New Jersey
Department of Environmental Protection

Site Remediation and
Waste Management Program

Technical Guidance:

Planning for and Response to Catastrophic Events at Contaminated Sites

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Version 1.0

Table of Contents

List of Figures

List of Tables

Appendices

1.0 Introduction and Background

Due to its industrial history and a progressive contaminated site cleanup program, New Jersey has identified many contaminated sites in need of remediation. By the end of 2014 there were approximately 14,000 contaminated sites under the purview of the New Jersey Department of Environmental Protection (NJDEP or Department). Leading up to, during, and in the aftermath of Superstorm Sandy in October 2012, the primary concerns of the Site Remediation and Waste Management Program (SRWMP) were securing and assessing the effects of Sandy on sites within the State. Prior to the storm, SRWMP communicated to the regulated community the need for site preparedness to prevent the release of hazardous materials and the need to address releases in a timely manner. In an attempt to learn from that catastrophic event, SRWMP staff and managers who were involved in the response efforts participated in a post-storm exercise to review, analyze and learn from the experience. The goal of this exercise was to evaluate lessons learned and identify improvements that could enhance remedial system resiliency for any catastrophic event in the future.

Through this evaluation, it became clear that Licensed Site Remediation Professionals (LSRPs), the Person Responsible for Conducting the Remediation (PRCR, as defined in N.J.A.C. 7:26C-1.3), and property owners could benefit from guidance to help them prepare for, respond to, and recover from catastrophic events. This guidance will cover the following:

- Planning for resiliency in the design and implementation of site remedies.
- Retro-fitting vulnerable sites to decrease disruption to existing systems.
- Establishing communication networks, chain-of-command structures, and procedures to be used during catastrophic events.
- Reviewing lessons learned.
- Re-assessing systems to be better prepared for future catastrophic events.

This guidance was prepared with stakeholder input. For more information on Technical Guidance Documents and the stakeholder process, go to http://www.nj.gov/dep/srp/guidance. The following people were on the committee who prepared this document:

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1.1 Intended Use

This guidance is designed to help LSRPs and PRCRs plan for and respond to a catastrophic event affecting a contaminated site. This guidance is intended to be used for planning purposes and does not require a submittal to the Department. It may be used in concert with, but does not supersede the Department's rules, regulations, and guidance. This guidance may be used by various people involved in the remediation of a contaminated site including LSRPs, non-LSRP environmental professionals, property owners, facility managers at operating companies and the PRCR. This guidance recognizes that contamination at a contaminated site might include the entire parcel, a single area of concern (AOC), multiple AOCs, and/or impacted media and the possibility of multiple PRCRs. The generic term "Investigator" will be used to refer to any person that uses this guidance to plan for or respond to a catastrophic event at a contaminated site on behalf of a remediating party, including the remediating party itself.

Sites that could benefit from the concepts presented in this guidance include operating facilities where contamination is present, contaminated sites undergoing investigation or remediation, or sites that have completed remediation but have engineering or institutional controls remaining on site. Active sites may have an Emergency Response Plan/Contingency Plan/Business Interruption Plan, or alternate, that incorporates how to handle and manage catastrophic events, and those Plans may benefit by considering this Guidance. This guidance document is not intended to apply to formerly contaminated sites where an unrestricted use remedial action (No Further Action, NFA or Remedial Action Outcome, RAO) has been completed.

Though not based in rule or statute, this guidance is intended to present best management practices to plan for and respond to catastrophic events. The Department recognizes that professional judgment may result in a range of interpretations on the application of this guidance to site conditions.

1.2 Purpose

Proper planning for catastrophic events can result in less significant impacts, including personal injuries/deaths, property damage, economic-production time losses, and resources dedicated to recovery efforts. Proper planning can also eliminate and/or reduce the unintended release of contaminants and impacts to the environment during these types of events. New Jersey strives to take a proactive approach when remediating contaminated sites or building/rebuilding structures with a vision of increased resiliency.

The purpose of this document is to provide guidance to the Investigator in the preparation for, response to and recovery from the damage caused by catastrophic events at site remediation projects, including the following:

- Providing guidance for Investigators to assess vulnerabilities of contaminated sites.
- Acting as a reminder to Investigators that some degree of planning should be considered, whether a simple list of important contacts, a stand-alone Catastrophic Event Plan, or facility-wide plans concerning environmental activities/infrastructure required by regulation for operating facilities.
- Maintaining site conditions or operational continuity during an event by implementing preventative measures.
- Responding effectively during an event by having appropriate tools and planning in place.
- Resuming operations or re-securing a site more quickly after an event by implementing recovery steps more readily.
- Learning from experiences during a catastrophic event to make adjustments to mitigate impacts from future events.

1.3 Document Overview

This guidance document is organized into the following sections:

1.0 *Introduction and Background.* This section describes the intended use and purpose of this guidance.

2.0 *Factors to Consider*. This section discusses factors to consider when planning and preparing for the impacts of catastrophic events at NJDEP SRWMP contaminated sites. Examples of the factors to consider include types of catastrophic events, site specific conditions, potential impacts, constraints (i.e., logistical, regulatory, etc.) and the current status of the remediation.

3.0 *Preparedness, Response, Recovery, and Re-Assessment.* This section is divided into four subsections that represent the key components of preparing for and responding to catastrophic events at contaminated sites. The subsections include planning, response to events, recovery from events, and a re-assessment process to identify lessons learned and areas for improvement.

4.0 *References.* This section provides a list of documents and websites used in the preparation of the guidance, and additional sources of information that were consulted and could be helpful to the user, but may not have been specifically referenced in the guidance. Hyperlinks are included in the body of this guidance to enable quick access to the reference materials.

Appendices. The appendices include examples or more detailed information of concepts presented in the guidance document, a case study, emergency contact information, glossary and acronyms/abbreviations.

2.0 Factors to Consider

The following discussion highlights factors which should be taken into account when planning and preparing for the impacts of catastrophic events. While certain site conditions will remain stable (e.g., hydrology, geology, etc.), other conditions may change over time (e.g., contaminant concentrations, site operations, land use, etc.). For this reason, the initial catastrophic event preparations should be periodically re-evaluated. A suggested timeframe might be in conjunction with the soil and/or ground water Remedial Action Permit (RAP) biennial certifications.

2.1 Types of Catastrophic Events

In the context of NJDEP SRWMP, a catastrophic event is a natural or human-caused occurrence of limited duration and/or significant magnitude to result in adverse impact to the infrastructure, public health and/or the environment on a municipal, county, regional, state or multi-state regional scale. A catastrophic event can occur as a result of natural phenomena, such as wind, storms or hurricanes, flooding, earthquakes, snow or ice events, or other extreme climatic conditions. They can also be caused by human activities, which can be intentional or unintentional. Examples of intentional events include acts of terrorism, war, and to a lesser extent, vandalism. Examples of unintentional events may include accidental train derailments, chemical spills, explosions/fires at industrial facilities and failure of manmade structures like dams and levees.

Depending on the type of catastrophic event, the impact can be categorized as anticipated or unanticipated. The amount of information available on the event and the time available to prepare will affect the ability to respond and recover. For example, a hurricane is typically tracked in terms of strength and movement, which provides a greater ability to predict the level of impact and prepare for it. In contrast, an unanticipated event like an earthquake or explosion gives no warning in terms of time of arrival, intensity or anticipated damage. For unanticipated events, establishing automatic management protocols and operational responses become increasingly important.

Large scale catastrophic events may present unique challenges in responding to existing or new releases of hazardous materials. Such an event may affect a large area and many sites, potentially initiating multiple releases simultaneously. The response to a catastrophic event may also divert resources that would have been available to respond to releases of hazardous materials. In addition, conditions caused by the event may restrict site access and interrupt resources like electrical power, water and communications. These challenges should be considered when planning for the effects of a catastrophic event at a remediation site.

2.2 Site Conditions

One useful tool for understanding site conditions is development of a Conceptual Site Model (CSM). While development of a CSM is not mandatory, it helps create a framework to understand the relationship between contaminant source areas, contaminant migration pathways and receptors at a site. This enables the Investigator to plan more effectively for a catastrophic event. Development of a CSM is an iterative process and updates to the CSM should be made when new information becomes available or when site conditions change in response to on-going remedial activities. The NJDEP SRWMP developed Technical Guidance for Preparation and Submission of a Conceptual Site Model (see http://www.nj.gov/dep/srp/guidance/#csm) to aid and document site characterization and remedial action decisions throughout the life of the remedial process. Some of the main considerations for development of a CSM are presented below:

Contaminants

Consideration should be given to the physical, chemical and biological characteristics of the contaminants and processes that control their transport, migration and potential impacts to receptors as part of the catastrophic event planning.

The potential impacts from the migration of contaminants due to a catastrophic event are related to the contaminants' toxicity, concentrations, mobility and persistence in the environment. Physical hazards, such as flammability or explosion, may also need consideration depending on the concentration of chemicals stored or otherwise present on-site.

Contaminants with greater adverse health or ecological effects and/or greater mobility and persistence in the environment warrant greater precautions against release. For these, a greater degree of hardening of the remedial systems, backup systems and/or automatic management or operational responses should be considered. Remedial and/or backup systems might also use chemicals (e.g., gasoline-powered motors, chemical reagents, etc.) that could be released during a catastrophic event and will need to be considered during planning or system hardening.

Subsurface Conditions

The subsurface conditions should be evaluated in the context of the known or suspected contaminants of concern, potential remedial system-related contaminants and their possible behavior as a result of the occurrence of a catastrophic event. For example, sites underlain by clayey soils will be less susceptible to ground water contamination from a surface spill than sites underlain by sandy soils. For sites that have reached the RI, RA or post-RA stage, it is expected that subsurface conditions and contaminants of concern will be well documented.

Hydrology and Topography

In the case of many natural hazards, site hydrology and topography are key factors for assessing site vulnerability. Consideration should be given to nearby surface water bodies and the topography of the site and surrounding area. Heavy rain from significant storm events could cause flooding of the site from rising surface water levels or from stormwater run-off. Fast moving flood waters are extremely damaging and the erosive forces would be a significant concern for any site with a soil capping remedy. In addition, consideration should be given to protecting exposed critical structures or buoyant tanks that could be damaged by water and waterborne debris.

Land Use

The Investigator planning for a catastrophic event should consider current and potentially, future land use if appropriate, at the site and adjacent properties, as well as the land-use categories within Site Remediation Reform Act (SRRA) and the Remediation Standards (N.J.A.C. 7:26D). For example, a more protective approach may be appropriate when the site or adjacent property is used for a school or child care, or is located in a regional classification area such as Pinelands or Highlands.

Remedial Systems

Remedial systems should be designed to maximize resiliency. In some cases they may need to continue functioning during an event, and hardening may be necessary. In other instances, it may be safer, more reliable, or more cost effective to shut them down and secure them in the case of a predictable catastrophic event. Investigators can conduct a Vulnerability Assessment, followed by a Risk and Probability Assessment, as discussed in Section 3.1, to assess the relative impact due to failure of various remedial system components so that mitigation measures can be prioritized.

