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February 27, 2015

To: Diane Carlton, NYSDEC, Region 7 (1 PDF)
Holly Sammon, Onondaga County Public Library (1 bound)
Samuel Sage, Atlantic States Legal Foundation (1 bound)
Joseph J. Heath, Esq., Onondaga Nation (cover letter only)

Re: Letter of Transmittal – Upper Harbor Brook IRM Repository Addition

The documents below have been approved by the New York State Department of Environmental Conservation (NYSDEC) and are enclosed for your document holdings:

- Wastebed B/Upper Harbor Brook IRM – Performance Verification and Monitoring Plan dated February 2015

Sincerely,

John P. McAuliffe by CCC

John P. McAuliffe, P.E.
Program Director, Syracuse

Enc.

cc: Tracy Smith – NYSDEC
Chris Fitch - Communications

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau D, 12th Floor
625 Broadway, Albany, New York 12233-7013
Phone: (518) 402-9676 • **Fax:** (518) 402-9020
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Joe Martens
Commissioner

February 13, 2015

Mr. John P. McAuliffe, P.E.
Honeywell International, Inc.
301 Plainfield Road
Suite 330
Syracuse, NY 13212

Re: Wastebed B/Upper Harbor Brook IRM
Performance Verification and Monitoring Plan

Dear Mr. McAuliffe:

The New York State Department of Environmental Conservation (NYSDEC) has completed its review of the "Wastebed B/Upper Harbor Brook IRM Performance Verification and Monitoring Plan" (PV&M Plan) dated February 2015. Based on our review, the PV&M Plan is approved. If you have any questions, please contact me at 518-402-9796.

Sincerely,

Tracy A. Smith

Tracy A. Smith
Project Manager

ecc:	J. Gregg, NYSDEC	R. Nunes, USEPA	M. Sergott, NYSDOH
	H. Kuhl	J. Shenandoah	J. Heath, Esq.
	T. Joyal, Esq.	A. Lowry	H. Warner, NYSDEC
	C. Waterman	D. Hesler, NYSDEC	M. Savage, Honeywell
	C. Calkins, OBG	R. Quail, NYSDEC	M. Dent OBG

Honeywell

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February 10, 2015

Mr. Tracy A. Smith
Project Manager
NYSDEC – Div of Environmental Remediation
Remedial Bureau D, 12th Floor
625 Broadway
Albany, NY 12233-7013

Re: Honeywell Upper Harbor Brook IRM - Performance Verification and Monitoring Plan Town of Geddes, Onondaga County, New York Order on Consent: Index #D-7-008-01-09

Dear Mr. Smith:

Attached please find responses to the Department's August 21, 2014 comment letter regarding the Upper Harbor Brook IRM Performance Verification and Monitoring Plan (PV&M Plan) dated April 2014, along with the revised PV&M Plan which was prepared by O'Brien & Gere on behalf of Honeywell.

These responses have been incorporated in the revised Performance Verification and Monitoring Plan.

Please contact Marc Dent at O'Brien & Gere (315-956-6258; marc.dent@obg.com) or me if you have any questions.

Sincerely yours,

John P. McAuliffe

John P. McAuliffe, P.E.
Program Director, Syracuse

(1 copy, 1 CD)

cc:	Mark Sergott	NYSDOH (1 CD)
	Harry Warner	NYSDEC (1 copy, 1 CD)
	Robert Nunes	USEPA (1 copy, 2 CDs)
	Margaret A. Sheen, Esq.	NYSDEC, Region 7 (ltr only)
	Argie Cirillo, Esq.	USEPA (ltr only)
	David Coburn	O.C. Office of the Environment (1 copy, 1 CD)
	Brian D. Israel, Esq.	Arnold & Porter (ec or CD)
	Joseph Heath, Esq.	(ec ltr only)
	Thane Joyal, Esq.	(1 CD)
	Jeanne Shenandoah	Onondaga Nation (1 copy and ec ltr only)
	Curtis Waterman	HETF (ec or CD)

Alma Lowry	(ec ltr only)
Michael Spera	AECOM (1 CD)
William Hague	Honeywell (ec or CD)
Michael Savage	Honeywell (ec or CD)
Christopher Calkins	O'Brien & Gere (ec or ec ltr only)
Marc J. Dent	O'Brien & Gere (ec or ec ltr only)

UPPER HARBOR BROOK IRM PERFORMANCE VERIFICATION AND MONITORING PLAN RESPONSE TO COMMENTS

Listed below are responses to the Department's August 21, 2014 comment letter regarding the Upper Harbor Brook IRM Performance Verification and Monitoring Plan (PV&M Plan). For ease of review, the Department's comments are provided below, followed by our responses. The response includes an explanation of how details have been incorporated into the revised or corresponding attachments, as applicable.

Comment 1: *Page 1, Bullet 6, Section 1.2. The first sentence of this bullet should be revised to state "Installation of two groundwater collection trenches .... "*

Response 1: Bullet 6 has been revised to state that "Installation of three groundwater collection trenches …" This includes Harbor Brook 1 and 2 and the I-690 Drainage Ditch collection trenches. This is consistent with the Upper Harbor Brook Construction Completion Report (CCR).

Comment 2: *Page 7, Bullet 6, Section 5.1. The Hiawatha USGS gauge is not appropriate to use for surface water elevations in open water areas adjacent to the collection systems. Surface water elevation data (collected from staff gauges installed in the adjacent open water areas, the Onondaga Lake USGS gauge, or by some other means approved by the NYSDEC) should be used for comparing to groundwater elevation data measured in the collection trench.*

Response 2: The USGS gauge station for Onondaga Lake at Liverpool, New York will be used to obtain surface water elevation data. Section 5.1 has been revised.

Comment 3: *Page 7, Paragraph 1, Section 5. The third sentence of this paragraph needs to be revised to state" ... systems in place, short term shutdown of the .... "*

Response 3: Section 5 has been revised.

Comment 4: *Page 7, Bullet 7 Section 5.1. To aid in determining the effectiveness of the groundwater collection systems, additional groundwater elevation readings should be collected from data loggers installed within the NAPL collection pipes.*

Response 4: Groundwater elevations in the passive NAPL collection systems will be monitored manually from the three observation ports and recorded. Section 5.4 has been revised.

