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## **Gowanus Environmental Remediation Trust**

### **Safety Health and the Environment**

#### **Process Safety (PHA Guidelines)**

Rev. #	Date	Description
0	8/9/2016	
1	10/2/2017	Designated PHA procedure; added PHA template

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## **1.0 PURPOSE**

The purpose of this procedure is to provide guidelines and framework to be used to identify, and then to minimize or eliminate, potentially hazardous situations on the project. All activities to be performed on the project will undergo a Process Hazard Analysis (PHA) review.

**NOTE: All references to “Contractor” also apply to Subcontractors and all business entities working on site.**

## **2.0 SCOPE**

This standard applies to major accident hazard assets for the project. In this context, major accident hazard assets are defined as those whose failure could lead to a major incident, resulting in significant consequences in terms of major injury, loss of life, environmental impact or reputational damage.

## **3.0 DEFINITIONS**

### **3.1 Process Hazard Analysis**

Organized effort to identify and analyze the significance of hazardous situations associated with a process or activity to aid management in making critical safety decisions. Also known as Hazard Identification, Risk Analysis, and Evaluation (HIRA).

### **3.2 Catastrophic Event**

An event that results in a large release of energy or material that has the potential to result in multiple fatalities or property, environmental, and reputational damage.

### **3.3 Causes**

Causes are the initiating events that commence the hazard scenario and describe how the deviations in design intent occur. Common classifications of causes include Equipment Failures, Human Failures, and External Events.

### **3.4 Hazard Scenario**

Specific unplanned event or sequence of events that has an undesirable consequence to safety or the environment.

### **3.5 Consequences**

The result of the hazard scenario. Consequences of concern are process safety issues, large scale environmental, property and longer-term equipment reliability/ operability issues to employees, contractors and the public.

### **3.6 Severity**

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Severity is the worst-case consequence of the particular hazard scenario and assumes that safeguards have failed.

### **3.7 Likelihood**

Likelihood is the qualitative probability of the hazard scenario occurring, given the safeguards that are currently in place. Current performance of safeguards and Probability of Failure on Demand are taken into account.

### **3.8 Management of Change (MOC)**

Process to ensure changes in design or scope after a PHA is completed are analyzed from a risk perspective to incorporate any impact to risks or hazard scenarios.

### **3.9 Risk Ranking**

The product of severity and likelihood used to evaluate risk.

## **4.0 RESPONSIBILITIES**

### **4.1 Contractor**

All references to “Contractor” shall also apply to Subcontractors and all business entities working on site.

### **4.2 Gowanus ERT**

The Gowanus Environmental Remediation Trust is the grantor/trust established by the participating members of the Gowanus Canal Superfund Site cleanup.

### **4.3 Owner’s Representative**

The Owner’s Representative acts on behalf of the Gowanus ERT and provides technical project management for the overall project.

### **4.4 PHA Team**

The Process Hazard Analysis (PHA) Team is specified in the Process Safety PHA Guidelines and is the team established for performing process hazard analyses of a particular process.

### **4.5 RA Management Committee**

The Risk Assessment Management Committee is compiled of members of the Gowanus ERT to provide direction for the PSM.

### **4.6 RA Team**

The Risk Assessment (RA) Team is specified in the Risk Assessment Procedure and is a team organized by the PSM and compiled of process experts for the activity being evaluated.

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#### **4.7 Project Safety Manager (PSM)**

The Project Safety Manager (PSM) is assigned by Gowanus ERT and takes direction from the Risk Assessment Management Committee to ensure compliance with the site Health and Safety and Risk Assessment Programs and Procedures.

#### **4.8 Site Safety Officer (SSO)**

The Site Safety Officer (SSO) is an individual assigned by each contractor to maintain that contractor's compliance with all federal, state, local, and project specific safety and risk assessment rules, regulations, and requirements while on the project. All contractors will maintain responsibility for the safety of their employees.