2.3 Receptors

Protection of human and ecological receptors is paramount during catastrophic events. Receptors are defined in the Technical Rules (N.J.A.C. 7:26E) as "any human or other ecological component which is or may be affected by a contaminant from a contaminated site." Response and mitigation planning should identify sensitive human and ecological receptors (e.g., schools, special status species habitat); assess the potential for these receptors to be impacted; and outline measures to protect the receptors in a timely and effective manner. This guidance presumes that, for the most part, it will be used at sites that have moved beyond the Preliminary Assessment stage, and the requirements set forth in the Administrative Requirements for the Remediation of Contaminated Sites (ARRCS) at N.J.A.C. 7:26C and the Technical Rules at N.J.A.C. 7:26E (7:26E-1.12 Receptor Evaluation) will apply. As such, the requirements to complete at least an Initial Receptor Evaluation (IRE) would have been triggered and the IRE would have been completed. Areas of concern and the existence and potentially the extent of contamination in any medium will be known, pathways for potential contaminant migration will be documented, and receptors will have been identified pursuant to regulatory requirements and other NJDEP technical guidance documents.

The information contained in the IRE, Receptor Evaluation or Risk Assessment should be reviewed and catastrophic event planning updated based upon current site conditions, site-related information and the consequences of a catastrophic event, should it occur. This is consistent with the iterative process in the CSM approach discussed above. Consideration should be given to how a catastrophic event might impact the findings of the CSM or change the vulnerability of receptors at sites with existing receptor evaluations.

It is important to consider the presence of Environmentally Sensitive Natural Resources (ESNR) and the potential for these to become contaminated from releases at the site during an event. ESNR is an area defined in the Discharges of Petroleum and Other Hazardous Substances Rules at N.J.A.C. 7:1E-1.8(a), or an area or resource protected or managed pursuant to the Pinelands Protection Act, N.J.S.A. 13:18A-1 et seq. and the Pinelands Comprehensive Management Plan (N.J.A.C. 7:50).

2.4 Regulations

The Investigator is encouraged to take into account applicable New Jersey statutes and regulations when planning for, during, and after a catastrophic event. Federal and local regulations should also be considered. Although not inclusive, the following NJ State laws and rules are important when preparing for and responding to a catastrophic event.

- Site Remediation Reform Act – N.J.S.A. 58:10C-1, et seq.
- Brownfields and Contaminated Site Remediation Act – N.J.S.A. 58:10B-1, et seq.
- Industrial Site Recovery Act – N.J.S.A. 13:1K-6, et al.
- Spill Compensation and Control Act – N.J.S.A. 58:10-23.1, et seq.
- Water Pollution Control Act – N.J.S.A. 58:10A-1, et seq.
- Underground Storage Tank (UST) Rules – N.J.A.C. 7:14B
- Administrative Requirements for the Remediation of Contaminated Sites (ARRCS) – N.J.A.C. 7:26C
- Industrial Site Recovery Act Rules – N.J.A.C. 7:26B
- Discharges of Petroleum and Other Hazardous Substances Rules – N.J.A.C. 7:1E
- Remediation Standards - N.J.A.C. 7:26D
- Technical Requirements for Site Remediation (Technical Rules) - N.J.A.C. 7:26E
- Solid Waste Rules – N.J.A.C. 7:26
- Hazardous Waste Rules – N.J.A.C. 7:26G

- Remediation Standards for Radioactive Materials – N.J.A.C. 7:28-12.1, et seq.
- Toxic Catastrophe Prevention Act - N.J.A.C. 7:31

In addition, recovery projects located within floodplains, wetlands or other protected ecological resources will require permit approvals from the NJDEP Land Use Division. Depending on the regulated resource, these permits are issued pursuant to New Jersey rules, including, but not limited to the following:

- Flood Hazard Area (FHA) Control Act Rules – N.J.A.C. 7:13
- Freshwater Wetlands Protection Act Rules – N.J.A.C. 7:7A
- Coastal Permit Program Rules – N.J.A.C. 7:7
- Stormwater Management Rules – N.J.A.C. 7:8

Also important are approvals for work within designated special habitat or use areas, such as the Pinelands, Highlands and Meadowlands. For more information see the following:

- New Jersey Pinelands Commission at http://www.state.nj.us/pinelands, the Pinelands Protection Act - N.J.S.A. 13:18A-1 et seq. and the Pinelands Comprehensive Management Plan - N.J.A.C. 7:50.
- New Jersey Sports and Exposition Authority at http://www.njmeadowlands.gov and enabling legislation N.J.S.A. 13:17-21 for Master Plan.
- New Jersey Highlands Council at http://www.highlands.state.nj.us/njhighlands and the Highlands Water Protection and Planning Act - N.J.S.A. 13:20-1 et seq.

Emergency Permits

In response to Superstorm Sandy, NJDEP Land Use Division provided updated regulatory guidance on exempt/non-regulated activities and the expedited processes to obtain emergency permits. Relevant guidance is now provided on the NJDEP website. However, multiple eligibility and permit duration restrictions apply to emergency permits. To apply for a Flood Hazard Area (FHA) emergency permit, permittees must demonstrate severity of environmental degradation and extraordinary risk or impact to public health and property (N.J.A.C. 7:13-12.1). In addition, limited work windows are allowed for FHA emergency permits, including starting the work within 30 days, and if the work is not complete within 60 days, a complete permit application may be required. For more information see: www.nj.gov/dep/landuse/fha/fha_ep.html.

For Coastal Emergency Permits involving work within the Coastal Area Facility Review Act (CAFRA) (N.J.A.C. 7:7-2.1), Coastal Wetlands (N.J.A.C. 7:7-2.2) or Waterfront Development (N.J.A.C. 7:7-2.3), NJDEP may issue an emergency permit authorization if it determines that there is an imminent threat to lives or property if regulated construction activities are not immediately started. For example, if a bulkhead was badly damaged due to a catastrophic storm event resulting in significant damage to the adjacent property, the bulkhead should qualify for an emergency permit to allow its replacement. The potential for severe environmental degradation will also constitute a basis for issuing an emergency permit authorization.

The NJDEP or the county government may waive District Solid Waste Flow Control Requirements to expedite waste removal after a catastrophic event. A summary of waste flow requirements for each New Jersey county can be found at http://www.nj.gov/dep/dshw/recycling/03cplsum.htm. NJDEP emergency permits for Temporary Debris Management Areas (TDMAs) may be issued in response to an event. The Investigator should evaluate options available for waste or debris disposal outside of the site's District if TDMAs and landfills located inside the District are not available.

2.5 Status of Remediation

The Technical Rules define "remedial phase" as a distinct component of the remediation process (see N.J.A.C. 7:26E-1.8). Such components include, without limitation, the preliminary assessment (PA), site investigation (SI), remedial investigation (RI) and remedial action (RA). This Guidance was developed for contaminated sites at any remedial phase, however, planning for and responding to a catastrophic event may differ depending on what remedial phase the site is undergoing.

Preliminary Assessment

The preliminary assessment scope of work typically does not include intrusive activities and, at this phase in the remedial process, it is unlikely that sufficient information would be available to effectively plan for a catastrophic event. An exception to this would be a situation where a third party is acquiring a known contaminated site from a PRCR. During the due diligence period in such a situation, the Investigator should identify whether the PRCR has conducted catastrophic event planning.

Site Investigation

Catastrophic event planning would be warranted at this stage to minimize damage to onsite equipment being used during the SI (e.g., drill rigs, backhoes, excavators, gasoline-powered generators, etc.) and to prevent further impact from contamination that has been identified. For example, if there is an on-site detention pond with dissolved contamination but the earthen walls of the pond are structurally unsound, it may be prudent to remove the liquid for off-site disposal at the earliest opportunity to minimize impacts from a catastrophic event.

Remedial Investigation

At this phase of investigation, contamination has been confirmed and intrusive work is likely occurring. The duration of this phase may be extensive and involve multiple areas of concern. Catastrophic event planning is warranted to protect equipment being used, control contaminant migration and prevent damage to any interim remedial measures that are being implemented. Catastrophic planning should always be updated in response to any new information generated during the RI Phase or any change in site use.

Remedial Action

A Remedial Action Work Plan (RAWP) will be prepared that describes the RA to be implemented and may include catastrophic event planning. Factors to consider during catastrophic event planning at the RA phase may include the following:

- whether the RA is site-wide or AOC specific
- potential changes in site use
- the nature and extent of contamination
- the type and location of remedial equipment
- the time period over which remediation will occur (e.g., years vs. decades)
- whether the remediation achieves restricted, limited restricted or unrestricted use

These factors help determine whether existing catastrophic event planning is appropriate or needs to be revised. This guidance assumes that some RAs will use remedial systems such as ground water pump and treat systems or engineering controls such as a cap. An evaluation of the catastrophic event planning with respect to the remedial system should be a component of the ongoing operation and maintenance activities. For example, if climate conditions have left the remedial system more vulnerable to a catastrophic event than when originally installed, or

such conditions are predicted for the future, some type of additional protective measures (e.g., installation of a fire suppression system, relocation of equipment, armoring of a cap, etc.) may be warranted.

Post Remedial Action

Where a remedial action results in contaminated material being left on-site, the ability of the post remedial containment system to withstand a catastrophic event should be considered. For example, where a soil cap built over contaminated soil may be subject to erosion during an extreme flooding event, armoring of the cap with stone would increase the ability of the cap to resist erosion and remain protective. The stability of Post Remedial systems under catastrophic event conditions should be considered during the Remedial Design Phase, and re-evaluated periodically after RA completion, so that measures to prevent failure can be taken. A suggested timeframe might be in conjunction with the soil and/or ground water RAP biennial certifications.

3.0 Preparedness, Response, Recovery, Re-Assessment

Section 3 addresses several concepts within the broad category of planning for and responding to catastrophic events. This includes planning appropriate response procedures prior to an event, identifying potential hardening measures to implement before an event or during remediation, response and recovery and documenting lessons learned subsequent to the event.

3.1 Preparedness

Proper planning by the Investigator aids in the quick response and recovery from a catastrophic event. Thorough knowledge of site conditions and evaluation of potential impacts from an event (Section 3.1.1), implementing hardening and adaptation measures (Section 3.1.2), establishing robust plans for communication (Section 3.1.3), maintaining necessary supplies and response contracting (Section 3.1.4) and training (Section 3.1.5) can all serve to minimize the impacts of a catastrophic event. Since it is not possible to know the impacts of every type of event, planning should be sufficiently broad. The Investigator is encouraged to use an "All Hazards Approach" that considers a variety of potential threats such as severe storms (high velocity winds, flooding and power outages), earthquakes, landslides, wild fires and explosions. Slow onset events are not within the purview of this guidance. However, in the case of remedial actions with an extended timeframe it may be appropriate to consider the potential for changes over time to affect catastrophic event risk.