Comment 5: *Page 8, Section 5.2. Additional sediment and surface water samples should be collected in Harbor Brook in OW-1, OW-3, and OW-4.*

Response 5: Additional sediment and surface water samples will be collected in Harbor Brook at OW-1, OW-3, and OW-4. Section 5.2 and Figure 5 have been revised.

Comment 6: *Page 9, Section 5.2.2. The first paragraph should be revised to reflect that sediment samples will also be collected from the tributaries to Harbor Brook, as well as from Harbor Brook.*

Response 6: Section 5.2.2 has been revised.

Comment 7: *Page 9, Paragraph 2, Section 5.2.2. In the last sentence "within the same OW area" should be removed.*

Response 7: Section 5.2.2 has been revised.

Comment 8: *Page 13, Section 5.4. How will the NAPL collection systems be inspected? The inspection should include determining if NAPL is present. If present, NAPLs will need to be collected and disposed.*

Response 8: If NAPL is observed during the groundwater elevation monitoring in the NAPL collection systems, it will be noted. Honeywell will also evaluate options and develop recommendations for the collection and disposal of NAPL. A summary report will be developed and submitted to NYSDEC for review and approval. Section 5.4 has been revised.

Comment 9: *Table 1. For surface water, the cyanide row should be filled in (or removed if cyanide is not collected in surface water).*

Response 9: The number of samples has been added to Table 1 for cyanide.

PLAN

Wastebed B/ Upper Harbor Brook IRM Performance Verification and Monitoring Plan

Honeywell

February 2015

O'BRIEN & GERE

1163 | 49142

Wastebed B/Upper Harbor Brook IRM Performance Verification and Monitoring Plan

Prepared for:

Honeywell

BRIAN E. WHITE, P.E.
O'BRIEN & GERE OF NORTH AMERICA

CERTIFICATIONS

I, **Brian E. White**, am currently a registered professional engineer licensed by the State of New York. I certify that this Performance Verification and Monitoring Plan was prepared in general accordance with applicable statutes and regulations and in substantial conformance with the New York State Department of Environmental Conservation's Division of Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).

072730	February 10, 2015	
NYS Professional Engineer #	Date	Signature

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LIST OF ACRONYMS

Acronym	Definition
AOS	Area of Study
DBH	Diameter at Breast Height
DER	Division of Environmental Remediation
DSA	Dredge Spoils Area
ERP	Emergency Response Plan
FRP	Fiberglass Reinforced Plastic
GPS	Global Positioning System
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations
IRM	Interim Remedial Measure
JSA	Job Safety Analysis
NAPL	Non-Aqueous Phase Liquid
LLDPE	Linear Low-Density Polyethylene
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
O&M	Operations & Maintenance
OSHA	Occupational Safety and Health Administration
OW	Open Water
PCB	Polychlorinated Biphenyl
QAPP	Quality Assurance Project Plan
RACI	Responsible Accountable Consulted Informed
ROD	Record of Decision
SOP	Standard Operating Procedure
SPDES	State Pollution Discharge Elimination System
SVOC	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TCL	Target Compound List
TKN	Total Kjeldahl Nitrogen
TSS	Total Suspended Solids
USACE	United States Army Corps of Engineers
UEF	Upper East Flume
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Survey
VOC	Volatile Organic Compounds

1. INTRODUCTION

This Performance Verification and Monitoring (PV&M) Plan (the Plan) presents the approach for verification of the groundwater collection system, as well as monitoring of restoration areas and media sampling activities that will be employed to evaluate the effectiveness of the Upper Harbor Brook portion of the Wastebed B/Harbor Brook Interim Remedial Measure at the Wastebed B/Harbor Brook Site (the Site). For the purposes of this document, the Upper Harbor Brook activities will be referred to as "the IRM". This plan has been prepared as set forth in the Order on Consent (Index #D-7-008-01-09) between the New York State Department of Environmental Conservation (NYSDEC) and Honeywell International, Inc., dated December 18, 2003 (NYSDEC 2003).

This Plan has been prepared by O'Brien & Gere on behalf of Honeywell International and in accordance with the requirements of the DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC 2010).

This document is organized into eight sections, with accompanying tables, figures, and appendices. The appendices contain relevant forms necessary for documenting inspections. In addition to this Plan, a detailed Operations & Maintenance (O&M) Plan for the mechanical equipment will be developed to incorporate the IRM systems.

Because of the similarities in Standard Operating Procedures (SOPs) between lakeshore area related projects (Lakeshore Hydraulic Containment System, Willis Ave Groundwater Treatment Facility, Wastebeds 1-8), these SOPs are being combined into a single, comprehensive document. The SOP document will be maintained by the Operations and Maintenance Contractor so that it can be referenced by anyone working at the Site.

1.1 PURPOSE

The purpose of the Plan is to describe the activities and procedures that will be followed during the initial and long term verification phases of the IRM's performance. Additionally, the Plan provides guidance for media sampling and restoration monitoring.

1.2 SITE LOCATION, DESCRIPTION, AND HISTORY

Harbor Brook originates southwest of Syracuse, New York, in the Town of Onondaga and flows through the western side of Syracuse prior to discharging to the southwest corner of Onondaga Lake. Harbor Brook drains a watershed of approximately 13.2 square miles (Blasland & Bouck, 1989). According to United States Geological Survey (USGS) data, the 10-year and 20-year average flow rate is approximately 11.5 cubic feet per second. The NYSDEC classifies Harbor Brook as a Class C stream, designating it as a water body that supports fisheries and is suitable for non-contact activities. Refer to **Figure 1**.

