FIVE-YEAR REVIEW REPORT FOR RE-SOLVE, INC. SUPERFUND SITE NORTH DARTMOUTH, BRISTOL COUNTY, MASSACHUSETTS

Prepared by

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LIST OF ABBREVIATIONS

ABR	Anaerobic Bioreactor
ARAR	Applicable or Relevant and Appropriate Requirement
AWQC	Ambient Water Quality Criteria
BAT	Best Available Technology
BFP	Biofilter/phytoremediation
BTEX	benzene, toluene, ethylene, xylene
CCC	Criteria Continuous Concentration
COC	Contaminant of Concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMC	Criteria Maximum Concentration
CVOC	Chlorinated volatile organic compounds
DNAPL	Dense non-aqueous phase liquid
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
FDA	Food and Drug Administration
FOSP	Field Operations Support Plan
gpm	gallons per minute
GWTP	Groundwater treatment plant
KW	Kilowatt
M&E	Metcalf and Eddy,Inc.
MassDEP	Massachusetts Department of Environmental Protection
MassDPH	Massachusetts Department of Public Health
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
MOM	Management of Migration
NCP	National Contingency Plan
Nobis	Nobis Engineering, Inc.
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operations and Maintenance
ORSG	Office of Research and Standards Guidelines

OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
ppb	parts per billion
ppm	parts per million
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Responsible Party
RSG	Resolve Site Group
RW	Recovery Well
SARA	Superfund Amendments and Reauthorization Act
Site	Re-Solve, Inc. Superfund Site
SVOC	Semi-volatile organic compounds
SOW	Statement of Work (appended to Consent Decree)
TCE	Trichloroethene
TSCA	Toxic Substances Control Act
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
USACE	United States Army Corps of Engineers
VISL	Vapor Intrusion Screening Level
VOC	Volatile organic compound
Weston	Weston Solutions, Inc.
WMA	Waste Management Area

EXECUTIVE SUMMARY

This is the fifth five-year review for the Re-Solve, Inc. Superfund Site (Site). The triggering action for this review is the completion of the fourth Five-Year Review dated September 2008. This statutory review is required since hazardous contamination remains at the Site above levels that allow for unlimited use and unrestricted exposure. The review was completed in accordance with the United States Environmental Protection Agency's (EPA's) *Comprehensive Five-Year Review Guidance* (OSWER No. 9355.7-03B-P), with clarifications provided in OSWER Document Nos. 9355.7-21, 9355.7-18, and 9200.2-111.

The Site is a former waste chemical reclamation facility that operated between 1956 and 1980. Various types of industrial and commercial solvents were brought to and processed at the facility. Residues, liquid sludge waste, and burned tires were disposed of in four on-site unlined lagoons. An oil waste sludge that accumulated at the bottom of the degreaser distillation still was disposed of on one portion of the Site through land farming. This oil waste sludge was also spread throughout the Site to control dust. These practices resulted in contamination of the soil, sediment and groundwater, and presence of dense non-aqueous phase liquid (DNAPL) in the overburden and possibly in the bedrock beneath the Site. In 1980, the State of Massachusetts accepted Re-Solve's offer to surrender its disposal license on the condition that all hazardous waste be removed from the Site. In 1981, all drums, debris, and buildings were removed from the Site, but the contents of the four lagoons remained.

EPA, Region 1, issued a Record of Decision (ROD) for the Site on July 1, 1983. This ROD established Operable Unit 1 (OU1) to perform remedial action work. This work included the excavation of approximately 15,000 cubic yards of contaminated soils and sediments from source areas on Site. Studies conducted near completion of the remedy indicated that extensive contamination remained and the OU1 remedial action was terminated in 1985. The remaining polychlorinated biphenyl (PCB) contamination was to be addressed through a subsequent comprehensive remedial action (Operable Unit 2), to supersede OU1.