Consideration of site conditions and complexity should be given to determine the appropriate level of planning and mitigation implemented to minimize the site's vulnerability. Figure 1 provides general guidelines regarding the various levels of catastrophic event planning and preparedness at a site or area of contamination on that site. Sites where remediation has already been completed, for example, where an Entire Site Remedial Action Outcomes (RAO-E), Area of Concern Remedial Action Outcomes (RAO-A) have been issued, or NFAs have been issued, may require no planning or preparation. Active sites in the investigation or remediation phase with no anticipated potential receptors, even in the event of a catastrophic disruption, may benefit from a minimal level of planning and preparation which should include maintaining a list of current site contacts. More involved planning and preparation is appropriate for sites with greater vulnerability. At active sites with potential receptors, a more detailed process may be appropriate, including a Risk-Probability or Vulnerability Assessment, mitigation measures and a written plan for response during an event. In the case of highly vulnerable sites and those at which a catastrophic event might result in a hazardous material related life safety event, a thorough risk reduction program should be considered, incorporating all of the above. If appropriate, capital investments to reduce risk should be considered. This planning process and resulting catastrophic event planning and mitigation steps can be documented in a standalone Catastrophic Event Plan. As noted in Section 1.1, no submittal to the Department is required by this Guidance.

Planning documentation is useful to facilitate mitigation activities and rapid recovery. Note that for occupied sites, whether industrial, commercial or residential, it is imperative to coordinate catastrophic event planning with site management and occupants. This is particularly the case at active industrial facilities which may have emergency management or health and safety personnel and programs in place that may take precedence over remediation related activities in the case of a catastrophic event. The Investigator should include guidance as to how and when the plan is to be implemented. If the catastrophic event is predictable, a schedule counting down to the time when the incident is to occur may be helpful and may be used to coordinate individuals and assets for each subsequent time period in which the information to be exchanged, equipment to be deployed, etc. (see example in Appendix A).

3.1.1 Assessment of Vulnerability and Risk

In cases where catastrophic event planning is warranted, for which Figure 1 may be a useful guide, the Investigator should follow a basic process of evaluating site systems and conditions, potential threats, the impact these threats may have on site operations and how they could affect public health and the environment. This evaluation will then inform decisions regarding the need for mitigation measures, communications, supplies and training. The following discussion presents two suggested methods for conducting such an evaluation. However, as noted above, the appropriate level of planning and mitigation may vary widely based on site conditions. In the case of complex sites, portions of this guidance may fall outside of the expertise of the Investigator and assistance from other qualified professionals, such as a licensed engineer or professional emergency manager, may be necessary while at low complexity sites a less formal evaluation may be adequate.

The Investigator should take the initial step in preparedness by conducting an inventory of all site systems falling under their responsibility. Systems may include remediation equipment and all types of engineering controls (e.g., sub-slab venting systems, water treatment systems, impermeable and clean fill caps, fences). Systems both on-site and off-site (e.g., residential potable water treatment systems) should be included. The Site System Inventory should include any design information (e.g., system power requirements, storage capacity for tanks and dimensions and construction of caps) which may be critical during subsequent planning and evaluation steps.

Upon completion of the Site System Inventory, the Investigator can identify and evaluate the potential hazards that could impact a site. The information resources listed in Appendix B may be used to help complete this evaluation.

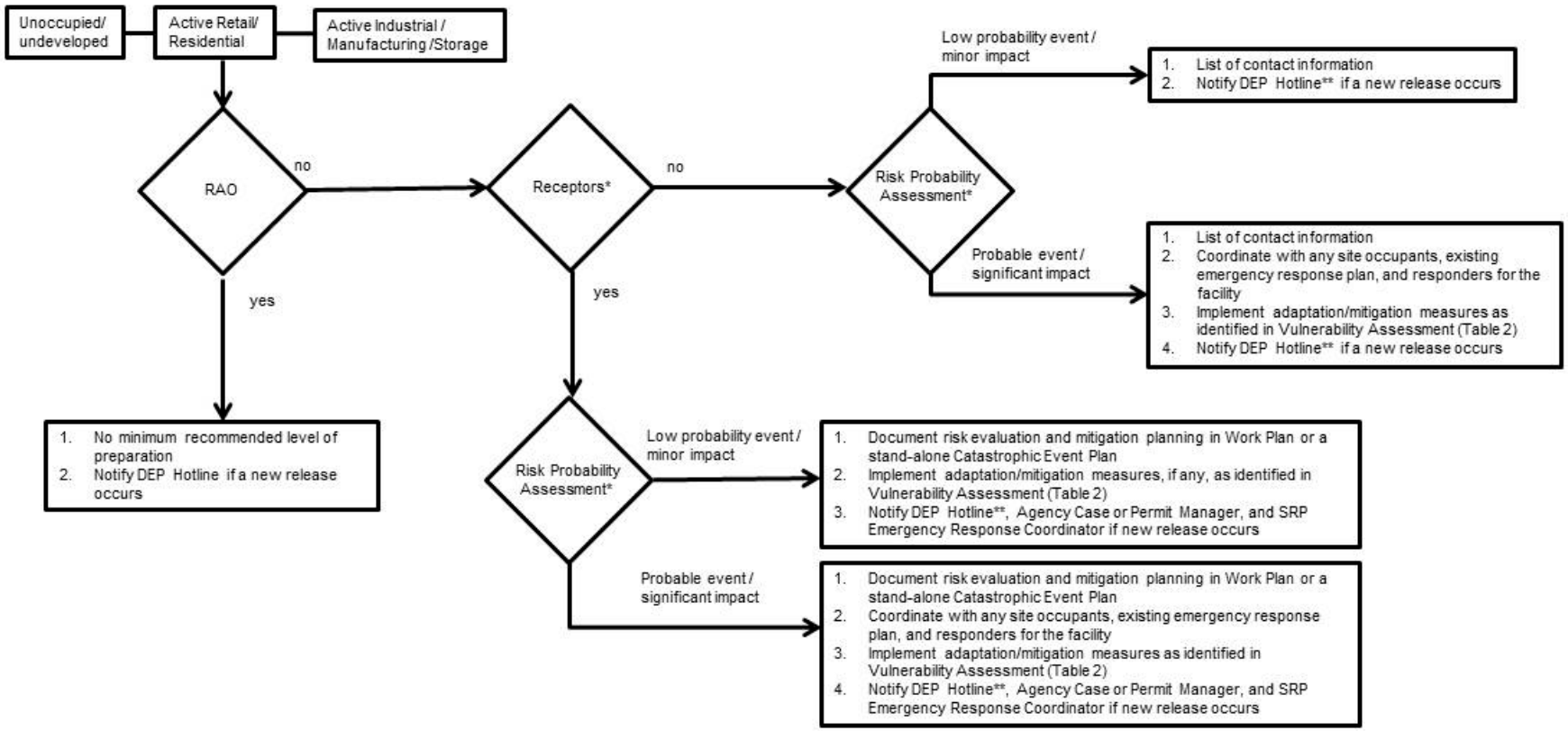
Depending on the complexity of the site and the degree of risk posed, evaluation of hazards could be qualitative (e.g., event probability) or quantitative (e.g., estimated heights and return periods for flooding on site). Preparation of a risk matrix can be useful to display the results of the hazards evaluation. The matrix serves to combine the information that has been assembled related to hazards, their probability and potential consequences, and can also be used later to facilitate decision-making regarding mitigation. An example of a Risk Assessment and Probability Matrix with color coded priorities for mitigation is provided in Table 1.

The impact of each hazard will be highly site specific and greater consideration should be placed on impacts with potential to affect human health or environmental quality. Special consideration should be given to loss of function of passive engineering controls, particularly where such a loss could result in acute exposure risk, and loss of active remedial systems, especially where loss could result in long term setbacks in remedial progress and the redistribution of contaminants on or off site. Factors discussed in Sections 2.2 which may affect the severity and duration of impacts should be fully considered, as should the potential receptors (Section 2.3) of those impacts. Additional impacts should be added to this list as they are identified. The results of these assessments will differ depending on what stage of a remedial action the site is in and should be updated as the remedial process moves toward completion.

Another way to evaluate hazards present at a site is to conduct a Vulnerability Assessment that identifies site specific remedial system components or operations and the potential disruption of those systems during a catastrophic event as illustrated in Table 2. From this evaluation, high priority adaptation and hardening measures for the site and its systems can also be identified.

Figure 1

Decision Chart - Appropriate Level of Planning and Preparation



* Periodic re-evaluation is needed as conditions and regulations change.
** 877 – WARN - DEP

Table 1

Risk and Probability Assessment Matrix – Example

Landfill with cap and leachate collection near tidelands and urban areas

		IMPACT				
Operational Definition (Annual % Probability)		Insignificant	Marginal	Moderate	Critical	Catastrophic
		Minor disruption to operations, no increase in risk to human health or environment	Interruption of remedial operations, minor releases confined to small area of site, minor damage <$10,000	Remedial operations halted for weeks to months, moderate releases but confined to site, moderate damage $10,000 - $100,000	Remediation halted for months or longer, large release requiring offsite response, significant damage >$100,000	Complete destruction of remedial/control systems, releases resulting in IDLH conditions, significant ecological impacts, sizable offsite property loss
Definitely	100%	Annual Storms (short term power interruption)	None	None	None	None
Likely	10%	None	Nor'easter/Strong Storm Systems (minor flooding/wind damage, moderate costal erosion, short term power loss) Wildfire (automatic shutdown, damage to plastic piping)	Lightening Strike (damage to electrical equipment, fire)	None	None
Occasional	1%	MMI VI E.Quake (minor disruption of operations)	Flooding within Flood Hazard Zone (temporary loss of site access, damage to lowlying equipment)	Tropical Storm -Cat. 1 Hurricane wind 39 - 95 mph (temporary loss of site access, damage to lowlying equipment, wind damage, significant errosion)	None	None
Remote	0.1%	None	MMI VII E.Quake (minor damage to unsecured equipment, minor damage to cap)	Flooding significantly beyond Flood Hazard Zones (extended loss of site access, damage to pumps and control systems)	Cat. 2-3 Hurricane wind 96 - 130 mph (loss of site axcess for days, some errosion and damage to equipment and structures)	None
Unlikely	< 0.1%	None	None	None	None	MMI VIII E.Quake, Cat. 4+ Hurricane wind >130 mph (loss of site access for weeks, extensive erosion and damage to equipment and structures)

Risk Prioritization Categories: Acceptable risk under current conditions | Risk requires additional mitigation | Probability too low to justify expense of mitigation

***MMI: Modified Mercalli Intensity Scale**

Table 2

Example of Vulnerability Assessment Results and Prioritized Hardening Measures

This example involves a Superfund Site located near a Metropolitan area along the Atlantic Coast at risk of flooding in a catastrophic event. The site is contaminated with liquid industrial wastes received from other manufacturing chemical firms. Remedial technologies include a soil-bentonite slurry wall, a sheet pile retaining wall along an onsite creek, and a groundwater pump and treat system with offsite discharge. The P&T system is located in a portion of a 500-year floodplain that surrounds a 100 year flood hazard area, where some remedial and support systems, such as equipment and material storage sheds or containers, and power lines, exist.