The Site is located on the border of the City of Syracuse and the Town of Geddes, and is proximate to Onondaga Lake's southwest shoreline as shown in **Figure 1.** The IRM project includes the following areas (refer to **Figure 2**):

- Harbor Brook from Culvert-1 upstream to Open Water (OW)-5
- I-690, Penn-Can, and Wastebed D/E Drainage Ditches
- Railroad Ditches-1 and -2
- Six wetland areas
- Sections of the I-690 storm sewer system

The IRM project includes:

- Installation of three groundwater collection trenches with slotted piping, two pump stations, and force mains adjacent to Harbor Brook for hydraulic control of impacted groundwater discharging to Harbor Brook. Discharge from the pump stations enters the East Wall force main at valve vault 6A (VV-6A) and is treated at the Willis Avenue Groundwater Treatment Plant (GWTP)

- Excavation of sediments, installation of a geomembrane liner or concrete, and restoration of the substrate in OW areas -1, -2, -3, and -4 in Harbor Brook
- Cleaning and sealing of Culverts-2, -3 (east and west), -4, and -5 in Harbor Brook and two culverts in Railroad Ditches-1 and -2, as required
- Excavation of sediments from the I-690 Drainage Ditch, Penn-Can Drainage Ditch, Wastebed D/E Drainage Ditch, Railroad Ditches-1 and -2, and restoration of the ditch substrate
- Installation of a geomembrane liner and groundwater collection trench beneath the I-690 Drainage Ditch
- Installation of 150 feet of geomembrane liner under the downstream section of the Wastebed D/E drainage ditch (starting at OW-3)
- Excavation of sediment and restoration of substrate in wetland areas WRR1, WRR2, WRR3, WRR4, WRR5, and WL6 to provide storm water detention, improved water quality, and improved habitat. As approved by NYSDEC, areas WPC1, WPC2, and WPC3 were not restored as wetlands but the excavation of sediment and the restoration of substrate were conducted. To provide compensatory acreage, wetlands WRR1, WRR2, WRR3, and WRR4 were expanded
- Cleaning and televising of sections of the I-690 storm sewer conveyance system that discharge to the I-690 Drainage Ditch
- Installation of a passive non-aqueous phase liquid (NAPL) collection system in OW-1, -3, and -4

A map showing the location of the groundwater collection systems and pump stations is included on **Figure 3**. Details of the groundwater collection systems and pump stations are presented in the Record Drawings in **Appendix A**.

This project is located within several properties with multiple owners. A list of the owners is provided below, a property map is included as **Figure 4** and a list of contacts is provided in Section 7.

- Honeywell International Inc.
- CSX Transportation
- New York, Susquehanna & Western Railway
- City of Syracuse
- New York State Department of Transportation
- Onondaga County Industrial Development Agency
- Onondaga County
- Duke Malavenda Realty LLC
- Hiawatha Associates LLC (Romano)
- Powder Mill Corporation (Lamar Advertising)

2. HEALTH AND SAFETY

Personnel working on-site shall follow the Honeywell Syracuse Portfolio Health and Safety Program (Honeywell 2007). The program specific Health and Safety Plan shall be updated on an annual basis, as may be required. Job Safety Analyses (JSA) forms which outline safety and health requirements, and guidelines developed for specific tasks shall be created and maintained on-site and updated, as required. Tasks outside of previous field efforts shall have a new JSA completed prior to beginning the task.

If a subcontractor is performing activities that require specialized training (*e.g.*, confined space entry, arc flash, excavation or trenching, scaffold use, hazardous waste operations and emergency response, etc.), copies of training certificates shall be provided to site personnel for applicable employees and the supervisors.

Communications

Inquiries from the general public (*e.g.*, media, workers from adjacent properties, etc.) about the project shall be directed to Craig Milburn at Honeywell [(315) 552-9784].

Spill Prevention Program

Spill prevention and reporting programs shall be in compliance with applicable state, federal, and local regulations.

3. FORMS AND REPORTING

PV&M data, inspections, and observations encountered during performance verification of the Integrated IRM elements, will be documented. The records (which can be in electronic form) shall be kept orderly and in a file form (topic, chronological, alphabetical). The recommended forms to document the PV&M program are provided in **Appendix B**.

3.1 MONITORING AND INSPECTION FORMS

The following forms may be used to document inspections and observations noted during collection of data related to PV&M, including:

- Performance Verification Inspection Form
- Field Inspection Data Form
- Wetland Inspection Data Form
- Erosion and Sedimentation Inspection Form

3.2 ANNUAL REPORTS

An annual report summarizing the previous calendar year of PV&M activities at the Site shall be prepared and submitted to NYSDEC. This information shall be coupled with the annual report for O&M activities and submitted as a single annual report. The O&M Plan is provided under separate cover.

The PV&M portion of the annual report shall include the following:

- Description of the PV&M activities performed
- Copies of field forms completed (*e.g.*, verification forms, monitoring and inspection forms, photo documentation)
- Summary of observations, conclusions, recommendations, and corrective actions, as necessary

During PV&M activities, observations that may warrant corrective action shall be communicated with NYSDEC, prior to submission of the annual report.

4. ENGINEERING CONTROLS

This section provides an overview of the Engineering Controls components of the IRM that are included in the PV&M activities. The PV&M activities include the evaluation of groundwater level data collected from the collection systems, and inspection of the open water areas of Harbor Brook, the ditches, the passive NAPL collection system, the vegetative cover areas, and the mitigated wetlands. Refer to the Record Drawings in **Appendix A**.

O&M of the groundwater collection system, pump stations, and groundwater conveyance system are not directly related to the PV&M activities, and are described in the O&M Plan provided under separate cover.

4.1 GROUNDWATER COLLECTION SYSTEM

The groundwater collection system minimizes the potential for discharge of groundwater to Upper Harbor Brook by lowering the groundwater level. The groundwater collection system consists of three separate collection trenches:

- Harbor Brook-1 collection trench (south side of I-690)
- Harbor Brook-2 collection trench (north side of I-690)
- I-690 Drainage Ditch collection trench

The groundwater collection systems comprise a 4-inch slotted FRP collection pipe buried in sand trenches. Excavations were made approximately 4 to 5-feet wide to accommodate installation of the collection pipe and sand. Plan and profile views of the ground water collection trenches are shown on Sheet G-25 (Harbor Brook-1), Sheet G-26 (Harbor Brook-2), and Sheets G-5 through G-8 (I-690 Drainage Ditch) of the Record Drawings.

Cleanouts and observation ports (OPs) were installed to provide access points to the groundwater collection system for cleaning, maintenance, and groundwater level monitoring purposes. OPs were constructed from 24-inch solid wall FRP pipe with covers and extend approximately 2 feet above grade. OPs were installed on both ends of the Harbor Brook-1 and Harbor Brook-2 collection trenches (OP-1, -2, -3, and -4). OPs were not installed on the I-690 Drainage Ditch because the collection pipe was installed under the centerline of the ditch, but cleanouts have been provided on that reach. Automatic data loggers will be installed in 2015 in the four OPs on the Harbor Brook -1 and -2 collection systems and three cleanouts (CO-1, 3, and 5) on the I-690 Drainage Ditch.

