**Short-Term Effects**						
26		**Q** = Annual emission rate (in tons per year)						**Q_h** = Hourly emission rate (in pounds per hour)						
27		**C** = C' x Q = Annual average ambient air concentration						**C_{st}** = C'_{st} x Q_h = Short-term average ambient air concentration						
28		**URF** = Unit risk factor (for carcinogenic risk)						**RfC_{st}** = Short-term reference concentration (for noncarcinogenic effects)						
29		**IR** = C x URF = Incremental risk (for carcinogen)						**HQ_{st}** = C_{st}/RfC_{st} = Hazard quotient for short-term noncarcinogenic effects						
30		**RfC** = Reference concentration (for noncarcinogenic effects)												
31		**HQ** = C/RfC = Hazard quotient (for noncarcinogenic risk)												
32														
33	*0*				**LONG-TERM EFFECTS**							**SHORT-TERM EFFECTS**		
34		**HAP**	**CAS No.**	**Chemical**	**Q** (ton/yr)	**C** (ug/m³)	**URF** [(ug/m³)⁻¹]	**IR**	**RfC** (ug/m³)	**HQ**	**Q_h** (lb/hr)	**C_{st}** (ug/m³)	**RfC_{st}** (ug/m³)	**HQ_{st}**
35	1	*	75070	Acetaldehyde		0.0E+00	2.2E-06	**0.0E+00**	9	**0.0E+00**		0.0E+00	470	**0.0E+00**
36	2	*	60355	Acetamide		0.0E+00	2.0E-05	**0.0E+00**						
37	3		67641	Acetone		0.0E+00			31000	**0.0E+00**		0.0E+00	62000	**0.0E+00**
38	4		75865	Acetone cyanohydrin		0.0E+00			60	**0.0E+00**				
39	5	*	75058	Acetonitrile		0.0E+00			60	**0.0E+00**				
40	6	*	98862	Acetophenone		0.0E+00			0.02	**0.0E+00**				

Type in emission rates in columns E and K



Stack height	25.0	ft
Distance to property line	100	ft
Annual air impact value, C'	6.22	**(ug/m³)/(ton/yr)**
24-hour air impact value, C'st	210.7	**(ug/m³)/(lb/hr)**

KEY:

Long-Term Effects

- **Q** = Annual emission rate (in tons per year)
- **C** = C' x Q = Annual average ambient air concentrat
- **URF** = Unit risk factor (for carcinogenic risk)
- **IR** = C x URF = Incremental risk (for carcinogen)
- **RfC** = Reference concentration (for noncarcinogenic eff
- **HQ** = C/RfC = Hazard quotient (for noncarcinogenic h

Short-Term Effects

- **Q_h** = Hourly emission rate (in pounds per hour)
- **C_{st}** = C'_{st} x Q_h = Short-term average am air concentration
- **RfC_{st}** = Short-term reference concentratio noncarcinogenic effects)
- **HQ_{st}** = C_{st}/RfC_{st} = Hazard quotient for sh erm noncarcinogenic effects