Potential Points of System Vulnerability		Potential System Disruption				Adaptation Measures for High-Priority Vulnerabilities
		Power Interruption	Physical Damage	Water Damage	Reduced Access	
Groundwater Extraction or Containment System	Wells		○		○	
	Extraction pumps and above ground controls	●	●	●		Power from off-grid sources; Well Head Housing
	Vertical Barriers		○		○	
	Pipe System		○	○	○	
	Monitoring Equipment	●	●	●	●	Power from off-grid sources; Remote access
Above Ground Components of the Treatment System	Electrical Controls	●	●	●	●	Power from off-grid sources; Remote access
	Pumps	◐	○	◐		
	Pipe System		◐			
	Electrical Equipment	●	○	●		Power from off-grid sources
	Natural Gas-Powered Equipment	◐	○	◐		
	Gasoline-Powered Equipment	◐	○			
	Flow-Through Units	◐	○	◐		
	Chemical Storage Containers		●	◐	●	Relocation; Tie-down systems
	Treatment Residuals Disposal System		○	◐		
	Treated Water Discharge System	◐	○	◐		
Site Operations and Infrastructure	Buildings, Sheds, or Housings	●	●	●	○	Power from off-grid sources; Hurricane straps
	Electric and Gas Lines	●	◐	●	●	Relocation
	Gasoline Storage and Transfer	◐	◐	●	●	Concrete pad fortification; Tie down systems
	Water Supplies	◐	◐	●	●	Potable water tank
	Exposed Machinery and Vehicles		◐	●	●	Relocation
	Surface Water Drainage Systems		◐	◐	◐	
	● high priority		◐ medium priority			○ low priority

adapted from USEPA, 2013

3.1.2 Select and Implement Mitigation

For each event or condition that has been determined to pose a risk level requiring additional mitigation (red cells in Table 1, high priority items in Table 2) the Investigator should implement a selection process to determine the most suitable mitigation and hardening measures to address these risks. Appropriate actions should be selected to mitigate any impacts of a potential catastrophic event, with primary consideration given to protection of human health and the environment, and potentially modified by cost and timing issues. The Investigator should consider remedial components located onsite and offsite, and conditions which might result in offsite impacts may warrant higher priority. Action should also be considered which may improve remedial effectiveness (e.g., increase operational time) or reduce recovery costs in the case of a catastrophic event.

A list of site adaptation and/or hardening measures ranging from the least protection, cost and effort, to greatest protection, cost and effort may be developed. The following provides examples of defensive or adaptive measures which may be appropriate to a remediation site:

- Soil stabilization with vegetation or stone
- Early warning monitoring systems (e.g., instrumentation of remedial systems, local or regional hazard warnings)
- Secure remedial equipment prior to and during a catastrophic event
- Secure storage areas
- Failsafe emergency shutdown
- Systems and safety interlocks
- Relief devices
- Fencing at the site to control access
- Repair or retrofit existing buildings to increase resistance to damage
- Elevate equipment or structures
- Relocate equipment, structures or processes temporarily or permanently to less vulnerable location
- Design remedial processes with redundant components for greater resilience
- Structural defenses (e.g., berms, walls)
- Maintaining spare equipment to repair damages from an event

Typical impacts from catastrophic events and examples of hardening measures are described below:

1. Impact: Buoyant forces from flooding may lift buried pipelines or tanks out of the ground causing leakage of hazardous substances.
   Hardening Measure: Pipeline or tank is covered with a concrete-filled mattress to prevent uplift (Figure 2-1).

Figure 2-1.
Anti-buoyancy mattress installed over pipeline to resist flotation (courtesy Williams Gas Pipeline).

2. Impact: Ground water treatment systems may be damaged by flooding and require costly repairs (Figure 2-2).
   Hardening Measure: Elevate equipment above flood level or provide a waterproof enclosure.

Figure 2-2
Flooding caused costly damage to mechanical and electrical equipment (courtesy Handex Consulting & Remediation, LLC).

3. Impact: Power and communication lines may be damaged, shutting down remedial systems (Figure 2-3).
   Hardening Measure: A backup generator may be installed with automatic startup in the event of power failure.

Figure 2-3
Extensive power line damage during Superstorm Sandy (courtesy NJ Task Force 1, 2012).

4. Impact: Erosion of soils behind a bulkhead could threaten stability of the bulkhead and cause loss of contaminated soil off site (Figure 2-4).
   Hardening Measure: Armor soils with stone, hardscaping or deep-rooted vegetation.

Figure 2-4
Loss of soil at bulkhead with exposed tieback rods.

Hardening measures can be identified and implemented in tandem, following the principle that multiple layers of defense are more difficult to penetrate. In some cases, hardening of site systems may not be practical but other operational changes may be possible to reduce risks from catastrophic events.

A record should be made of the assessment and selection process for future consideration and reassessment of risk.

3.1.3 Contacts and Communication

It is usually preferred that communication of site conditions during an event occurs via phone (cell or land line). However, depending upon the severity of the event, phone service may be severely limited or unavailable. Other communication methods, such as radio or internet programs (e.g., email, web-conferencing) represent good alternatives, but these services could also be disrupted. The Investigator should establish a redundant communication network, a defined chain of command, and a decision tree to be followed at each site to minimize the effects of communication disruptions. This should include multiple communication methods and appropriate contacts, such as the Investigator, the business/property owner, the PRCR and the facility manager or site occupants. Since this list of contacts has the potential to change, it should be updated frequently. In addition to contingencies for communications, it is recommended that back-up plans be developed for other logistics, such as the identification of default meeting locations. These may be on-site locations at a facility where managers and decision makers know to meet to assess damage and implement a response plan, or an off-site location where key decision makers know to meet if travel to the site is dangerous and communication is not possible.

The Investigator should communicate site conditions in accordance with the National Incident Management System, or NIMS and as required by municipal, county and state authorities (see Section 3.1.5 and Appendix E), and also to report discharges or conditions that warrant an Emergency Response to the NJDEP Hotline (877-WARN-DEP) per the requirements of the Spill Act, N.J.S.A. 58:10-23.11e. Concurrent with notification to the Hotline, the Investigator should notify the National Response Center at 1-800-424-8802 (see http://www.nrc.uscg.mil/ for more information).

In the event of a state-wide emergency, the New Jersey State Emergency Operations Center will be activated. The LRSP is encouraged to establish contact with the state agency personnel managing the event if necessary per established protocol (e.g., State of New Jersey Office of Emergency Management Emergency Operations Plan, Emergency Support Function 10 - Hazardous Materials, and Emergency Support Function 3 - Public Works).

3.1.4 Assess supplies and equipment

Response to a catastrophic event can be greatly enhanced by preparing and successfully deploying materials necessary to immediately and safely mitigate the effects of the catastrophic event. If not part of an existing emergency response plan for the site, the Investigator should create an inventory of available personnel, equipment and materials that will be needed during event preparedness and response activities. The recommended quantity of equipment and materials needed for a response should also be noted, along with verification that an adequate amount is in stock, and a list of suppliers and their contact information.

An example list of materials and equipment anticipated to be applicable to most sites includes, but is not limited to, the following:

- Universal spill kit including at a minimum a bucket, shovel, drying media, 6 mil poly bags with sealing tape, and labeling materials
- Sheet polyethylene
- Spill response sorbent pads, boom, and sorbent material
- 55-gallon drum and an over pack drum
- First aid kit
- Personal protective equipment in appropriate sizes (gloves, hard hats, boots, suits, etc. as dictated by site conditions and expected contaminants)
- Appropriate respiratory protection under an Occupational Safety and Health Administration (OSHA) Respiratory Protection Program (e.g., N-95 masks, air purifying respirator with High-Efficiency Particulate Arrestance (HEPA) and organic filters fitted to the Investigator or other, etc.)
- Weather proof garments
- Testing equipment dictated by site conditions and expected contaminants (e.g., lab kit for testing pH, photoionization device (PID))
- Pry bar or similar tool
- Chain saw and fuel
- Radio or cell phone, and backup methods of communication (e.g., walkie-talkies or CB radio)
- Flares
- Battery operated emergency lighting

Based on site specific conditions, other equipment and supplies may be needed. If the site is in proximity to a stormwater system or water body, then protection of the surface water should be included in the site preparedness assessment. If the site is remote to paved roads, it may require specialized transportation to access it such as boats, all-terrain vehicles or other specialized vehicles.

A hard copy of the material and equipment inventory should be kept on-site in the area in which these spill response materials, equipment and supplies are stored. An electronic copy should also be maintained.

The assessment of the required materials, equipment and supplies for successful response to a catastrophic event is dynamic. Adjustments to the necessary materials should be made with each significant newly assessed risk for the site. Plans should consider the fact that catastrophic event-related disruptions (i.e., power, communication) may significantly impact response, and may continue for weeks thereby impacting recovery. Planning in the form of service agreements and pre-contracting in advance of an event for necessary resources can assist in speeding both response and recovery efforts. Evaluation of the business continuity of operation plans of key contractors and suppliers may be required to ensure that they will be able to execute their planned part in response and recovery operations.

A list of local/State emergency responders, emergency response contractors and larger equipment suppliers should be maintained by the Investigator for each site in accordance with the conditions at that particular site (e.g., water borne spill responders for those sites near a body of water, fire responders for those sites in an area with increased fire potential, etc.). Local/State emergency responders are important resources, and the process for requesting their assistance should be factored in and detailed. For instance, if a power source or generator could not be obtained commercially for a pumping station at a wastewater treatment plant, the Investigator or other official at the site may request assistance from the local municipality. If not available, the request would then be made at the county level and then the State level through the Office of Emergency Management Program.

Finally, while more suited to managing the specialized needs of larger and more complex sites than normally encountered at a remediation site, tools available from the US Department of Homeland Security at https://rtlt.preptoolkit.org/Public, such as the Incident Resource Inventory System (IRIS) software, can be used to inventory and identify resources needed for response actions.

3.1.5 Training and Exercises

Once the planning process has been completed, it is imperative to properly train personnel responsible for implementing a response at each site for which the Investigator is responsible. The level of training will vary depending on the complexity of the site. At a minimum for low-risk sites, training should include a program of routine review and verification of the contacts list. Some sites may already have emergency response plans which have training and exercise requirements. Training exercises may be conducted based on an event that is likely to occur, and assuming worst-case conditions. Where warranted based on the scale of the potential remedial activities, this exercise should be conducted periodically (e.g., every two years to coincide with biennial certification process) to re-establish and exercise the emergency response structure for the site.

As a primary standard protocol, the Investigator is encouraged to become familiar with NIMS, which is a systematic standardized approach to incident management developed by the United States Department of Homeland Security (DHS). The purpose of the NIMS is to provide a common approach for managing incidents (see Appendix D). The Investigator is encouraged to take the awareness level IS-700 online course found at http://training.fema.gov/EMIWeb/IS/courseOverview.aspx?code=IS-700.a and become NIMS certified. A description of this training can be found at http://www.fema.gov/pdf/emergency/nims/ics_700_fs.pdf .These protocols apply to all incident command structures, which the Investigator may encounter.

For additional information on training exercises, consult the National Preparedness for Response Exercise Program (PREP) Guidelines at http://www.au.af.mil/au/awc/awcgate/uscg/prep_gid.pdf. The PREP Guidelines spell out a tiered program of steps to test existing plans starting with seminars, workshops, tabletop exercises, games, drills, functional exercises and full scale exercises. Based on the potential risk from the site, all or a subset of the above may be implemented. The outcome of the exercise program should be used to refine existing plans. The refinement should also lay out the need for and timing of future exercises.