4.2 OPEN WATER AREAS AND DITCHES

Four open water areas of Harbor Brook (OW-1, -2, -3, and -4) were excavated, isolation layers were installed, and substrate material was placed in the channel and on the side slopes of the banks. The isolation layers consisted of geomembrane liner systems, concrete liner systems, and clay backfill which were installed to minimize the potential for impacted groundwater to discharge into Harbor Brook, and subsequently Onondaga Lake. Four ditches (Railroad Ditch-1 and-2, Wastebed D/E Ditch, and the Penn Can Ditch) were excavated and substrate material was installed in the channel and on the side slopes of the banks. The I-690 Ditch was also excavated, an isolation layer was installed, and substrate material was placed in the channel and on the side slopes of the banks.

4.3 PASSIVE NAPL COLLECTION SYSTEM

Passive NAPL collection systems were installed in OW-1, OW-3, and OW-4. The passive NAPL collection systems consist of a 4-inch slotted FRP pipe surrounded by ¾-inch to 1½ -inch rounded washed stone and Mirafi 600X filter fabric, as shown on Sheet G-44 of the Record Drawings in **Appendix A**. The 4-inch slotted pipe installed in OW-1, OW-3, and OW-4 transitions to a 4-inch solid wall FRP pipe on the western edge of the OWs and is surrounded by a 2-foot wide clay plug. The solid wall FRP pipe ties into a vertical 8-inch solid wall FRP pipe with cover which extends approximately 2 feet above grade to serve as an access point.

4.4 WETLAND RESTORATION AND VEGETATIVE COVER AREAS

As part of the IRM, select wetlands were excavated and restored at various locations within the Site so there was no net loss of wetland area. The wetland areas are shown on Sheet G-3 of the Record Drawings and **Figure 2**.

Wetlands WRR1, WRR2, WRR3, WRR4, WRR5, and WL6 were excavated to a depth of approximately 2 feet. Following excavation and backfilling with approximately 12 inches of Type L select fill (clay), a habitat layer was installed to bring the elevation to final grade. The habitat layer consisted of approximately 12 inches of topsoil that was seeded.

The former WPC1, WPC2, and WPC3 areas were considered to be lower quality wetland areas and were not included in the mitigated wetlands that will be part of the PV&M activities. The original design intent was to restore a combined total of 0.447 acres of wetland in the former WPC1, WPC2, and WPC3 areas. The acreage loss at the former WPC1, WPC2, and WPC3 areas was compensated for by the addition of acreage in WRR-1 through WRR-4.

The approximate area of each wetland before and after restoration is as follows:

Table 4-4. Wetland Restoration

Wetland	Original Area	Actual Restored Area
WRR1	0.046 acres	± 0.07 acres
WRR2	0.211 acres	± 0.47 acres
WRR3	1.214 acres	± 1.48 acres
WRR4	0.19 acres	± 0.22 acres
WRR5	0.038 acres	± 0.03 acres
WL6	0.352 acres	± 0.27 acres
Former Penn-Can Areas	0.447 acres	0 acres
Total Area	**2.498 acres**	**± 2.54 acres**

The total area of wetland restoration at the Site totaled approximately 2.54 acres, approximately 0.042 acres larger than originally proposed. In sum, this wetland work resulted in significant ecological enhancement as these wetlands were dominated by invasive species, such as common reed (*Phragmites australis*), which were removed during wetland excavation. Approximately 60 native plant species, including some that are locally significant (*e.g.*, saltmeadow rush (*Juncus gerardii*), seaside goldenrod (*Solidago sempervirens*) and prairie cordgrass (*Spartina pectinata*), were introduced to the restored wetlands. Initial observations suggest successful establishment of wetland vegetation across the restored wetlands, with most herbaceous plugs and potted woody plants surviving and putting on substantial growth. Initial growth from the seed mix also appeared to be vigorous with Virginia wild rye (*Elymus virginicus*) and beggar ticks (*Bidens frondosa*) providing significant cover throughout the wetlands.

Surfaces and other features that were disturbed or damaged during performance of the work were generally restored with seed or where required, topsoil and seeding were placed to minimize the potential for erosion of the restored area.

5. PERFORMANCE VERIFICATION AND MONITORING

PV&M includes the following main activities:

- Groundwater collection system performance verification
- Surface water and sediment monitoring
- Wetland restoration verification and monitoring
- Passive NAPL collection system monitoring
- General site inspection

A geomembrane liner or concrete liner was installed in the four OW areas of Harbor Brook and cracks and holes were sealed in the culverts to create an isolation barrier that minimizes the potential for impacted groundwater to discharge into Harbor Brook, and subsequently Onondaga Lake. The groundwater collection systems provide an additional means of minimizing the potential for impacted groundwater to discharge to Harbor Brook by creating preferential groundwater flow away from the brook and to the collection trench. With the liners and the groundwater collection systems in-place, short term shutdown of the groundwater collection system/pump station for periodic maintenance is not expected to jeopardize the objectives of the IRM.

5.1 GROUNDWATER COLLECTION SYSTEM PERFORMANCE VERIFICATION

The performance verification for the groundwater collection systems is based on the measured groundwater elevations. The groundwater elevations will be evaluated to demonstrate hydraulic control of the groundwater proximate to the geomembrane liner in the OW areas. Performance verification criterion and monitoring activities for the collection systems are as follows:

- The performance verification criterion for the Harbor Brook – 1 and – 2 groundwater collection trenches is that groundwater elevations in the collection trenches are maintained below the surface water elevation in Onondaga Lake. The surface water elevations in Onondaga Lake will be obtained from a gage, operated by the U.S. Geologic Survey (USGS), on Onondaga Lake at Liverpool, New York (04240495).
- Groundwater elevations in the collection trenches will be monitored manually approximately every 2 weeks using a hand held water level probe, until automatic data loggers are installed in 2015, at the four OPs (OP-1, 2, 3, and 4) in the Harbor Brook -1 and -2 collection trenches and the three cleanouts (CO-1, 3, and 5) in the I-690 Drainage Ditch collection trench. Refer to **Figures 2** and **3**. The groundwater elevation data collected from the Harbor Brook -1 and -2 collection trenches will be recorded and used to evaluate the system performance against the performance verification criterion and to evaluate when the slotted collection pipes in the trenches require cleaning. The groundwater elevation data from the I-690 Drainage Ditch collection trench will also be recorded and used to evaluate when the slotted collection pipes in the trench requires cleaning.
- Once the automatic data loggers are installed, groundwater elevation data will be manually downloaded every 2 weeks from the data loggers for the first year of operation. Subsequent to the first year of operation, a change to monthly data downloading will be evaluated and recommendations provided to NYSDEC.
- The operational goal will be to maintain groundwater elevations in the Harbor Brook – 1 and -2 collection trenches at approximately the top of the substrate in OW-3 (361.6) for Harbor Brook – 1 collection trench and in OW-1 (360.9) for Harbor Brook – 2 collection trenches. Refer to **Table 5-1** for substrate, liner, and collection system elevations.
- Pump station wet well elevations in Pump Station-1 and -2 will also be recorded (from the SCADA system at Willis Avenue Water Treatment Plant) and evaluated.
- During seasonal high groundwater elevation events the set points in the wet wells may be increased, if appropriate, but the groundwater elevations in the collection trenches will be maintained below Onondaga Lake surface water elevations.

Table 5-1 Depth of Groundwater Collection System, Substrate, and Liner in Open Water Areas

Open Water Area	Open Water Channel Invert Elev.	Depth of Substrate Material (ft) Over Liner	Liner Elevation	GW Collection Pipe Invert Elev.	Depth of GW Collection Pipe Below Liner (ft)
OW-1	360.9	4	356.9	356.3 – 355.4 (OP-4 TO PS-2)	0.6 – 1.5
OW-2	361.6	N/A	Concrete	356.9 – 355.4 (OP-3 TO PS-2)	N/A
OW-3	361.6	3	358.6	356.1 – 356.6 (OP-2 TO PS-1)	2.5 – 2.0
OW-4	361.9	3	358.9	357.4 – 356.6 (OP-1 TO PS-1)	1.5 – 2.3

Source: O'Brien & Gere

Notes:
1. Elevations are based on as-built surveys (12/11/13) provided by Thew Associates Land Surveyors
2. Depth of substrate material is based on the average depths of material placed in the open water areas over the liner.

5.2 SURFACE WATER AND SEDIMENT MONITORING

Surface water and sediment monitoring will be conducted on an annual basis as described below. Monitoring will be performed for 5 years following completion of the IRM construction. Results of the monitoring will be used to evaluate the effectiveness of the groundwater collection trench and the geomembrane liner, and will be included in the annual report. In the case that monitoring results suggest deficiencies, a corrective measures plan that addresses the deficiencies will be submitted to NYSDEC for approval prior to submittal of the annual report. After 5 years, the need for continued monitoring will be evaluated and recommendations provided to NYSDEC.

5.2.1 Surface Water Monitoring

Surface water samples will be collected annually (immediately prior to collecting sediment samples) to evaluate the potential impacts of Site groundwater (*e.g.*, liner compromised), surface water run-off from the Site, storm sewer inputs to Harbor Brook, or potential upgradient sources. Surface water will be sampled from the following nine locations in and adjacent to Harbor Brook (**Figure 5**):

- Harbor Brook channel at Hiawatha Boulevard (upstream sample indicative of background)
- Railroad Ditch #1 prior to entering Harbor Brook channel
- Railroad Ditch #2 prior to entering Harbor Brook channel
- Wastebed D/E Drainage Ditch prior to entering Harbor Brook channel
- Penn-Can Drainage Ditch prior to entering Harbor Brook channel
- I-690 Drainage Ditch prior to entering Harbor Brook channel
- OW-1, OW-3, and OW-4

Surface water samples will be collected by immersing a glass container in the specified body of water. The container will then be used to fill the laboratory containers. Prior to preservation of the surface water samples, the temperature, pH, turbidity, conductivity, and dissolved oxygen will be measured in the field. The sample containers will be placed in a cooler containing ice and submitted with an appropriate chain of custody to a New York State (NYS)-certified laboratory for the analyses discussed below. Surface water samples will be collected in accordance with the NYSDEC-approved QAPP (O'Brien & Gere 2011).

The surface water samples will be analyzed by United States Environmental Protection Agency (USEPA) SW846 methods. The samples will be analyzed for target compound list (TCL)/target analyte list (TAL) parameters including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, mercury, and cyanide. A sample summary matrix including analytical methods is provided as **Table 1**.

5.2.2 Sediment Monitoring

Sediment samples will be collected annually (after collecting surface water samples) to evaluate the potential impacts of Site groundwater (e.g., liner compromised), surface water run-off from the Site, storm sewer inputs to Harbor Brook, or potential upgradient sources. A total of nine composite sediment samples will be collected at the same general locations as the surface water samples discussed above and shown on **Figure 5**. The exact sampling locations will be selected based on field conditions observed at the time of sampling.

Sediment samples will be collected from the 0-6 inch interval using Lexan® tubing, bucket auger, or similar sampling device and transferred to dedicated aluminum pans for homogenization. Prior to homogenization, sediment will be transferred to the appropriate laboratory containers for VOC and SVOC analyses. If sediment is not present at the sample location, the location will be adjusted to an area, where sediment is present.

Subsequent to homogenization, sediment will be transferred to the appropriate laboratory containers for analyses and placed in a cooler containing ice. These samples will be submitted with an appropriate chain of custody to a NYS-certified laboratory for the analyses discussed below. Sediment samples will be collected in accordance with the NYSDEC approved QAPP (O'Brien & Gere 2011). The sediment samples will be analyzed by USEPA SW846 methods for USEPA TCL/TAL parameters including VOCs, SVOCs, metals, mercury, and cyanide. A sample summary matrix including analytical methods is provided as **Table 1**.

5.3 WETLAND RESTORATION VERIFICATION AND MONITORING

This PV&M Plan presents the ecological maintenance and monitoring activities that will commence immediately after planting is completed (*i.e.*, the year of planting/seeding or in the following spring if planting is completed in the fall) and continue for four subsequent years (totaling a five-year maintenance and monitoring period). The primary goals of the restoration monitoring and verification activities are to:

- Describe activities performed to monitor the restoration and stabilization areas and document observed field conditions that enable direct comparison with performance standards specified herein
- Identify verification activities and potential adaptive measures that will be employed throughout the monitoring period to achieve project success

5.3.1 Restoration and Stabilization

Two general types of activities, described below, occurred after the construction of the IRM:

- Restoration
- Stabilization

Restoration

Site wetlands, ditches, and Harbor Brook banks were targeted for restoration. The general goal of restoration is to recreate the following community types where appropriate, as shown on Sheet G-40 of the Record Drawings. Refer to **Appendix A**.