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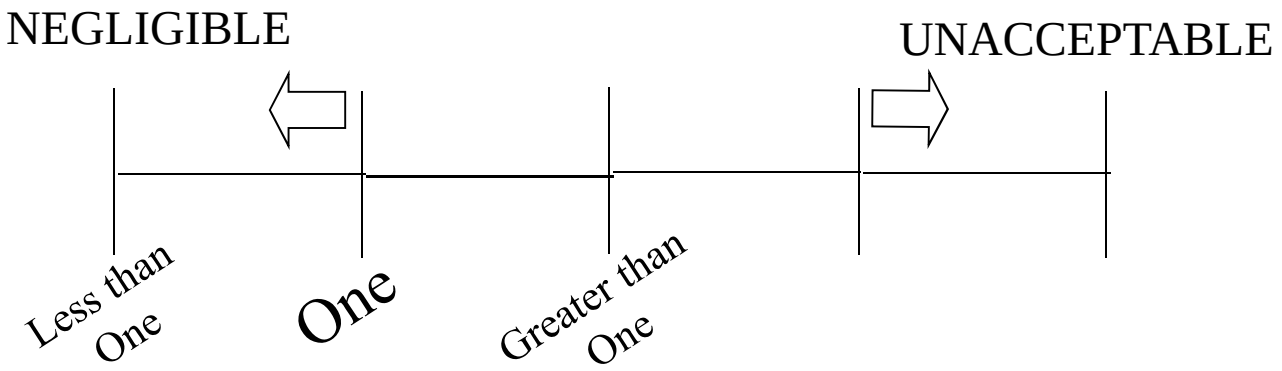
				LONG-TERM EFFECTS						SHORT-TERM EFFECTS			
	HAP	CAS No.	Chemical	Q (ton/yr)	C (ug/m³)	URF [(ug/m³)⁻¹]	IR	RfC (ug/m³)	HQ	Q_h (lb/hr)	C_{st} (ug/m³)	RfC_{st} (ug/m³)	HQ_{st}
1	*	75070	Acetaldehyde	3.0E-01	1.9E+00	2.2E-06	**4.1E-06**	9	**2.1E-01**	6.0E-02	3.2E+01	470	**6.7E-02**
2	*	60355	Acetamide		0.0E+00	2.0E-05	**0.0E+00**						
3		67641	Acetone		0.0E+00			31000	**0.0E+00**		0.0E+00	62000	**0.0E+00**
4		75865	Acetone cyanohydrin		0.0E+00			60	**0.0E+00**				
5	*	75058	Acetonitrile	3.0E-03	1.9E-02			60	**3.1E-04**				
6	*	98862	Acetophenone		0.0E+00			0.02	**0.0E+00**				
7	*	53963	Acetylaminofluorene (2-)		0.0E+00	1.3E-03	**0.0E+00**						
8	*	107028	Acrolein	7.0E-04	4.4E-03			0.02	**2.2E-01**	5.0E-01	2.6E+02	2.5	**1.1E+02**

Check resulting cancer risk & hazard indices

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
259	225	*	95807	Toluene-2,4-diamine		0.0E+00	1.1E-03	**0.0E+00**						
260	226	*	95534	Toluidine (o-)		0.0E+00	5.1E-05	**0.0E+00**						
261	227	*	8001352	Toxaphene		0.0E+00	3.2E-04	**0.0E+00**						
262	228		76131	Trichloro-1,2,2-trifluoroethane (1,1,2-)		0.0E+00			30000	**0.0E+00**				
263	229	*	120821	Trichlorobenzene (1,2,4-)		0.0E+00			4	**0.0E+00**				
264	230	*	79005	Trichloroethane (1,1,2-)		0.0E+00	1.6E-05	**0.0E+00**						
265	231	*	79016	Trichloroethylene	8.0E-03	5.0E-02	2.0E-06	**1.0E-07**	600	**8.3E-05**				
266	232		75694	Trichlorofluoromethane		0.0E+00			700	**0.0E+00**				
267	233	*	88062	Trichlorophenol (2,4,6-)		0.0E+00	3.1E-06	**0.0E+00**						
268	234	*	121448	Triethylamine		0.0E+00			7	**0.0E+00**		0.0E+00	2800	**0.0E+00**
269	235	*	1582098	Trifluralin		0.0E+00	2.2E-06	**0.0E+00**						
270	236		1314621	Vanadium or vanadium pentoxide		0.0E+00			0.1	**0.0E+00**		0.0E+00	30	**0.0E+00**
271	237	*	108054	Vinyl acetate		0.0E+00			200	**0.0E+00**				
272	238	*	593602	Vinyl bromide		0.0E+00	3.2E-05	**0.0E+00**	3	**0.0E+00**				
273	239	*	75014	Vinyl chloride	0.056	3.5E-01	8.8E-06	**3.1E-06**	100	**3.5E-03**	4.0E-02	2.1E+01	180000	**1.2E-04**
274	240	*	75354	Vinylidene chloride		0.0E+00			200	**0.0E+00**				
275	241	*		Xylene (m-,o-,p-, or mixed isomers)		0.0E+00			100	**0.0E+00**		0.0E+00	22000	**0.0E+00**
276							Total		Total				Total	
277			**TOTALS**				Cancer	**7.5E-06**	Hazard	**4.3E-01**			Short-term	**1.1E+02**
278							Risk		Index				Hazard Index	
279														
280	**NOTE:**													
281	*		**Clean Air Act hazardous air pollutant**											
282	**		**Clean Air Act hazardous air pollutant, but not listed individually (part of a group)**											
283														
284	a		Dioxins may be considered to be all 2,3,7,8-tetrachlorodibenzo(p)dioxin), or separated into congeners (contact AQEv).											
285	b		PAH or POM may be considered to be all benzo(a)pyrene, or separated into individual PAHs (contact AQEv).											
286														