3.2 Response

The very first and highest priority of all persons involved in a response to a catastrophic event is personal safety. Depending on the nature of the event, some areas may be under an evacuation order until the threat has passed and response activities can begin. Such warnings, communicated through previously established channels, must be heeded and may result in the coordination of response activities being managed at back-up locations so response personnel are kept safe.

The nature of the response may be affected by the activity level at a site. For operating facilities, more staff and resources may be available to respond compared to a vacant or abandoned property that is being investigated or

remediated. In all cases, it is important that someone be designated as the "person in charge" of the site to supervise response actions and to make decisions. This person may be the facility manager in the case of an operating facility, or the LSRP/project manager in the case of a remedial action at non-operational sites.

3.2.1 Assess Event and Site Conditions

Event is Imminent

When the event is about to begin, assess the specific threat and current site conditions, as described in Section 3.2.2 below, and be prepared to communicate this information to appropriate response agencies as requested. For remediation being conducted for the State through a contract with NJDEP, or other particularly complex sites, NJDEP may reach out to the Investigator to establish a proactive communication network.

When the event is imminent, planning documents should be reviewed to determine those applicable to the event and make any necessary adjustments. The Investigator should ensure all planning procedures and actions are activated and in effect. If possible, the Investigator should be in a pre-determined safe location with access to redundant communication and information resources (e.g., cell phone, land-line, scanner, UHF/VHF 2-way radio, weather/AM/FM radio, television, etc.). Communication should be maintained as appropriate with authorities, site personnel and other affected parties.

Event has Occurred

If a catastrophic event occurs at a site for which the Investigator is responsible, the Investigator is encouraged to travel to the site as soon as possible after any type of travel restrictions or shelter in place directives have been lifted, to directly observe site conditions. For safety reasons, the Investigator should notify others in the chain of command that he/she will be traveling to the site to conduct an initial inspection. Site conditions and risks should be evaluated based on actual or potential contaminant discharge and resulting impact to human health and the environment. Actions that could mitigate unacceptable risk or further damage to site structures/equipment should be considered. The Investigator should then coordinate with facility representatives and appropriate government agencies to implement all relevant response plans.

If the impact from the event makes traveling to the site hazardous or impossible, the Investigator should use alternative methods to obtain needed information. These methods may include reviewing remote electronic monitoring devices, viewing video or pictures from site surveillance cameras, communicating with on-scene facility staff, contacting representatives of adjacent properties/facilities, or contacting local or State government emergency management officials.

3.2.2 Prioritization

When evaluating a site impacted by the catastrophic event, the recommended hierarchy of conditions requiring response actions is as follows:

1) Emergency Response conditions
2) Immediate Environmental Concern (IEC) conditions
3) containment of contamination from that site

Consult and evaluate tools from the planning stage to determine what to address first, such as fire, power outages, systems failure, etc., or if other action is needed to address something not covered in the plan. Based on risks posed and immediacy of response needed, the Investigator should prioritize all required measures, response actions, materials and equipment to address each area of impact.

If the Investigator is responsible for multiple sites, it is also recommended that they prioritize their sites relative to each other. A system to help prioritize what conditions at a site or what sites among multiple sites to address first is presented below:

High:	Actual impact to human or ecological receptors has occurred, requiring an emergency response or causing an IEC condition(s).
Moderate:	Actual impact to human or ecological receptors has occurred or is anticipated, not requiring an emergency response or causing an IEC condition(s).
Low:	Actual impact or anticipated impact with effects posing minimal risk.

For high or moderate priority conditions, the Investigator should communicate site conditions and recommended response actions in accordance with prearranged plans and in accordance with protocols described in Section 3.1.3.

3.2.3 Evaluate Resources and Implement Response

At this point, the PRCR is responsible for evaluating resources and implementing the response, however the Investigator, if requested, can assess the required response actions associated with new discharges or ongoing remedial actions. For example, the Facility Contact may be focused on restoring site operations while the Investigator could assist in restoring or evaluating on-site ground water treatment or engineering controls, or applying for NJDEP emergency permit waivers as necessary (air, stormwater, discharge to ground water, surface water discharges, land use, dredging, solid waste, etc.). Ideally, properly trained personnel should be deployed.

Based on the type and anticipated severity of the event, the availability of response equipment should be determined. This includes gasoline, electrical generators, spill response equipment, laborers and technicians, access to the site, water, tools, spare parts, and others. Arrangements should be made for delivery of necessary equipment, distribution of necessary supplies and mobilization of required labor.

Once the resources have been evaluated and response actions selected, implement those actions, monitor the results, and make adjustments as needed.

3.3 Recovery

In the context of this document, recovery refers to the process of returning a site to the same operational condition that existed prior to the catastrophic event, or returning it to an equivalent condition that is equally protective of human health and the environment, in accordance with NJDEP regulations.

As during the response process, communication should continue along the established contact network and chain of command. During the recovery process adequate communication is critical to develop and maintain consensus on recovery goals and priorities among the site's various stakeholders (e.g., property owner, LSRP, PRCR, etc.).

Prior planning of recovery goals (e.g., return treatment system to operational conditions that existed prior to the event, repair engineering controls) can allow for a faster and more organized recovery effort. Full consideration should be given to actions which may be taken to improve the level of protection for human health and the environment or mitigate future vulnerability to catastrophic events. Changes to site conditions and efforts taken to stabilize conditions during recovery should be documented.

During recovery, site conditions should be reassessed to determine required resources and their availability. Catastrophic event-related disruptions may significantly limit the availability of resources required for recovery, such as power, communication systems, the availability of parts, materials and skilled labor, including regular

employees or contractors. In extreme cases, direct assistance to employees with regard to transportation and housing issues may be required to facilitate recovery efforts. Planning in the form of service agreements and pre-contracting in advance of an event for necessary resources can assist in speeding recovery efforts. For more information, see Section 3.1.4 - Assess supplies and equipment.

3.4 Re-assessment

3.4.1 Post-event reporting

The occurrence of a catastrophic event might trigger certain regulatory reporting requirements depending upon items such as the following:

- Nature of the catastrophic event
- Type of remedial system at the site
- Extent of impact to the remedial systems
- Permit-specific requirements
- Potential emergency exemptions (e.g., Governor Christie's Executive Orders issued in the wake of Superstorm Sandy providing temporary relief from certain permit requirements)

The Investigator should evaluate potential reporting requirements on a site-specific basis as part of his/her post-event activities. At a minimum, the Investigator should evaluate whether the catastrophic event caused a "new" release at the site thereby triggering the need for a new Spill Act notification to the NJDEP Hotline and, if applicable, other agencies.

Documents in the site's remedial history (e.g., PA, SI, RAWP, Remedial Action Report (RAR), permits, etc.) and the results of the planning and preparedness steps outlined in Section 3.2 of this technical guidance will help document pre-event site conditions. Post-event conditions should be evaluated, compared to pre-event conditions and documented.

3.4.2 Lessons learned

Subsequent to an event, the Investigator should review the results of the catastrophic event planning process to identify elements that were effective and ineffective. The Investigator should then identify lessons learned and modify the elements in the planning process as appropriate. If appropriate, post-event reconnaissance should be reviewed by a qualified professional who can make recommendations for mitigation measures based on the observed stresses and failures.

The Investigator should re-apply the steps outlined in this technical guidance and modify any documentation of the planning process as necessary in response to the changed conditions and new information. For example, the existing receptor evaluation might no longer be valid if the catastrophic event resulted in altered contaminant migration pathways (e.g., an engineered cap might have been eliminated thereby resulting in a direct-contact situation where none existed pre-event). Alternatively, the catastrophic event might have resulted in the elimination of previous receptors (e.g., a nearby day care center might no longer be in operation). Therefore, many of the factors that are discussed earlier in this guidance such as site conditions, receptors, constraints and vulnerability should be re-evaluated.

3.4.3 Review of new technologies and guidance that might better protect the site

Changes to site conditions due to the catastrophic event could allow alternative remedial measures to be considered. As appropriate, consideration should be given to new technologies or remedial approaches which would better protect human health and the environment. Any consideration of new technologies should consider the administrative effort and cost required to alter approved RAWPs, implemented RAs, and established engineering and administrative controls.

This guidance assumes the Investigator will be conducting remedial activities in conformance with the most current, applicable NJDEP SRWMP technical guidance and regulations; however, a post-event review of the applicable guidance and current technologies, especially with respect to construction, building codes and engineering is warranted. For example, certain pre-event remedial systems could be outdated and vulnerable to damage in the future. Newer construction methods might be available and updated building code requirements could be in-place. In such cases, restoring remedial systems to pre-event conditions might not be prudent, or might not be allowed because they would be considered new construction and need to comply with updated building and zoning codes.

Following a catastrophic event and an assessment of site conditions and response efforts, mitigation may be needed to minimize the potential damage to remedial systems and spread of contaminants from a future event. This may include changes to site conditions, planning, contracting, insurance, or other risk reduction measures. This is discussed in this guidance in Section 3.1.2 – Select and Implement Mitigation. Mitigation should also reconsider and revise actions taken under Section 3.1 - Preparedness, based on feedback from an assessment of the post-event site conditions.

4.0 References

Used in Guidance Document

Administrative Requirements for the Remediation of Contaminated Sites (ARRCS) - N.J.A.C. 7:26C. http://www.nj.gov/dep/srp/regs/arrcs/

Discharges of Petroleum and Other Hazardous Substances Rules – N.J.A.C. 7:1E. http://docplayer.net/8841956-N-j-a-c-7-1e-discharges-of-petroleum-and-other-hazardous-substances-rules.html

Emergency Management Institute and US Department of Homeland Security's FEMA NIMS, awareness level IS-700 online course found at http://training.fema.gov/EMIWeb/IS/courseOverview.aspx?code=IS-700.a.

National Fire Protection Association, Quincy, MA. NFPA 1600 Standard on Disaster/Emergency Management and Business Continuity Programs, 2013 edition, http://www.nfpa.org/codes-and-standards/document-information-pages?mode=code&code=1600

National Preparedness for Response Exercise Program (PREP) Guidelines - http://www.au.af.mil/au/awc/awcgate/uscg/prep_gid.pdf.

Pinelands Comprehensive Management Plan – N.J.A.C. 7:50, http://www.nj.gov/pinelands/cmp/CMP.pdf

Pinelands Protection Act – N.J.S.A. 13:18A-1 et seq., http://www.state.nj.us/pinelands/images/pdf%20files/pinelandsprotectionact1.pdf

Remediation Standards - N.J.A.C. 7:26D., http://www.state.nj.us/dep/srp/regs/rs/

Site Remediation Reform Act (SRRA), N.J.S.A. 58:10C-1 et seq., http://www.nj.gov/dep/srp/regs/statutes/srra.pdf

State of New Jersey Office of Emergency Management, New Jersey Emergency Operations Plan, http://www.state.nj.us/njoem/preparedness.html

Support Function 10 (Hazardous Materials) and Emergency Support Function 3 (Public Works). https://www.fema.gov/pdf/emergency/nrf/nrf-esf-10.pdf, https://www.fema.gov/pdf/emergency/nrf/nrf-esf-03.pdf

Technical Guidance for Preparation and Submission of a Conceptual Site Model http://www.nj.gov/dep/srp/guidance/#csm.