EPA issued a second ROD on September 24, 1987 (1987 ROD), which established two additional OUs; the source control component was labeled Operable Unit 2 (OU2) and the management of migration (MOM) component was labeled Operable Unit 3 (OU3). The 1987

ROD called for site security, excavation and treatment of PCB-contaminated soils and sediments by on-site dechlorination, and treatment of volatile organic compound (VOC)-contaminated groundwater by an on-site process involving metals removal, air stripping, and carbon adsorption. The 1987 ROD set cleanup standards for PCBs for Site soil and sediment at 25 parts per million (ppm) and 1 ppm, respectively. Site-related groundwater indicator compounds identified in the OU3 MOM component of the ROD include trichloroethene (TCE), tetrachloroethene (PCE), and methylene chloride. Treatment to 5 parts per billion (ppb) for TCE, PCE, and methylene chloride was expected to reduce other contaminants identified in groundwater to non-detectable levels. Additional groundwater cleanup standards were identified in the Consent Decree implementing the 1987 ROD. These cleanup levels included all Maximum Contaminant Levels (MCLs) established under the Safe Drinking Water Act in effect at the time of the entry of the Consent Decree (May 31, 1989), including, but not limited to, lead, vinyl chloride, p-dichlorobenzene, and 1,1-dichloroethylene.

OU2 source control activities commenced in June of 1993 and were completed in December of 1994 and included site security, excavation and treatment of contaminated soils and sediments, and wetland restoration. Approximately 36,000 cubic yards of PCB-contaminated soils and sediments were treated to an average concentration of 2.8 ppm, backfilled within the waste management area (WMA), and covered with 18 inches of gravel. Institutional controls placed on the WMA in 1995 prevent building construction, extraction of groundwater, excavation beyond six inches, and residential development. The excavation also included the removal of PCB-contaminated soils from the adjacent parcel known as the North Access Road Area, which also received an 18-inch gravel cap. Institutional controls were placed on the North Access Road property in 2011, which provide the same protections as those required for the WMA. EPA declared the OU2 source control remedy complete in June 1995. The second five-year review, completed in 1998, concluded that the source control remedy was protective.

OU3 MOM construction, which took place during 1997 and 1998, included construction of a groundwater treatment system consisting of metals removal, air stripping, and carbon adsorption for treatment of groundwater, and a catalytic oxidizer for treatment of the VOC emissions from the air stripper. It also included the installation of a two-tiered groundwater extraction system. The inner group of four Tier I extraction wells was installed along the eastern boundary of the WMA to contain the DNAPL contamination and prevent migration beyond the WMA boundary. The outer group of four Tier II extraction wells was installed along the eastern

boundary of the dissolved VOC plume to treat the groundwater contaminants to the established cleanup standards.

Full-scale operation of the OU3 MOM remedy commenced on April 27, 1998, using the four Tier I extraction wells. Operation of the Tier II wells commenced on July 27, 1998, in conjunction with the Tier I wells. Monthly average pumping rates for the extraction system were maintained at or near the target of 48 gallons per minute (gpm) from November 1999 until November 2010, when the EPA approved a reduction in pumping rate to 35 gpm. Since November 2010, the system has operated at or near the reduced target rate, except for short periods when wells were shut down for planned maintenance or construction, for unplanned maintenance events, or during power outages.

In December 2006, the catalytic oxidizer used to treat air emissions from the groundwater treatment system was removed from service in order to eliminate unnecessary propane consumption. A November 2006 study had concluded that discontinuing use of the oxidizer would not result in adverse health effects in the vicinity of the Site.

Various sustainability enhancements were implemented at the Site from 2002 through 2011 that used natural treatment processes as a means to reduce the energy and chemical use, and residuals generation and disposal associated with the Site groundwater treatment system. Two full-scale enhancements were constructed in 2011.

A full-scale pilot Anaerobic Biological Reactor (ABR) system was constructed from August 2011 to December 2011. The system operated in various transition phases from December 2011 until July 2012. The groundwater treatment plant (GWTP) was shut down on July 3, 2012 for completion of the transition to the ABR system, and the ABR system began full-scale operation on July 31, 2012. Comprehensive monitoring was required for a 1 to 2 year period to evaluate: the effectiveness of the ABR system in achieving treatment levels comparable to the conventional treatment system; compliance with the existing GWTP discharge standards; and compliance with ROD Applicable or Relevant and Appropriate Requirements (ARARs) (EPA, 2009). If the full-scale pilot system achieves the stated objectives, EPA would consider using the system as an optimization, enhancement, or modification to the existing treatment. Despite some operational issues, the ABR system has operated consistently since July 31, 2012 and has consistently achieved the required effluent discharge limits. At the time of this review, the

operational issues were still being evaluated and no determination had been made about the long-term status of the ABR system.