#### **4.9 Contractor Project Manager and Remedial Design Engineer**

Any and all recommendations made to the Contractor must be signed off as acceptable and appropriate by the Contractor Project Manager, and the Remedial Design Engineer if appropriate, before being implemented. An Acceptance Form (**Attachment A**) will be developed by the Risk Assessment Management Committee.

## **5.0 REQUIREMENTS**

### **5.1 PHA Techniques**

- Appropriate PHA techniques must be applied to identify and evaluate hazards for new construction or modifications to existing plant and equipment where there is the potential for a failure to lead to a catastrophic event. PHAs shall also be applied to identify and evaluate potential catastrophic events from non-routine plant operations.
- Qualitative PHA techniques will be applied consistently across technologies; the "What-If?" method is employed using the template in **Attachment B**. The degree of assessment carried out should be in proportion with the scale/complexity/novelty of the activity. Techniques will be updated in line with industry standards and lessons learned from prior PHAs
- If another PHA technique is desired, agreement on the appropriate techniques that should be applied for a given activity should be finalized with the contractor before the commencement of the project design. Upon completion of the PHA, management must be able to make confident decisions regarding the existing safeguards. If a decision cannot be reached, further semi-quantitative analysis may be required.

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- Any action items arising from PHAs that have a medium or greater risk must be completed before a system is turned over for operation.
- Any action items arising from a construction PHA must be completed before that construction activity is begun.
- Any and all recommendations made to the contractor must be signed off on the Acceptance Form (**Attachment A**) as acceptable and appropriate by the contractor Project Manager, and the Remedial Design Engineer if appropriate, before being implemented.

## 5.2 Procedure

As a minimum, a PHA must be completed for activities involving a new process, a significant equipment modification, decommission or a non-routine operation in which there is potential for a major accident or catastrophic event.

- Pre-Operation Safety Review: The PSM and the PHA Team shall review and approve the PHA prior to the system being placed into operation, or if construction / decommissioning related, prior to those activities taking place if any of the following conditions are met:
  - The PHA is related to a new system or activity
  - The PHA had risks in the High zone
  - The Layer of Protection Analysis (LOPA) had risk above the risk tolerance level
- The PHA Team shall review appropriate process safety information regarding the process or activity as part of the PHA to ensure that they understand the potential hazards. This information should include equipment information, technology information and information on any flammable or hazardous materials used or created in the process.
- PHAs that have similar low or medium hazard scenarios as an earlier approved PHA do not have to come back to the PSM for approval.
- The PHA techniques that will be applied at the varying stages of a project must be documented at the commencement of the project and should be based on the complexity and intention of the project.
- All PHAs shall have a purpose statement, a scope statement and an objective statement containing the minimum criteria given during RA Team training. The contractor is responsible to indicate the scope of work or design to be included in the PHA.
- Changes in the scope of work after a PHA is completed shall be reviewed by the SSO in accordance with Management of Change Procedure. If the change results in new or

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increased high risk process safety hazard scenarios, or LOPAs above the risk tolerance, then those scenarios must be discussed with the PSM and RA Team before continuing the work.

- Technology information should include drawings, diagrams, maximum onsite inventories of any flammable or hazardous materials, safe operating limits of key parameters like temperature, flow, pressure, etc. and an understanding of potential consequences if deviations from those parameters occur.
- Equipment information should include materials used in construction, indication of design codes and regulations, any safety equipment utilized and other information necessary for the team to conduct the PHA.
- The information should be sufficient to enable the PHA Team to perform a knowledgeable, qualitative risk assessment of the process
- PHAs shall identify potential hazard scenarios for the particular process or asset. As part of the PHA, the team should consider human factors, facility siting for relevant components of it. The PHA should also include a review of prior near misses and incidents to determine if there are potential risks and hazard scenarios relative to this particular PHA.
- All PHAs shall use a qualitative risk criterion to evaluate and prioritize the risks identified. The risk criteria and methodology shall follow the approved approach in the Project's Risk Assessment Procedure. The current risk matrix is attached at the end of this procedure.
- PHA's on assets must be reviewed, updated, and revalidated to reflect major changes to the asset or how it is operated or at least every 5 years or more frequent if per regulatory requirements. The objective is to ensure no new significant hazards have been introduced.
- PHA studies must be formally documented and appropriately communicated to PSM upon completion.
- Contractors with assets considered a Major Accident Hazard who regularly perform PHAs shall have their own procedure and a list of high risk work activities that could have potential process safety consequences and that require them to perform a PHA.