Technical Requirements for Site Remediation (Technical Rules) - N.J.A.C. 7:26E., http://www.nj.gov/dep/rules/rules/njac7_26e.pdf

U.S. Environmental Protection Agency. Climate Change Adaptation Technical Fact Sheet: Groundwater Remediation Systems, December 2013, https://clu-in.org/download/techdrct/cca-tech-fact-sheet-gw-remediation-systems.pdf

Other Important Sources of Information

City of New York. 2013. A Stronger, More Resilient New York. Office of the Mayor. http://www.nyc.gov/html/sirr/html/report/report.shtml.
Local example of detailed risk analysis, including climate projections and cost benefit analysis. Discussion of brownfield site vulnerability.

FEMA. Risk Assessment, A How-To Guide to Mitigate Potential Terrorist Attacks Against Buildings. FEMA 452. January 2005. https://www.fema.gov/media-library/assets/documents/4608
A comprehensive guide to conducting vulnerability and risk analysis and evaluate mitigation option for buildings. Although focused on terror risk, it explains tools and concepts applicable to all hazard evaluation.

Hardening and Resiliency, U.S. Energy Industry Response to Recent Hurricane Seasons, Infrastructure Security and Energy Restoration, Office of Electricity Delivery and Energy Reliability, U.S. Department of Energy. https://www.oe.netl.doe.gov/docs/HR-Report-final-081710.pdf
A detailed review of measures taken within the petroleum and refining industries to increase hurricane resiliency.

Hashash, Y.M.A. et al. 2014. Field Reconnaissance of Geotechnical Aspects of October 2012 Hurricane Sandy along the US East Coast. National Science Foundation – GEER Association. GEER-032. http://www.geerassociation.org.
A review of the impacts of Hurricane Sandy with a focus on erosion.

NFPA 1600 Standard on Disaster/Emergency Management and Business Continuity Programs, 2013 edition, National Fire Protection Association, Quincy, MA.
http://www.nfpa.org/assets/files/AboutTheCodes/1600/1600-13-PDF.pdf
Standard guide to emergency management

U.S. Environmental Protection Agency. Superfund Climate Change Adaptation
https://www.epa.gov/superfund/superfund-climate-change-adaptation
Resources for preparing remediation sites for natural hazards. Includes fact sheets addressing natural hazard issues related to sediments, landfills/containment and groundwater pump and treat systems.

U.S. Global Change Research Program. 2014. Global Climate Change Impacts in the United States. Third National Climate Assessment. http://www.globalchange.gov/nca3-downloads-materials
Review of climate and natural hazard trends and mitigation for the US including information specific to the Northeast.

Appendices

Appendix A "Zero-Hour" Schedule – Anticipated Events

Appendix B Information Resources to Help Identify Hazards

Appendix C Contact Information

Appendix D National Incident Management System

Appendix E Case Study (Fabricated) – Holicong Manufacturing Site

Appendix F Glossary

Appendix G Acronyms

Appendix A

"Zero-Hour" Schedule – Anticipated Events

Hour 96 – Hour 72 (4 to 3 days prior to event):

- Monitor weather forecasts for "up to date" information.
- Begin to determine what sites may be impacted.
- Evaluate which sites are in high risk areas.

Hour 72 – Hour 48 (3 to 2 days prior to event):

- Monitor current weather updates.
- Review and coordinate emergency preparatory measures.
- Identify, inventory and determine what needs to be secured or removed to mitigate potential releases or loss of control at potentially impacted sites.

Hour 48 to Hour 24 (2 to 1 day prior event):

- Monitor current weather updates.
- Begin mitigating operations to prevent releases and loss of control at potentially impacted sites.

Hour 24 to Hour 0 (1 day prior event):

- Monitor current weather updates.
- All potential impacted sites should be secure.

Appendix B

Information Resources to Help Identify Hazards

FEMA Flood Map Service Center Digital mapping of flood hazards https://msc.fema.gov/portal
NOAA Digital Coast Variety of data sources on coastal risk including hurricanes, flooding and sea level rise http://coast.noaa.gov/digitalcoast
National Hurricane Center Data In GIS Format GIS resources describing current and historic hurricane risk http://www.nhc.noaa.gov/gis
NJ Flood Mapper Interactive maps of sea level rise and flood hazards in NJ http://slrviewer.rutgers.edu/
Digital Geodata Series DGS06-3 Landslides In New Jersey Map and GIS data describing landslide hazards in NJ http://www.state.nj.us/dep/njgs/geodata/dgs06-3.htm
Earthquake Risk in New Jersey Earthquake risk and preparedness information for NJ http://www.state.nj.us/dep/njgs/enviroed/eqrisk.htm
State of New Jersey Forest Fire Service NJ wildfire information and interactive map of fire history http://www.state.nj.us/dep/parksandforests/fire

Appendix C

Contact Information

This Contact List is provided as a resource to aid in obtaining answers to questions about preparing for and recovering from a Catastrophic Event.

1. NJDEP Important Contacts

Category	Representative	E-Mail Address	Phone Number
New Release			
To report an environmental incident in NJ	24 hour Hotline	**N/A**	1-877-WARNDEP 1-877-927-6337
Contact Prior to Catastrophic Event			
To report facility readiness to NJDEP	SRWMP Emergency Response Coordinator (William Hadsell or Frank Sorce)	SRPEmerRespCoord@dep.nj.gov	

2. County Office of Emergency Management Coordinators

http://www.ready.nj.gov/about/association.html

3. Real-Time Weather Alerts

The New Jersey State Police Weather Information from the National Weather Service can be found at:

http://njsp.org/info/info.html#weather

4. NJDEP Site Remediation and Waste Management Program Technical Expertise

The NJDEP website provides a list of points of contacts with specialized expertise to answer questions on a wide variety of topics (listed below). Go to the following link for the most accurate and up-to-date information: http://www.nj.gov/dep/srp/srra/srra_contacts.htm

Rules and Statutes

Administrative Requirements for the Remediation of Contaminated Sites (ARRCS) Rule
General Technical Rules
Site Remediation Reform Act (SRRA)

Licensing
LSRP Applications/Licenses

General Questions on Cases Subject to SRRA
New Cases\Forms
On-Scene Coordinator approvals for Emergency Discharges to Surface Water
Permitting (DN, CEA, Remedial Action Permits)
Permitting (NJPDES-DGW Permits for Remediation)
Review of Documents
Site Applicability/Administrative Compliance

Technical Questions
Analytical Methods/Data Validation
Classification Exception Area Questions
Ecological/Sediment Criteria
General Technical
Ground Water Standards
Historic Pesticides
Natural Background Investigation (Arsenic)
Polychlorinated Biphenyls (PCBs)
Soil Standards - General
Soil Standards - Direct Contact
Soil Standards - Impact to Ground water
Surface Water Standards
Vapor Intrusion

Guidance Documents
Alternative and Clean Fill
Compliance and Attainment with Remediation Standards
EPH Guidance
Fees/Oversight Costs
Immediate Environmental Concerns (IEC)
Linear Construction
LNAPL
Presumptive Remedy
Receptor Evaluations
Remedial Actions that Render a Property Unusable
Response Action Outcome
Historic Fill
Conceptual Site Model
Ecological Investigation
Preliminary Assessment
SI/RI/RA - Soils
SI/RI/RA - Ground Water
Technical Impracticability
Monitored Natural Attenuation
QA/QC

General Topics
Brownfield Redevelopment/BDAs
Dredging Sediment and Technology/ Dredged Material Management
Enforcement

Green Remediation
ISRA Initial Notice
ISRA Remediation Certifications
Land Use Permits for Sites Undergoing Remediation
LSRP Overview
Mandatory Time Frames
Publicly Funded Remediations
Public Notification
RCRA, Superfund
Regulatory Time Frames
UHOT Program
UST Initial Notice

Financial/Fees
Annual Remediation Fees
Child Care Center Fees
Direct Oversight Billing
HDSRF Funding
ISRA Fees
Regulated UST Fees
Remediation Funding Sources
Financial Assurance
Technical Assistance Grants (TAG)
Unregulated Heating Oil Tank Fees
UST Fund

IT Systems
DEP Online
Electronic Data Deliverables (EDD)
GIS (mapping)
SRWMP WEB Page

Miscellaneous
NJDEP online web (Notice of Intent to Close an UST)

Appendix D

The National Incident Management System

The National Incident Management System (NIMS) is a systematic standardized approach to incident management developed by the Department of Homeland Security (DHS). The purpose of the NIMS is to provide a common approach for managing incidents. The concepts contained therein provide for a flexible but standardized set of incident management practices with emphasis on common principles, a consistent approach to operational structures and supporting mechanisms, and an integrated approach to resource management. The Investigator is encouraged to take the awareness level IS-700 online course found at http://training.fema.gov/EMIWeb/IS/courseOverview.aspx?code=IS-700.a and become NIMS certified. A description of this training can be found at http://www.fema.gov/pdf/emergency/nims/ics_700_fs.pdf . These protocols apply to all incident command structures, which the Investigator may encounter.

The NIMS is the essential foundation to the National Preparedness System (NPS) and provides the template for the management of incidents and operations in support of all five National Planning Frameworks. Use the links below for direct links to all pages within the NIMS website.

In its effort to proactively guide government, nongovernment and private sector elements to work together seamlessly in the management of incidents involving threats and hazards regardless of the cause, size, location or complexity in order to reduce loss of life, property and harm to the environment, the Federal Emergency Management Agency (FEMA) has adopted this DHS initiative and now offers online training designed in levels for various participants in the management of catastrophic events.

Incidents typically begin and end locally, and they are managed daily at the lowest possible geographical, organizational, and jurisdictional level. There are other instances where success depends on the involvement of multiple jurisdictions, levels of government, functional agencies, and/or emergency-responder disciplines. These instances necessitate effective and efficient coordination across this broad spectrum of organizations and activities. By using NIMS, communities, LSRPs and PRCRs are part of a comprehensive national approach that improves the effectiveness of emergency management and response personnel across the full spectrum of potential threats and hazards (including natural hazards, terrorist activities, and other human-caused disasters) regardless of size or complexity.

For additional information on training exercises, consult the National Preparedness for Response Exercise Program (PREP) Guidelines at http://www.au.af.mil/au/awc/awcgate/uscg/prep_gid.pdf. The PREP Guidelines spell out a tiered program of steps to test existing plans, starting with seminars, workshops, tabletop exercises, games, drills, functional exercises and full scale exercises. Based on the potential risk from the site, all or a subset of the above may be implemented. The outcome of the exercise program should be used to refine existing plans. The refinement should also lay out the need for and timing of future exercises.

Please refer to the descriptions below to gain an understanding of where to locate certain information.

NIMS Doctrine Supporting Guides & Tools: The National Integration Center develops supporting guides and tools to assist jurisdictions in their implementation of the NIMS.