A 150-kilowatt (KW) solar photovoltaic system was also constructed on the Site in late 2011. Start-up testing of the system was completed in December 2011. The local electric utility inspected the system and provided approval to operate the solar system in February 2012. The system operates on a net-metering basis such that electricity produced by the solar system that is not used on-Site by the MOM system is supplied to the local electricity grid. At times when the solar system is not producing sufficient power, such as at night, electricity is provided by local electricity grid. The system has been in full-time operation since receiving approval to operate.

The operation and maintenance (O&M) phase of the OU3 MOM remedy includes O&M of the groundwater treatment and extraction systems, process monitoring of the treatment system, and environmental performance monitoring. Process monitoring includes sampling and analysis of: groundwater from each extraction well, treatment system influent and effluent, and process water at various stages within the treatment system. Process monitoring is intended to determine the effectiveness of operation of the primary unit processes within the groundwater treatment system and evaluate compliance with effluent discharge and air emission criteria. Environmental performance monitoring includes sampling and analysis of groundwater, surface water, fish tissue, and residential wells; and wetlands monitoring. Monitoring of groundwater provides the basis for evaluating whether the remedial objectives are achieved and determining whether and when any of the outer set (Tier II) of extraction wells may be shut down. As the groundwater cleanup proceeds, it is expected that the Tier II extraction wells will be successively shut down, followed by interim monitoring to ensure that cleanup standards continue to be attained downgradient of the wells. The Tier I extraction well system will continue to operate to prevent DNAPL and contaminant migration beyond the WMA.

The review of Site-related documents, data, O&M procedures, applicable or relevant and appropriate requirements (ARARs), and Site inspection observations indicate that the remedy is functioning as intended by the ROD.

With respect to the OU2 source control remedy, this judgment has been made based on Site inspection observations of the site access controls, security systems, soil cover materials in the

WMA and North Access Road Area, and restored wetlands; evaluation of changes in ARARs since the last Five-Year Review; and review of the deed restrictions for the two areas where PCB-contaminated soils remain on Site at concentrations that may pose an unacceptable human health risk. The physical controls are effective in restricting access to and disturbance of the areas. The institutional controls in effect on the two properties prevent any intrusive earthwork or landscaping activities that could disturb the soils, future development that could result in unacceptable exposures, and groundwater extraction.

With respect to the OU3 MOM remedy operating at the Site (i.e., pumping and treating contaminated groundwater), this judgment has been made based on an evaluation of environmental and process monitoring data that has been collected during operation of the OU3 MOM remedy in accordance with the Field Operations Support Plan (FOSP) and the ABR Transition and Monitoring Plan (Weston, 2011a); review of O&M procedures and documentation; evaluation of changes in ARARs; and presence of new contaminants. The groundwater treatment appears to be effective in capturing and treating the dissolved phase VOC plume and minimizing the mobility of DNAPL, all of which appears to be improving the quality of surface water, groundwater, and fish tissue sampled downgradient of the Site. The system is able to do this at a flow rate that does not compromise the restored wetlands. Evaluation of recent groundwater monitoring well data with low detection limits indicates that vapor intrusion is not a concern for the residences located in the vicinity of the Site. A limited number of monitoring wells were sampled in 2013 to evaluate the presence of 1,4-dioxane. The contaminant 1,4-dioxane was detected at low levels in several wells with the maximum concentration (3.2 µg/L) at one well (MW-14B). This maximum concentration exceeds the Massachusetts Office of Research and Standards Guidelines (ORSG) value of 0.3 µg/L, but is below the ROD groundwater cancer risk cleanup standard of 1 $x10^{-5}$ (5 x 10^{-6}). There is currently no federal or state MCL for 1,4-dioxane. It is recommended that the annual groundwater monitoring program be expanded to included 1,4 dioxane so that this compound can be monitored along with the other VOC compounds in the groundwater at the Site.

Protectiveness Statements

The OU2 source control remedy at the Re-Solve, Inc. Superfund Site is protective of human health and the environment.