### 5.3 Generic PHAs

- Generic PHAs can be developed and used for repetitive activities that have the same types of hazards and safeguards in order to apply the benefits of the PHA consistently across



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multiple projects. An example of this is the generic PHA for environmental subsurface investigation activities which are commonly conducted activities for environmental projects or for certain construction activities.

- The generic PHA can be created for the work activity and can then be applied for all similar projects as long as the hazard scenarios are the same as the existing approved PHA and there are no additional hazard scenarios from either the work being performed or from external site-specific hazards present.
- When considering applying an approved generic PHA, it is the responsibility of the Contractor SSO to determine whether all of the hazard scenarios contemplated in the generic PHA address all of the hazards of the proposed work activities. If there are different scenarios, they should be considered to see if they could result in Process Safety risks. All additional hazards not contemplated in the generic PHA must be addressed. If an evaluation of a generic PHA determines that there are additional high hazard scenarios that were not addressed in the generic PHA, a job specific PHA should be conducted.
- Generic PHAs must be refreshed every 5 years in order to ensure continued effectiveness.

#### **5.4 Process Hazard Analysis Team**

- Competent personnel familiar with the applicable engineering, operation, maintenance, construction of the process must be part of the evaluation team.
- The team must be led by an individual who has been specifically trained to lead a PHA in the chosen technique. A newly trained PHA team leader shall first display competency in the PHA process by being mentored by a trained and experienced PHA team leader before leading his/her own PHA. It is each contractor's responsibility to ensure that only a trained and competent individual leads a PHA.
- The team leader shall request multi-disciplinary resources to form the team depending on the scope of the effort and the contractor Project Manager shall approve team members. Consideration shall be given to including an operator to the team as a subject matter expert.
- Members of the PHA team must understand the particular technique that they will be involved in. The number of team members should be consistent with the complexity of the process.
- Where there is no internal expertise to understand the process, external third-party subject matter experts should be considered for addition to the PHA team.

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- The team leader shall work with the responsible contractor SSO to develop target completion date(s) for all action items coming from a PHA, LOPA or other process safety risk assessment. This will be done at the completion of the PHA and completion of the LOPA or other risk assessment. The contractor is responsible to ensure the action items are tracked through to completion and completed on time. Any High-Risk Action Items should be reported to Gowanus ERT Representative and PSM within 12 hours of the finding by the Team.

## 6.0 DOCUMENTATION AND RECORD RETENTION

- PHAs and associated documents including resultant mitigation actions shall be documented and tracked. This data shall be retained in each contractor's project files.
- Any and all recommendations made to the contractor must be signed off on the Acceptance Form (**Attachment A**) as acceptable and appropriate by the contractor Project Manager, and the RD Team if appropriate, before being implemented.
- Low and medium risk action items from the PHA or other risk assessments such as LOPAs shall be signed off by the contractor SSO. Contractor Project Managers or above shall review and perform close out for action items designated as high risk or those above the risk tolerance for LOPAs or Risk Assessments. For any action item rejected, there shall be documentation supporting reasons why it is justifiably declined and how adequate safety is provided in an alternative measure if this is a medium or high risk.
- PHA records must be submitted to the PSM upon completion of PHA and remain available for the life of the project.
- Results of completed PHAs shall be proactively communicated to employees involved in that work process across all contractors and the PHAs shall be available to employees.