National Preparedness for Response Exercise Program (PREP) Guidelines: The PREP Guidelines spell out a tiered program of steps to test existing plans, starting with seminars, workshops, tabletop exercises, games, drills, functional exercises and full scale exercises. See http://www.au.af.mil/au/awc/awcgate/uscg/prep_gid.pdf.

Training: The NIMS Training Program defines the national NIMS training program. It specifies National Integration Center and stakeholder responsibilities and activities for developing, maintaining and sustaining NIMS training.

Resource Management & Mutual Aid: National resource management efforts aid a unified approach in building and delivering the core capabilities across all five mission areas (Prevention, Protection, Mitigation, Response and Recovery). Effective resource management is founded on the guiding principles of the NIMS.

Guidance on Implementation & Reporting: Federal Departments and agencies are required to make adoption of NIMS by local, state, territorial, and tribal nation jurisdictions a condition to receive Federal Preparedness grants and awards.

NIMS Alerts: The National Integration center announces the release of new NIMS guidance, tools, and other resources through the distribution of NIMS Alerts.

FEMA NIMS Regional Contacts: The FEMA Regional NIMS Coordinators act as subject matter experts regarding NIMS for the local, state, territorial, and tribal nation governments within their FEMA Region, as well as for the FEMA Regional Administrator and staff.

Incident Command System Resources: The Incident Command System (ICS) is a fundamental element of incident management. The use of ICS provides standardization through consistent terminology and established organizational structures.
Reference - http://www.fema.gov/national-incident-management-system#

Appendix E

Case Study (Fabricated) – Holicong Manufacturing Site

Background

The Holicong Manufacturing Site (Site) is located on the banks of the Manasquan River and adjacent to New Jersey Route 35. Major areas of concern on Site include surface soils impacted by Polychlorinated Biphenyls (PCBs) due to a historic transformer spill, and subsurface soils and ground water impacted by volatile organic compounds (VOCs) downgradient of the former Paint Mix Building (see attached Site Plan). An on-site, trailer-mounted Air Sparge/Soil Vapor Extraction (AS/SVE) remediation system is in operation to address VOCs and is expected to operate for up to five years. Remote operation of the AS/SVE is possible for the LSRP using cellular communication and a Supervisory Control and Data Acquisition (SCADA) System. A remedial investigation has been completed delineating PCB impacts, but a remedial design has not been completed. The Person responsible for conducting the remediation (PRCR) established a Remediation Funding Source (RFS) in an amount based upon projected costs for the five-year operation and maintenance of the AS/SVE system, periodic ground water performance sampling and analysis, and the estimated costs for a conceptual PCB remediation.

Previous hydrogeologic studies have indicated the ground water and surface water are in hydraulic communication, and the on-site ground water is subject to tidal influence.

The majority of the Site is below an elevation of 27 feet above mean sea level. A storm water detention basin that receives flow from the facility storm drain network and sheet flow runoff is located on the site. The Site experienced significant flooding resulting in damage and the shutdown of operations for several weeks during Super-Storm Sandy, prior to initiation of remedial activities.

Factors to Consider

Based on the elevation and history of the Site, FEMA flood maps and advisory base flood elevations, the Site is vulnerable to flooding within the 100 year flood zone.

Residential properties are located near the Site which could be adversely impacted by any PCB contaminated soils that spread offsite. A Remedial Investigation Report (RIR) for the site delineates the extent of surficial soil contamination which could be mobilized by erosion.

Assessment of Catastrophic Event Risk and Vulnerability

The LSRP completed a simple Risk and Probability Assessment Matrix for catastrophic events with probabilities ranging from certain to occasional. Examining more remotely probable events was not justifiable, since many of the mitigation measures for more probable events would also provide protection during the more extreme ones. This Matrix was helpful in communicating risks and opening a discussion of mitigation options with the site owner.

Due to location and lack of anchoring, the AS/SVE trailer and catalytic oxidation unit are vulnerable to damage from both high winds and flooding. In a worst case scenario, damages could impact remedial operations for several months and result in costs up to $200,000. Short duration power outages and minor storm damage were considered of low significance, with costs less than $10,000, and could be handled as part of the remedial effort.

PCB contaminated surface soils in the area of the former transformer are vulnerable to erosion due to a significant slope towards the river and limited vegetation. However, in the event of a storm surge these contaminated soils

could be transported upland onto neighboring properties. Although contaminant levels would be expected to be insignificant, a sampling and analysis program would be needed to document whether contaminants spread.

Based on the potential risks, a Vulnerability Assessment for the various remedial systems and controls at the site was completed by the LSRP. Adaptation measures to mitigate identified hazards and associated costs were identified. Vulnerability of the AS/SVE system could be reduced by adding anchors to the trailer, however pumps and control systems would remain vulnerable to water damage. Contaminated surficial soils at the site could be protected by seeding, covering with a geotextile fabric and stone, or with an asphalt cap, depending on cost and impacts to future site development.

Implement Mitigation Measures

Due to budget constraints, remedial activities in the former transformer area are not scheduled to begin for up to two years. Based on cost and implementation considerations, plans were made to move the remediation trailer to a portion of the Site outside the floodplain and install temporary tie downs prior to predicted flooding or hurricanes. Plans were made to require draining the on-site detention basin prior to major storm events to allow for maximum capacity. The person responsible for conducting the remediation (PRCR) also made improvements to the integrity of the bulkhead as part of general facility capital improvements, which had the collateral benefit of better preventing contaminated soils from eroding into the River. The former transformer area was covered with turf reinforced matting and seeded to stabilize soils until a remedial design could be finalized.

Appropriate planning included modifying the Remediation, Operations and Maintenance Plan to include the requirement to sign up for the National Oceanic and Atmospheric Administration (NOAA) weather alerts and confirming the presence of appropriate equipment for moving the trailer to a designated safe location. Due to the proximity of residences the phone numbers of relevant local and State contacts were added to the Plan, along with the NJDEP Emergency Response Coordinator in the event that contamination spreads offsite, or a new release occurs.

Tropical Storm Janine

On October 9, 2016, New Jersey was hit by Tropical Storm Janine causing statewide flooding, power outages, road closures, loss of some landline, cellular and cable communication systems, and coastal evacuations. By 8:00 am on October 9, the Manasquan River was overflowing. Wind gusts ranged from 70-75mph and the water levels at the Site began to rise. Due to a weather alert issued regarding Janine on October 7, the AS/SVE remediation system had been moved and secured on October 7. However, above ground sections of AS/SVE piping were damaged by flood-borne debris. The detention basin was drained, in accordance with previous planning, to allow for maximum storm water capacity. Due to large volume of rain, a small quantity (ca 5 cubic yards) of surface soils from the transformer area were eroded and dispersed in flood waters. As a result of the state of emergency and limited communication, the LSRP was not aware of the status of the Site until October 13. Once the LSRP became aware of the erosion of soil from the area around the transformer, the Investigator notified the appropriate contacts and NJDEP Emergency Response Coordinator. The LSRP was able to use the site's remote access SCADA system when power was restored on October 13 to communicate with and assess damage to the remedial systems.

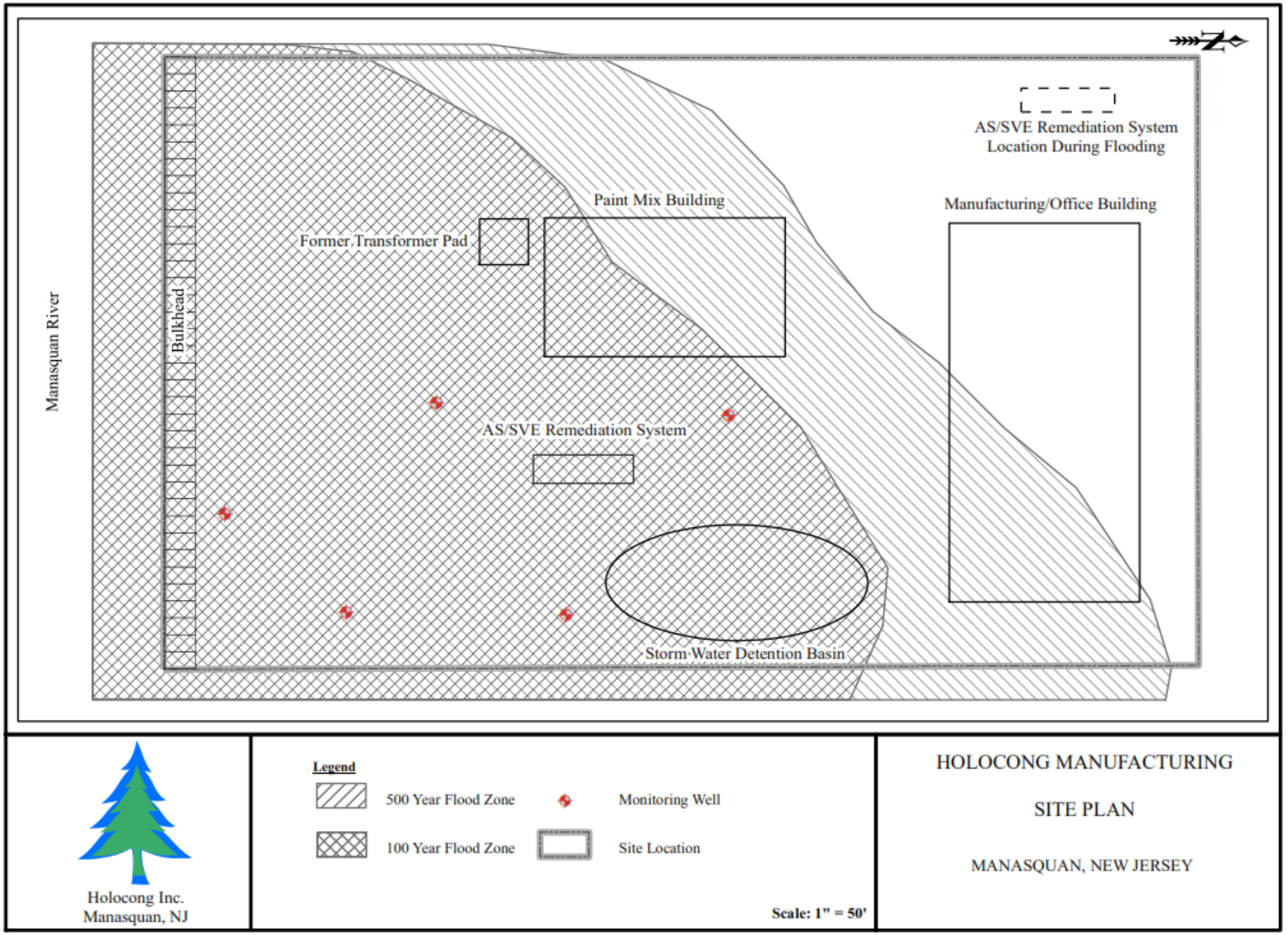
Response and Lessons Learned

Due to the high demand for equipment and contractors, on-site remedial systems were not restored to operation until 30 days following the storm event. The PRCR and LSRP performed an updated Receptor Evaluation due to changed site conditions that focused on the potential for PCBs entrained in the runoff to have impacted the river. Sediment samples collected upstream, adjacent to the facility and downstream detected no PCBs and the Receptor Evaluation results were unchanged. The monitoring well network was sampled to determine the effects of the

storm on VOC concentrations and overall plume impact. The analytical results indicated that the VOC concentrations did not vary statistically from pre-storm levels and the overall plume remained stable. As a result of these experiences, it was determined that plans for protection of the AS/SVE system and catalytic oxidizer were adequate. Expediting remediation of the transformer area was considered, however the remedial design is still under development. Instead of expediting completion of the design, it was determined that hardening of in-place controls should occur to prevent any release of soils from the transformer area. The steepest portion of the Site, where erosion was experienced, was reinforced with turf matting prior to re-stabilizing with grass seed.