The OU2 source control remedy was declared complete by EPA in 1996 and judged protective by EPA in the 1998 Five-Year Review (OU1 was terminated and superseded by OU2). Physical controls and institutional controls are in place in the two areas where PCB-contaminated soils remain at concentrations that may pose an unacceptable human health risk. The physical controls, including the soil cover, site fencing, gates, signs, and security systems, are effective in restricting access to and disturbance of the areas. The institutional controls prevent any intrusive earthwork or landscaping activities that could disturb the soils, future development that could result in unacceptable exposures, and groundwater extraction. The restrictions on the two properties are self-renewing so will remain in effect in perpetuity, helping to ensure the long-term protectiveness of the remedy

The OU3 MOM remedy for the Site is protective of human health and the environment.

The MOM groundwater extraction system is effectively capturing the dissolved phase contaminant plume and preventing further migration of DNAPL and dissolved phase contaminants beyond the system capture zone. The wetlands have been successfully restored and do not appear to be adversely impacted by operation of the extraction system. A pilot groundwater treatment system has been in operation for approximately one year. Despite some operational problems it has consistently achieved effluent discharge limits, and measures are in place to ensure that effective treatment continues. Restrictions on the use of Site groundwater are in place on all the properties above the contaminant plume, effectively minimizing the risk of exposure to contaminated groundwater and limiting the potential for interference with the remedy.

The Site-wide remedy at the Re-Solve, Inc. Superfund Site is protective of human health and the environment.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Re-Solve, Inc. Superfund Site		
EPA ID: MAD980520621		
Region: 1	**State:** MA	**City/County:** North Dartmouth/Bristol

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:**
Author name (Federal or State Project Manager): Joseph F. LeMay
Author affiliation: EPA Region 1
Review period: 10/01/08 – 09/30/13
Date of site inspection: April 25, 2013
Type of review: Statutory
Review number: 5
Triggering action date: 09/29/2008
Due date *(five years after triggering action date)*: 09/30/13

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU2 Source Control (OU1 remedy was terminated and superseded by OU2)
OU3 Management of Migration Remedy

Issues and Recommendations Identified in the Five-Year Review: NONE

Five-Year Review Summary Form (cont.)

Five Year Review Site Wide Protectiveness Statement		
Operable Unit: OU2 Source Control	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The OU2 source control remedy was declared complete by EPA in 1996 and judged protective by EPA in the 1998 five-year review. Physical controls and institutional controls are in place in the two areas where PCB-contaminated soils remain at concentrations that may pose an unacceptable human health risk. The physical controls are effective in restricting access to and disturbance of the areas. The institutional controls prevent any intrusive activities that could disturb the soils, future development that could result in unacceptable exposures, and groundwater extraction. The restrictions on the two properties are self-renewing so will remain in effect in perpetuity, helping to ensure the long-term protectiveness of the remedy		
Operable Unit: OU3 Management of Migration	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The MOM groundwater extraction system is effectively capturing the dissolved phase contaminant plume and preventing further migration of DNAPL and dissolved phase contaminants beyond the system capture zone. The wetlands have been successfully restored and do not appear to be adversely impacted by operation of the extraction system. A pilot groundwater treatment system has been in operation for approximately one year. Despite some operational problems it has consistently achieved effluent discharge limits, and measures are in place to ensure that effective treatment continues. Restrictions on the use of Site groundwater are in place on all the properties above the contaminant plume, effectively minimizing the risk of exposure to contaminated groundwater and limiting the potential for interference with the remedy.		

Sitewide Protectiveness Statement (if applicable)	
Protectiveness Determination: Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: Physical controls and institutional controls are in place that effectively prevent human exposure to contaminants in soil or groundwater that may pose an unacceptable health risk. The institutional controls also prevent any actions that could interfere with the operation or effectiveness of the remedy. The groundwater extraction system is effectively capturing Site contaminants and preventing further migration of contaminants beyond the extraction system capture zone and the groundwater treatment system consistently achieves the required effluent discharge limits.	

1.0 INTRODUCTION

The purpose of this fifth Five-Year Review is to determine whether the remedy selected for the Re-Solve Inc. Superfund Site remains protective of human health and the environment. This report summarizes the Five-Year Review process, investigations and remedial actions undertaken at the Site; evaluates the monitoring data collected; reviews, the Applicable or Relevant and Appropriate Requirements (ARARs) specified in the Record of Decision (ROD) for changes; discusses any issues identified during the review; and presents recommendations to address those issues.