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**ATTACHMENT A: ACCEPTANCE FORM**

**PROCESS HAZARD ANALYSIS ACCEPTANCE FORM**  
**GOWANUS CANAL TB4 CONSTRUCTION**

The undersigned are in agreement with the recommendations of the PHA Team

Date of assessment: \_\_\_\_\_

**Company Name:**

**Task Analyzed:**

**Recommendations:**

NAME (Please print)	SIGNATURE	TARGET DATE FOR COMPLETION	ACTUAL DATE OF COMPLETION

PHA TEAM MEMBER NAME: \_\_\_\_\_

PHA TEAM MEMBER SIGNATURE: \_\_\_\_\_

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**ATTACHMENT B: PHA TEMPLATE AND RISK MATRIX**

	Process Step	Task	Potential Hazard	What If	Consequences	Ranking	Controls	Ranking	Additional Action Required	Responsible Person
	Process:									

PHA Risk Matrix			Likelihood of Occurrence					
Severity and Likelihood Criteria - Used to evaluate Credible Hazard Scenarios			Very Unlikely	Unlikely	Possible	Likely	Very Likely	
			May occur once in 10,000 years or longer	May occur once in 1,000 years	May occur once in 100 years	May occur about once every 10 years	Occurs at least once or more a year	
			1	2	3	4	5	
Hazard Severity	5	Event resulting in > 5 fatalities onsite or multiple member of public fatal injuries	Event resulting in release outside Company property with major damage that cannot be cleaned up within four weeks or has severe consequences, potentially being reported on international news. Potential international outcry. Example: > 100,000 gallon oil spill					
	4	Event resulting in 2 to 5 fatalities onsite or 1 member of public fatal injuries	Event resulting in release outside Company property with major damage that can be cleaned up within four weeks or without significant severe consequences, potentially being reported on national news. Includes damage to environmentally sensitive areas. Potential national outcry. Example: 10,000 to 100,000 gallon oil spill					
	3	Event resulting in 1 fatality onsite	Event resulting in release outside Company property with potentially larger environmental damages that can be cleaned up within two weeks; potential regulatory enforcement actions; potential local outcry. Example: 1000 to 10,000 gallon spill					
	2	Event resulting in 1 or more serious permanent injuries	Event resulting in release outside Company property with potentially significant cleanup implications (either time or expense); potential small environmental consequences; potential regulatory enforcement actions; and/or potential public outcry. Example: 100 to 1000 gallon oil spill; wetland damage, etc.					
	1	Event resulting in 1 or more LTIs or less severe injury	Event resulting in minor release either on or off Company property with short term environmental consequences but is large enough to be reported to Company management. Example: <100 gallon oil spill or minor air capacity issue					
The Intersection of the Severity and Likelihood selections represent the qualitative risk of the particular hazard scenario identified by the PHA team. Each of the boxes in the above 5X5 grid is a graphic measure of the risk. The safety or environmental risks identified in the PHA will show the risk indicated by the boxes above with the words "safety" or "env" in the PHA.								
Safety or Environmental Risk is at or below Broadly Acceptable region and significant corrective action or investigation is not required, though this must be monitored to ensure the conditions do not change.								
MEDIUM RISK Corrective action should be initiated to further reduce the risk score. In addition, for Safety severity at 3 or greater risks and Environmental severity at 4 or greater risks, LOPA shall be performed to better quantify the risk. Depending on LOPA results, a QRA may be necessary.								
HIGH RISK This may represent an intolerable risk to the asset or process. Action must be taken to reduce the risk to a more tolerable level. LOPA shall be performed to better quantify the risk and based on results, a QRA may be necessary.								
Note: For some PHAs such as construction and non routine operations based ones, it may not be feasible to perform LOPAs since controls are all human based and not based on instrumentation and automatic controls. In those cases, LOPAs are not required								