To mitigate the problem of obtaining contractors following the storm event, the PRCR established on-call contracts for response, remedial or restoration services. The contact list in the Remediation, Operations and Maintenance Plan was expanded to include personal phone numbers and email addresses of key facility and consultant personnel to facilitate future communication in the case where offices were closed and/or primary contact numbers were inoperable. The SCADA system was considered a valuable asset because it allowed information on the condition of on-site remedial systems to be accessed without the need to travel to the site.

The PRCR and LSRP re-evaluated the RFS and determined that no adjustments to the amount were necessary at this time.


Manasquan River
Bulkhead
Former Transformer Pad
Paint Mix Building
AS/SVE Remediation System
Location During Flooding
Manufacturing/Office Building
AS/SVE Remediation System
Storm Water Detention Basin
Holocong Inc.
Manasquan, NJ
Legend
500 Year Flood Zone
100 Year Flood Zone
Monitoring Well
Site Location
Scale: 1" = 50'
HOLOCONG MANUFACTURING
SITE PLAN
MANASQUAN, NEW JERSEY

Appendix F

Glossary

Adaptation - Modification of remedial systems, controls or other site appurtenances or operations in anticipation of and response to a catastrophic event or its effects, which moderates damage to on-site systems or harm to off-site receptors.

All Hazards Approach - "An approach for prevention, mitigation, preparedness, response, continuity, and recovery that addresses a full range of threats and hazards, including natural, human-caused, and technologically caused." (NFPA 1600)

Best Management Practices – Methods, measures, or practices to improve resiliency of a contaminated site to a catastrophic event.

Catastrophic Event - In the context of NJDEP SRWMP, a catastrophic event is a natural or human-caused occurrence of limited duration and/or significant magnitude to result in adverse impact to the infrastructure, public health and/or the environment on a municipal, county, regional, state or multi-state regional scale. The result being to cause discharges of contaminants that would require notification to the NJDEP and remediation subject to the Administrative Requirements for the Remediation of Contaminated Sites (ARRCS), N.J.A.C. 7:26C, and Technical Requirements for Site Remediation (Technical Rules), N.J.A.C. 7:26E), and/or cause disruption of remedial activities or remedies at contaminated or formerly contaminated sites, necessitating recovery and/or remedial actions. For the purposes of this guidance, a catastrophic event is considered to be of short duration, on the order of hours or days, although the impacts and response actions may extend over a long time period. This definition is not intended to include slow-onset events such as prolonged drought, sea-level rise, global climate change, etc.

Contaminated Site - "All portions of environmental media and any location where contamination is emanating, or which has emanated there from, that contain one or more contaminants at a concentration above any remediation standard or screening criterion." (N.J.A.C. 7:26E-1.8). For the purposes of this guidance, sites that were remediated to unrestricted use are not considered contaminated.

Hardening - Hardening is a type of mitigation that alters or changes site infrastructure so that it is better able to withstand the damage due to natural or anthropogenic catastrophic events. The effect of hardening will be to reduce the impact of a disaster event onsite and improve durability and resiliency of the site infrastructure. Examples of hardening include moving electrical systems to a higher elevation, having automatic shut off valves on natural gas supplies, armoring a cap over contaminated soils to prevent erosion, or burying power lines underground.

Immediate Environmental Concern - "Immediate environmental concern" or "IEC" means a condition where any of the following types of contamination, or any of the following conditions related to a discharge are found:

- Contamination in a well used for potable purposes at a concentration above any Class II ground water quality standard pursuant to N.J.A.C. 7:9C – Appendix Table 1
- Contamination in indoor air at a level greater than the Department's vapor intrusion rapid action level as found at http://www.nj.gov/dep/srp/guidance/vaporintrusion/vig_tables.pdf
- Contamination that has migrated into an occupied or confined space producing a toxic or harmful atmosphere resulting in an unacceptable human health exposure, or producing an oxygen-deficient atmosphere, or resulting in demonstrated physical damage to essential underground services

- Contamination in surface soil such that dermal contact, ingestion, or inhalation of the contamination could result in an acute human health exposure

- Any other condition that poses an immediate threat to the environment or to the public health and safety

For the purpose of this definition, an "unacceptable human health exposure" is based on an evaluation of site specific conditions and the toxicity of the contaminant present. An oxygen-deficient atmosphere is defined as any atmosphere containing oxygen at a concentration below 19.5% at sea level and an acute health exposure means that an adverse human health impact could result from an exposure of less than 2 weeks to a contaminant. The potential for exposure is based on site-specific conditions, and therefore, the person responsible for conducting the remediation shall evaluate the reasonable likelihood of exposure." (N.J.A.C. 7:26E-1.8).

Inventory - A list of the components, tools and/or hard assets which may be needed in the planning or implementation of a response to a catastrophic event.

Investigator - Any person that uses this guidance to prepare for and respond to a catastrophic event, or to remediate a contaminated site on behalf of a remediating party, including the remediating party itself. This may include the LSRP, other environmental professionals, a property owner, management at an operating facility, the PRCR, etc. The responsibilities of the Investigator may vary depending on the event and the delegated levels of authority at the site or operating facility.

Life Safety Event - Those construction, protection, and occupancy features that pose an immediate danger to life from the effects of fire, including smoke, heat, and toxic gases created during an emergency event. (NFPA 1011)

Mitigation - Eliminating or reducing the probability of damage from a catastrophic event. Mitigation seeks to stop the cycle of damage, reconstruction and repeated damage. Mitigation activity can take place before and after a catastrophic event and in most cases will have a long-term sustained impact. Mitigation can include activities such as physical infrastructure modifications (e.g., hardening), contingency planning, and other risk reduction measures.

Preparedness - Preparing for an emergency, including plans or preparations made to prevent damage to remedial systems or release of hazardous substances, and to assist with spill control and cleanup operations. Preparedness also includes the implementation of applicable plans. In the *National Incident Management System*, preparedness focuses on: planning; procedures and protocols; training and exercises; personnel qualification and certification; and equipment certification. Activities could also include stockpiling supplies and spill response equipment.

Re-assessment - Post-event survey and information collection activities undertaken to evaluate the suitability of the planning and responses to a catastrophic event at a site.

Recovery - Short and long-term activities which begin after the catastrophic event has ended. This includes actions taken to return to a normal or safer situation following an event.

Resilience - Resiliency related to a site and/or site infrastructure refers to the capability to prevent or protect against significant impacts from, to maintain critical functions, structures and operations during, to recover from, and to resume normal operations after a catastrophic event.

Resources - Those strategic first responders, agencies, suppliers, contractors and/or site personnel who may be needed in the planning or implementation of a response to a catastrophic event. Resources may also include equipment and materials.

Response - Responding safely to an emergency on-site and off-site. Response includes the execution of emergency operation plans and mitigation activities designed to limit the loss of life, personal injury, property damage, release of hazardous substances, and other unfavorable outcomes. Activities may include putting a preparedness plan into action, securing remedial systems, switching to generators for power and notifications to State and local emergency responders.

Risk - Within this guidance, the general definition of risk is a combination of the likelihood of occurrence, vulnerability and the consequences of a catastrophic event.

Risk and Probability Assessment - A risk and probability assessment shows the threat, probability of occurrence and degree of potential damage to ascertain the level of risk for on-site systems, and on and off-site receptors, against each applicable catastrophic event. Identifying high-risk combination of threats and assets, allows for prioritizing resources when implementing mitigation measures. Risk and probability assessments are often shown as a matrix.

ROIC - The NJ Regional Operations Intelligence Center (ROIC) is New Jersey's 24/7/365 command and control, fusion and intelligence-gathering center located at New Jersey State Police (NJSP) Division Headquarters. On any given day at the ROIC, multiple organizations from NJSP to FBI to Coast Guard can collaborate, coordinate, troubleshoot and problem-solve together. When New Jersey State Police Office of Emergency Management (NJSP-OEM) determines that an all hazards event requires activation of the State Emergency Operations Plan (SEOP), the State Emergency Operations Center (SEOC) opens at the ROIC and based on the event is staffed by NJSP-OEM and various State, federal and private agencies as needed. For example, an event can be a storm, the Super Bowl, or a terrorist incident.

Vulnerability Assessment - Vulnerability Assessment of a site or system requires identifying the potential impacts to a site or system from an event-related stress (e.g., wind, water, other), and their relative degrees of disruption to remedial systems so that mitigation measures can be prioritized.

Appendix G

Acronyms

AOC	Area of Concern
ARRCS	Administrative Requirements for the Remediation of Contaminated Sites
AS/SVE	Air Sparging/Soil Vapor Extraction
CAFRA	Coastal Area Facility Review Act
CEA	Classification Exception Area
CSM	Conceptual Site Model
DHS	Department of Homeland Security
ESNR	Environmentally Sensitive Natural Resource
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FHA	Flood Hazard Area
HDSRF	Hazardous Discharge Site Remediation Fund
HEPA	High-Efficiency Particulate Arrestance
ICS	Incident Command System
IDLH	Immediately Dangerous to Life and Health
IEC	Immediate Environmental Concern
IRE	Interim Receptor Evaluation
ISRA	Industrial Site Recovery Act
LSRP	Licensed Site Remediation Professional
NFA	No Further Action
NIMS	National Incident Management System
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJSP	New Jersey State Police
NJSP-OEM	New Jersey State Police Office of Emergency Management
NOAA	National Oceanic & Atmospheric Administration

OSHA	Occupational Safety and Health Act
PA	Preliminary Assessment
PCB	Polychlorinated Biphenyls
PID	Photo Ionization Detector
PRCR	Person Responsible for Conducting the Remediation
PREP	National Preparedness for Response Exercise
RA	Remedial Action
RAO	Remedial Action Outcome
RAO-A	Remedial Action Outcome – AOC Specific
RAO-E	Remedial Action Outcome – Entire Site
RAP	Remedial Action Permit
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RE	Receptor Evaluation
RFS	Remedial Funding Source
RI	Remedial Investigation
ROIC	NJ Regional Operations Intelligence Center
SCADA	Supervisory Control and Data Acquisition
SEOC	State Emergency Operations Center
SEOP	State Emergency Operations Plan
SI	Site Investigation
SRRA	Site Remediation Reform Act
SRWMP	Site Remediation and Waste Management Program
TDMA	Temporary Debris Management Area
UHOT	Unregulated Heating Oil Tank
UST	Underground Storage Tank
VOC	Volatile Organic Compound