- Wet meadow (freshwater and salt tolerant variants)
- Shrub swamp
- Red maple-hardwood swamp
- Floodplain forest
- Successional shrubland

Stabilization

Adjacent areas that are impacted by the IRM construction process (*e.g.*, by clearing and grubbing) will be seeded with native species that are consistent with successional old field habitat (shown on Sheet G-40 in **Appendix A**). A goal of 80% vegetative cover has been specified for stabilization areas in accordance with the NYSDEC State Pollutant Discharge Elimination System (SPDES) general permit for storm water discharges from construction activities (GP-0-10-001).

5.3.2 Monitoring Stages

Monitoring will occur in two stages with the objective of evaluating the success of establishing a viable ecological community that complements the local ecosystem. Success criteria are consistent with those presented for mitigation wetlands designed and constructed at other Onondaga Lake sites. The monitoring stages are defined in the following sections.

5.3.2.1 Stage 1 Restoration Monitoring

Project components will be evaluated during the year of planting (or in the subsequent spring if planting occurs in the fall) and include completion and evaluation of the items described in this section.

Plant Type, Installation, and Survivorship

Because the Restoration Plan calls for the installation of over 10,000 plants, spot checks of species type and quality of installation practices will be performed within each vegetation zone immediately after plant installation. The limits of each vegetation zone are depicted on Sheet G-40 in **Appendix A**.

Following installation, the Site will be surveyed, to the extent practicable, for deceased plants. Plants will be evaluated by stock type (*i.e.,* woody versus herbaceous plants), and species to the extent possible. Qualitative notes will be collected regarding the physical and ecological condition of restored and stabilized areas.

The criterion for survivorship of installed plants is 80%. Adaptive measures such as replacement of deceased plants will be conducted, as necessary, if the survivorship criterion of 80% is not met. Sufficient numbers of individual plants will be replanted to achieve survivorship criteria. As described in Section 5.3.4, below, vegetation establishment and development will be monitored via cover estimates in subsequent years.

5.3.2.2 Stage 2 Restoration Monitoring

Monitoring of the project area will occur over a five-year period (including the year of plant installation). Field monitoring activities will be performed during the growing season (*i.e.*, mid-April through mid October). Annual reports (see Sections 3 and 5.3.6) regarding the status of the restored and stabilized areas will be prepared for each year of the monitoring program.

Characteristics to be monitored as part of Stage 2 efforts include:

- Vegetation type and cover
- Invasive species
- Hydrology
- Wildlife usage
- Wetland boundaries.

These characteristics are further described below.

Vegetation Type and Cover

Permanent vegetative survey plots will be established by zone within representative sections of the restored areas, and recorded with a GPS unit. Approximate plot locations are presented on **Figure 5**. Up to six plots will be established in areas representative of each wetland vegetative community. The number and location of plots has been established proportionate to the acreage of each community—with a minimum of one plot per community. Graduated plots consisting of 5-ft, 15-ft, and 30-ft radius zones will be used along with a three-stratum sampling design as outlined below:

- *Tree Stratum*- woody plants, excluding vines, approximately 3-inch or more in diameter at breast height (DBH). *Woody vines* – all woody vines greater than 1 meter in height are included in this stratum.
- *Sapling-shrub stratum* – woody plants, excluding vines, less than 3-inch DBH and greater than or equal to 1-meter tall.
- *Herb stratum* – herbaceous plants and all other plants less than 1 meter in height.

Percent cover of herbaceous vegetation will be estimated within the 5-ft zone, saplings and shrubs within the 15-ft zone, and trees and vines within the 30-ft zone. The vegetation plots will be monitored annually during the growing season.

The criterion for percent cover of hydrophytic vegetative species is a minimum of 85% for restored areas. Vegetation cover in adjacent (stabilization) areas will be estimated visually; however, sampling methods such as plot surveys will not be conducted. A qualitative visual assessment of the stabilization areas will be performed to evaluate if the 80% coverage has been attained.

Invasive Species

The criterion for percent relative cover of invasive species is a maximum of 5% for restored areas by year 5 of monitoring. Following completion of planting, restoration areas will be visually surveyed monthly during the growing season for the presence of invasive species. Survey frequency may vary over the five-year monitoring period commensurate with the extent of invasive species colonization.

Invasive species include, but may not be limited to: purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinacea*), common reed (*Phragmites australis*), buckthorn (*Rhamnus cathartica)*, and garlic mustard (*Alliaria petiolata)*. Should populations of invasive species be found, corrective measures may be taken, as described in Section 5.3.5.

Hydrology

Water depths will be measured annually during the growing season to evaluate whether sufficient hydrology is present to sustain the proposed ecological communities. Depths will be recorded consistently from the center of each vegetative plot location. Shallow soil borings will be manually installed to, but not through, the underlying clay layer in wetland areas, as needed. These borings may be used to document indicators of hydrology. In accordance with wetland boundary delineation methodology, hydrology may be indicated by inundation or the presence of the water table at less than or equal to a depth of 12 inches from the soil surface.

Wildlife

Evidence of fish and wildlife, including living and extant individuals, tracks, nests, hair/fur, herbivory, scat, and direct observation, will be recorded to the species level to the extent practicable. Observations will be made while on-site for vegetation and water level monitoring and recorded for inclusion in annual reports.

Wetland Boundaries

Restored wetland acreages will match or exceed the acreages identified in the Restoration Plan (and associated correspondence with NYSDEC) and will be evaluated by wetland boundary delineations performed following the third and fifth monitoring year efforts. Boundary surveys will be performed in accordance with United States Army Corps of Engineers (USACE) protocol (USACE 1987; 2012). Corrective measures, as discussed in Section 5.3.5, may be taken if wetland conditions are not developing as expected.

5.3.3 Maintenance and Adaptive Management Program

A maintenance and adaptive management program will be employed throughout the monitoring period to provide for the long-term sustainability of the restored areas and to address unforeseen changes in Site conditions or other components of the Restoration Plan. Program components include:

- Water Maintenance
- Invasive Species Control
- Adaptive Strategies

Adaptive management techniques will be identified and implemented as needed to correct potential concerns. The implementation of adaptive management techniques will be documented in annual reports.