The United States Environmental Protection Agency, Region 1 (EPA) prepared this Five-Year Review pursuant to the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Section 121 and the National Contingency Plan (NCP). The Five-Year Review requirement, as stated in the NCP, 40 CFR §300.430(f)(4)(ii), is as follows:

> *"If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action."*

Five-Year Reviews are required by statute in such circumstances, provided that the ROD for the site was signed on or after October 17, 1986 (the effective date of the Superfund Amendments and Reauthorization Act (SARA)) and the remedial action was selected under CERCLA Section 121.

This is the fifth Five-Year Review for the Site. The first Five-Year Review was completed in July 1993 as a pre-SARA policy review in accordance with the 1983 ROD. The first review was triggered by the December 12, 1983 remedial action start date for the 1983 ROD (Operable Unit 1 [OU1]), which involved the excavation of soils and sediments from source areas on Site. The second Five-Year Review was completed in September 1998, as a post-SARA statutory review in accordance with the 1987 ROD. The second review was prepared approximately 2 years after completion of the construction of the 1987 ROD OU2 source control remedial action (February 1996) and during the construction start-up of the 1987 ROD OU3 Management of Migration (MOM) remedy. The third Five-Year Review was completed in September 2003, and

the fourth Five-Year Review was completed in September 2008, both as post-SARA statutory reviews.

This fifth Five-Year Review assesses the protectiveness of the MOM remedy for OU3 at the Site and the completed source control remedies for OU1 and OU2. Note: the OU1 remedy was terminated and superseded by OU2. This statutory Five-Year Review is required since contaminants remain on the Site above levels that allow for unlimited use and unrestricted exposure. This Five-Year Review was completed in accordance with EPA's Comprehensive Five Year Review Guidance, Office of Solid Waste and Emergency Response (OSWER) publication no. 9355.7-03B-P (June 2001), with clarifications provided in OSWER Document Nos. 9355.7-21, 9355.7-18, and 9200.2-111. For sites with both pre-SARA and post-SARA RODs with remedies that leave contaminants on-site, such as Re-Solve, the guidance clarifies that the pre-SARA remedial actions are subject to post-SARA Five-Year Review procedures. Hence, the second and subsequent Five-Year Reviews are considered post-SARA statutory reviews.

This report was developed by EPA with support from Nobis Engineering, Inc. (Nobis) under EPA Contract No. EP-S1-06-03, Task Order No. 0084-FR-FE-0118. This review was performed between February and September 2013 and is based on the approved Work Plan dated January 2013, a review of relevant documents (identified in Appendix A), a site inspection, and interviews with stakeholders.

2.0 SITE CHRONOLOGY

This section contains Table 2-1, which presents the Site historical events in chronological order to allow the reader to see the decisions made that led to the selection of the clean up remedies for the Site.