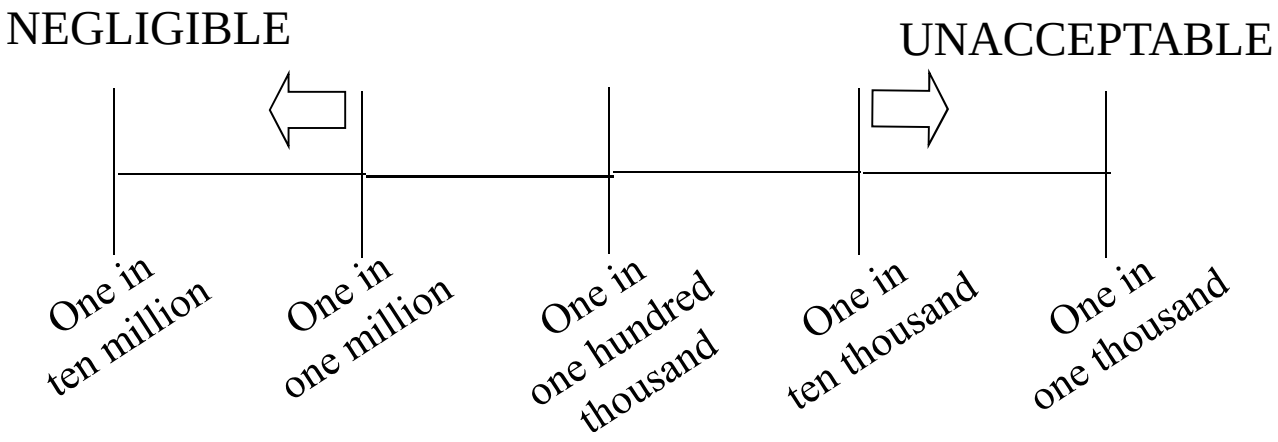
NONCANCER RISK GUIDELINES FOR ALL SOURCES

NJDEP Division of Air Quality



CANCER RISK GUIDELINES*

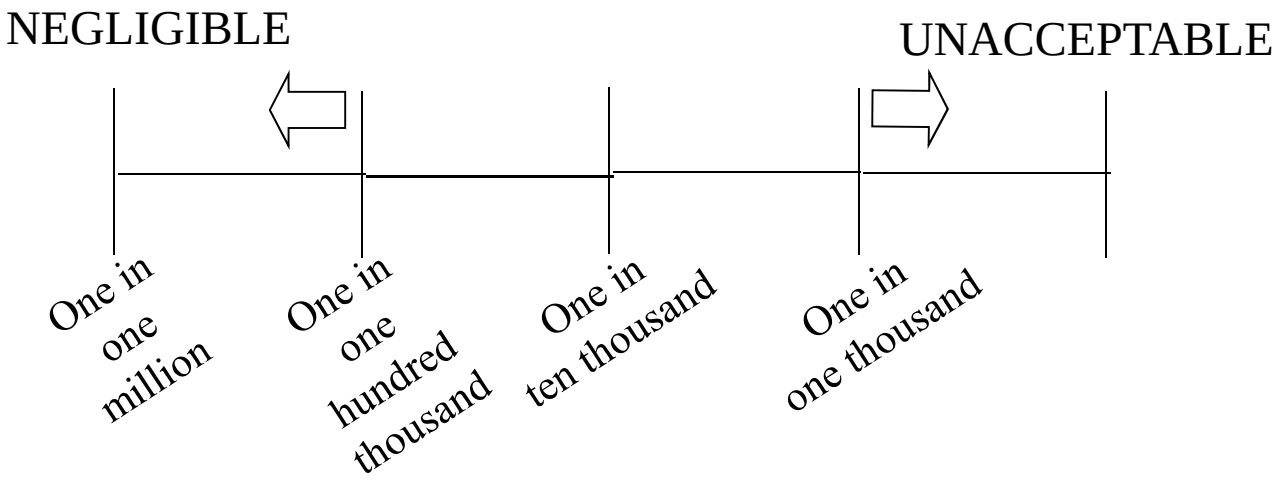
NJDEP Division of Air Quality



*For new and modified sources

FACILITY-WIDE CANCER RISK GUIDELINES

NJDEP Division of Air Quality



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