5.3.3.1 Water Maintenance

Bypass pumping in wetlands

During the year of planting, bypass pumping may be employed, as needed, in wetlands in order to avoid plant mortality due to submergence or flooding stress. Vascular plants, including hydrophytes, can be stressed by flooding—particularly in the year of planting.

Irrigation

As stated in the Restoration Plan, the following protocol is to be followed in the year of seed (or plant) installation:

- Watering of herbaceous and woody species installed for stabilization or restoration may occur if sufficient precipitation is not received in any seven-day window from June through August. In wetlands, watering will not be performed if soils remain moist and plants are showing no signs of moisture stress.

  Water for irrigation activities may be obtained from the following sources in accordance with federal, state, and local regulations:

  - Off-Site potable water sources conveyed on-Site via water truck
  - Harbor Brook

5.3.3.2 Invasive Species Control

If invasive species are observed during the periodic surveys, the following actions will be taken to limit persistent invasive species problems:

- Location of the population will be recorded
- If the population is of manageable size (*e.g.*, less than approximately 500 stems or 0.1 acres) plants will be manually removed by pulling or clipping
- If the population is considered to be too large for manual control methods, wetland-approved herbicide (*e.g.*, Rodeo combined with non-ionic surfactant) will be used according to manufacturer's instructions
- Species, control method and date of control action will be recorded
- Control methods will be adapted over time given outcomes of control efforts, and other methods such as cutting and flooding, or introduction of biological control agents such as *Galerucella* beetles (for purple loosestrife) may be considered if initial efforts are not successful
- Control methods and results will be summarized in annual reports

The timing and methods for control measures will be specifically designed for each species observed.

5.3.3.3 Adaptive Strategies

In addition to the management strategies identified herein, the following measures will be considered and implemented as necessary to achieve the specified performance standards:

- Installation of alternate seed mixes or species if selected species fail to establish at desired densities
- Installation of additional security measures (*e.g.*, additional signage) if trespassing and/or vandalism to vegetation is observed during periodic monitoring
- Installation of prohibitive measures such as decoys or an overhead grid system if Canada geese activities prevent establishment of desired plant communities
- Use of preventative measures (*e.g.*, fencing) or the planting of alternate, less palatable species if deer browsing or rubbing is problematic

- Alteration of the irrigation schedule or quantities to achieve desired soil moisture (irrigation will only be performed in the year of planting)
- Addition of fertilizer or organic material if needed to promote vegetative growth
- Modification of rip-rap aprons to further facilitate water retention in wetlands

5.3.4 Vegetation Monitoring and Verification Reporting

Data collected during field monitoring activities will be presented and compared to the performance standards specified in Section 5.3.4. These data include plant survivorship and community composition in plots established in wetlands, and surface water level elevations. In the first annual report, stage one monitoring criteria and corrective actions (if any) will be reported. The third and fifth annual reports will include the results of wetland boundary delineations.

A narrative section will document evidence of fish and wildlife activities in restored areas. Proposed adaptive management measures and alternative practices will be presented as needed to address situations where the restoration areas have not reached performance standards. The report, figures, and appendices will be prepared as discussed in Section 3.

5.4 PASSIVE NAPL COLLECTION SYSTEM MONITORING

Three passive NAPL collection systems are located in OW-1, 3, and 4. Refer to **Figure 3**. Ground water elevations will be monitored manually approximately every 2 weeks from the OPs (NAPL 1, 3, and 4) using a hand held water level probe and the data will be recorded and evaluated. If NAPL is observed during the groundwater elevation monitoring it will be noted. If present, options regarding the collection and disposal of NAPL will be evaluated and a brief letter report will be submitted to NYSDEC for review and approval in 2015.

5.5 GENERAL SITE INSPECTION

The Harbor Brook channels will be inspected annually to compare observed conditions to design parameters. Features that will be evaluated include: erosion and deposition of the channel bed and banks, condition of outfalls and culverts entering Harbor Brook, and exposed areas of the geomembrane liner. Observations will be recorded on the field monitoring form included in **Appendix B.** A photograph log will also be prepared to document observations from the channel inspection. **Figure 5** shows the locations where photographs for documentation should be taken for consistency in comparison.

Observations from the annual channel inspection will be included in the annual report. Recommended corrective actions for observed deficiencies will also be provided. Measures to correct the causes of the deficiencies (*i.e.*, stormwater runoff, flow from outfalls or culverts to Harbor Brook) will be evaluated and discussed with NYSDEC prior to implementation.

6. PERMITS AND AGREEMENTS

Since this project is located within several properties with multiple owners, there are several permits and/or access agreements that are required to conduct monitoring and verification activities. The following is a brief summary of the permits and agreements that are required or that have already been obtained by Honeywell.

- The existing CSX Transportation and/or New York, Susquehanna & Western Railway Access Permits will be discussed with the railroads regarding future on-site activities. .
- Entry onto NYS Department of Transportation property requires a Highway Work Permit that shall be obtained on an annual basis.
- Entry onto CSX Transportation property shall be in compliance with CSX Agreement No. CSX 672278 between Honeywell and CSX, dated November 10, 2011.
- Entry onto Onondaga County property shall be in compliance with the Access Agreement dated June 16, 2011.
- Entry onto City of Syracuse property shall be in compliance with Special Ordinance No. 86, adopted by the Syracuse Common Council on February 27, 2012.
- Access to Hiawatha Associates' (Romano) property shall be in compliance with the Easement Agreement, dated October 16, 2012.
- Pump station 1 is located on property belonging to Hiawatha Associates (Romano) and also requires access through New York, Susquehanna & Western Railway property.
- Pump station 1 observation ports for the collection trench are located on NYS Department of Transportation property (north observation port) and Hiawatha Associates' (Romano) property (south observation port).
- Pump station 2 and the associated observation ports for the collection trench are located on Honeywell property.

The above-referenced Agreements and Ordinance are included in **Appendix C**. Permits shall be obtained by the Monitoring and Verification Contractor, as required.

7. CONTACTS

For additional information, the public is encouraged to contact any of the following project staff.