Table 2-1
Chronology of Site Events
Re-Solve, Inc. Superfund Site
North Dartmouth, Massachusetts
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Event	Date
Re-Solve, Inc. begins operating as a waste chemical reclamation facility.	1956
Massachusetts Division of Water Pollution and Control issues Re-Solve a license to collect and dispose of hazardous waste.	1974
Re-Solve facility closes.	1980
Re-Solve, Inc. offers to surrender its disposal license.	10/21/1980
Massachusetts Division of Hazardous Waste agrees to accept Re-Solve's offer, on the condition that all hazardous waste will be removed from the Site.	12/23/1980
Massachusetts Attorney General's office becomes involved due to lack of response from Re-Solve, Inc.	3/1981
Re-Solve, Inc. removes drums and other debris, including buildings, from the Site. Site area covered with an unknown amount of sand.	1981
Massachusetts Department of Environmental Quality Engineering submits a request to EPA to place the Re-Solve Site on the National Priorities List (NPL).	6/19/1981
Re-Solve Site is included in an interim NPL list of 115 priority hazardous waste sites that are eligible for federal assistance as part of the Superfund program.	10/1981
EPA publishes a Remedial Action Master Plan for the Re-Solve Site.	7/16/1982
Remedial Investigation/Feasibility Study (RI/FS) process initiated to assess the extent of on-site source contamination and evaluate remedial alternatives.	9/1982
Re-Solve Site is placed on the proposed NPL.	12/30/1982
EPA compiles a list of Potentially Responsible Parties (PRPs) and informs each of its potential liability in relation to the Re-Solve Site.	5/1983
RI/FS completed. Four areas identified as contaminant sources. EPA proposes a source control remedial action including: excavation of 7,000 cubic yards of source materials, treatment, and on-site encapsulation.	6/1983
EPA narrows the list of PRPs and begins negotiating to recover past costs and performance of the remedy recommended in the RI/FS.	1983
EPA signs a ROD describing the selected remedial action: excavation of 7,000 cubic yards of source materials, transportation and off-site treatment/disposal, and encapsulation of the Site. A modified remedial action is selected in response to public comments. This is considered OU1.	7/1/1983
Re-Solve Site is placed on the Final NPL.	9/8/1983
EPA initiates an off-site RI/FS to assess the extent of contamination that has migrated beyond the boundaries of the Re-Solve Site.	9/1983
U.S. Army Corps of Engineers (USACE) completes design of the source control remedial action. Quantity of waste requiring disposal increased to 15,000 cubic yards.	11/1983
Construction of the source control remedial action begins.	7/1984

Table 2-1
Chronology of Site Events
Re-Solve, Inc. Superfund Site
North Dartmouth, Massachusetts
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Event	Date
EPA completes the off-site RI, confirming the four major source areas identified during the 1983 RI/FS and indicating that the Site is acting as a continuous source of contamination to off-site groundwater, surface water, and sediment.	2/1985
USACE informs EPA that additional investigations performed to evaluate the effectiveness of the source control remedial action revealed extensive polychlorinated biphenyl (PCB) contamination in soils located up to ten feet below the seasonal-low groundwater table. Construction of the remedial action is stopped.	4/1985
EPA holds a meeting with the PRP negotiating committee to discuss the off-site RI/FS. PRPs are informed of newly discovered contamination and EPA's intent to perform a Supplemental RI. Negotiations between EPA and PRPs cease.	5/3/1985
EPA initiates a Supplemental RI to address the newly discovered on-site PCB contamination.	9/1985
EPA completes the Supplemental RI.	2/1987
EPA meets with the PRPs to discuss the comprehensive FS development strategy for the Site.	3/1987
EPA holds a public meeting to discuss the project schedule, the findings of the Supplemental RI, and the preliminary list of remedial alternatives that are under development for the FS.	3/11/1987
Supplemental FS is released to the public for review and comment.	6/2/1987
EPA meets with the PRPs and a representative from the Town of Dartmouth to discuss EPA's Proposed Plan for Site remediation.	6/1987
EPA holds a public information meeting to discuss the proposed plan and Supplemental FS. Public comment period extended to July 31, 1987.	6/23/1987
EPA holds a public hearing to allow the public the opportunity to enter oral comments into the record.	7/1/1987
USACE Final Report documents completion of OU1 source control remedial action.	9/21/1987
A second ROD is signed for the Site requiring excavation and on-site treatment of PCB-contaminated soils and sediments (source control), and treatment of volatile organic compound (VOC)-contaminated groundwater by an on-site process involving metals removal, air stripping, and carbon adsorption (MOM). This is considered OU2 (source control) and OU3 (MOM).	9/24/1987
Re-Solve, Inc. and the Settling Defendants enter into an Easement and Restriction Agreement to prohibit the use of the waste management area (WMA), including the underlying groundwater, after all of the remedial activities are completed.	5/22/1989
A group of 224 parties that contributed hazardous substances to the Site (Settling Defendants) enter into a Consent Decree with EPA, resolving their liability for the cleanup.	5/31/1989
MOM Pre-Design Report submitted.	12/21/1990
Source Control pilot tests completed.	6/1992
Source Control Pre-Design Report submitted.	10/2/1992