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Citizen Participation

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Syracuse, NY 13204
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Document Repositories for the Upper Harbor Brook Site Project Are As Follows:

Robert P. Kinchen Central Library, Onondaga County Public Library
The Galleries of Syracuse
447 South Salina Street
Syracuse, NY 13202
(315) 435-1900

Atlantic States Legal Foundation
658 West Onondaga Street
Syracuse, NY 13204
(315) 475-1170

NYSDEC
Tracy A. Smith
625 Broadway
Albany, NY 12233-7015
(518) 402-9767
(800) 342-9262

NYSDEC
Regional Hazardous Waste Engineer
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Syracuse, NY 13204
(315) 426-7400

Solvay Public Library
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Solvay, NY 13209
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CSX Transportation
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Property Services
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8. REFERENCES

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Table 1
Upper Harbor Brook IRM - Performance Verification and Monitoring Plan
Sample Summary Matrix

Table 1: Annual Sampling Summary Matrix								
Matrix/Analysis	**Method**	**Samples**	**MS[1,2]**	**MSD[1,2]**	**Field Duplicates[2]**	**Equipment Blanks[2]**	**Trip Blanks[2]**	**Total Samples**
Sediment Samples (9 locations; 1 sample per location)								
TCL VOCs	8260C	9	1	1	1	0	1	13
TCL SVOCs	8270D	9	1	1	1	0	0	12
TAL Metals	6010C	9	1	1	1	0	0	12
Mercury	7470A	9	1	1	1	0	0	12
Cyanide	SW9012	9	1	1	1	0	0	12
Surface Water samples (9 locations; 1 sample per location)								
TCL VOCs	8260C	9	1	1	1	0	1	13
TCL SVOCs	8270D	9	1	1	1	0	0	12
TAL Metals	6010C	9	1	1	1	0	0	12
Mercury	1631	9	1	1	1	0	0	12
Cyanide	E335.4	9	1	1	1	0	0	12

Notes:

All analyses will be performed in accordance with USEPA SW846 methods.

Additional samples may be collected based on field observations.

1 - MS/MSD - Matrix Spike/Matrix Spike Duplicate

2 - The number of QA/QC samples presented in this table should be considered estimates. The actual number of QA/QC samples will be determined during performance of the investiation based on the actual number of samples and time period of collection.

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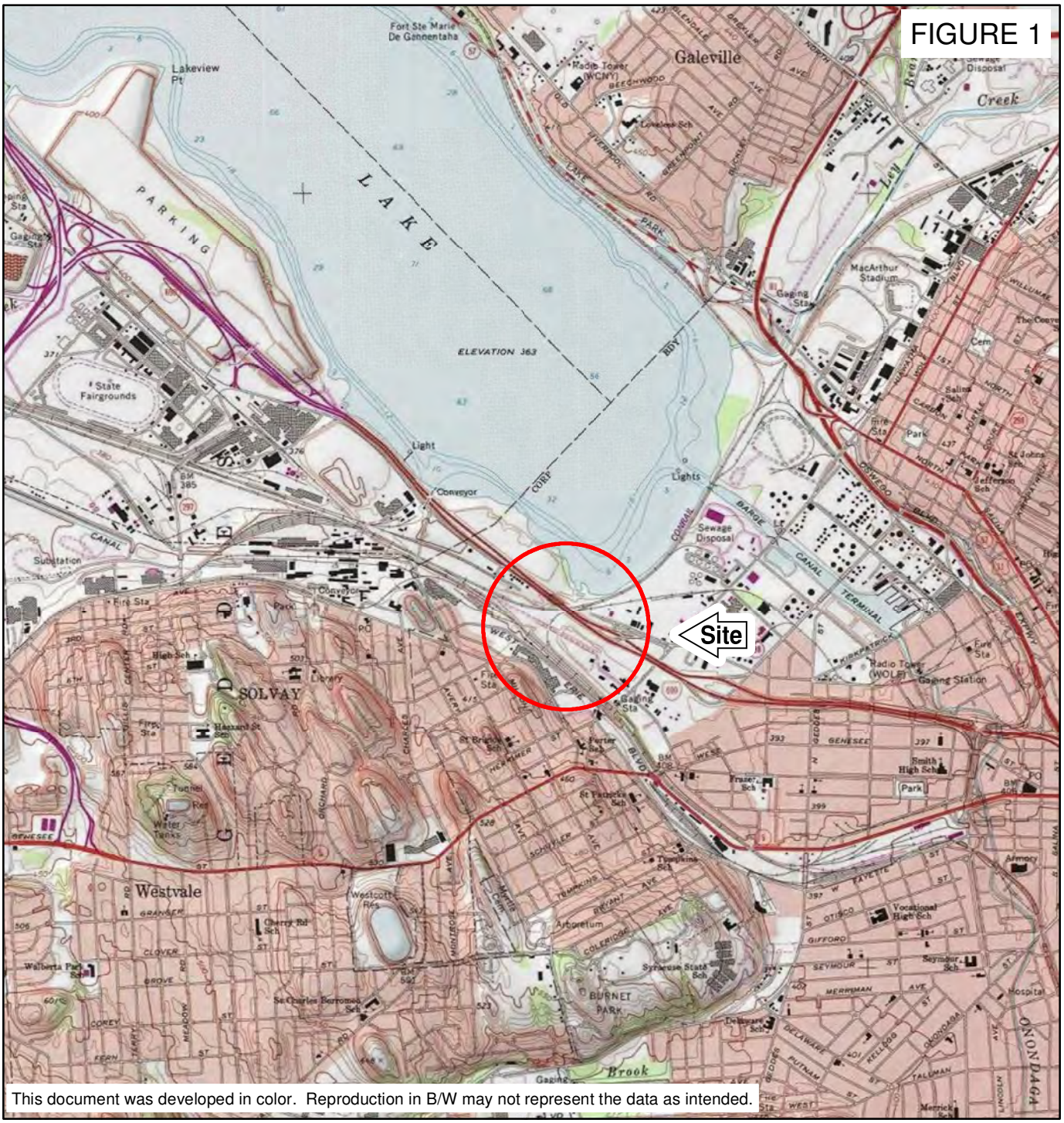

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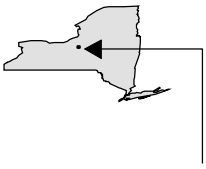
HONEYWELL
INTERNATIONAL INC.
UPPER HARBOR BROOK IRM
SYRACUSE, NEW YORK



MAP LOCATION

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SITE LOCATION

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