Table 2-1
Chronology of Site Events
Re-Solve, Inc. Superfund Site
North Dartmouth, Massachusetts
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Event	Date
EPA issued an Explanation of Significant Differences (ESD) to decouple the ROD-specified dechlorination process from the low-temperature thermal desorption process for on-site soil treatment. Organic liquid residual waste to now be shipped directly to an off-site Resource Conservation and Recovery Act (RCRA)- and Toxic Substances Control Act (TSCA)-permitted incinerator for disposal.	6/11/1993
Settling Defendants begin the source control remedial action.	6/21/1993
First Five-Year Review Report completed.	7/1993
Settling Defendants complete the source control remedial action.	12/21/1994
EPA determines that all of the source control closeout issues have been adequately addressed and declares the source control remedy (OU2) complete.	6/21/1995
A second Restriction Agreement is executed between Re-Solve, Inc. and the Settling Defendants to clarify the scope of the deed restrictions and conform them to the precise wording of the Consent Decree and Statement of Work (SOW).	7/17/1995
EPA completes the Final Source Control Remedial Action Report.	2/1996
Final Approval of the MOM Groundwater Treatment Plant (GWTP) 100 Percent Design.	10/23/1996
Construction of the GWTP begins.	8/20/1997
GWTP construction complete. Settling Defendants commence full-scale operation of the MOM remedy.	4/27/1998
An Easement and Non-Interference Agreement is executed between the Settling Defendants and Mr. and Mrs. John Reed, granting access to their property to perform work relating to the Consent Decree.	6/11/1998
EPA Final Preliminary Close Out Report documenting construction completion.	8/19/1998
Second Five-Year Review Report completed.	9/1998
Construction and startup of biofilter/phytoremediation pilot field study.	8/2002 – 2009
Third Five-Year Review completed.	9/2003
Settling Defendants submit initial ISCST3 air model supporting request to disconnect Catalytic Oxidizer.	10/30/2003
Settling Defendants request recalculation of permit equivalency limit for PCBs.	5/2005
EPA denies Settling Defendants request for recalculation of permit equivalency limit for PCBs	6/2006
Settling Defendants submit CALFUFF air model supporting request to disconnect Catalytic Oxidizer.	6/29/2006
EPA conditionally approves Settling Defendants request to disconnect Catalytic Oxidizer.	11/15/2006
Settling Defendants submit final ISCST3 air model supporting request to disconnect Catalytic Oxidizer.	11/28/2006

Table 2-1
Chronology of Site Events
Re-Solve, Inc. Superfund Site
North Dartmouth, Massachusetts
Page 4 of 4

Event	Date
Use of Catalytic Oxidizer discontinued	12/26/2006
EPA Project Update	2/2007
Fourth Five-Year Review completed.	9/2008
Construction of the Full-Scale Pilot Anaerobic Bioreactor (ABR) System	8/2011 – 12/2011
ABR System start-up, trouble-shooting, and transition	12/2011 – 7/31/2012
Full-Scale Pilot Operation of ABR system (all treatment equipment in GWTP off-line)	7/31/2012 - present
Fifth Five-Year Review completed.	9/2013

3.0 BACKGROUND

Re-Solve, Inc. operated as a waste chemical reclamation facility from 1956 until its closure in 1980. Facility operations resulted in significant contamination of on-site soils, and groundwater beneath and downgradient from the facility. The Site was placed on the NPL of hazardous waste sites on September 8, 1983. The first ROD for the Site was signed on July 1, 1983. The remedial action work performed under the ROD signed in 1983 is considered to be OU1. On September 24, 1987, a second ROD was signed for the Site, encompassing both on-site and off-site contamination. The 1987 ROD established two new operable units; the source control component was labeled OU2, and the management of migration component was labeled OU3.

3.1 Physical Characteristics

The Site is located approximately two miles north of I-95 and the Reed Road interchange in the northern part of Dartmouth, Massachusetts (Figure 1). The Site is bounded by wetlands to the north and east and a pine and mixed hardwood forested areas to the south and west. The west side of the Site is an upland area with a gradual slope to the east. There is a steeper slope on the north and east edges of the Site leading to the two wetland areas. An Algonquin Gas Pipeline right-of-way abuts the eastern side of the Site.

The Copicut River, Carol's Brook, and an unnamed tributary are located along the east and south sides of the Site and drain into Cornell Pond, which is approximately 700 feet southeast of the Site. The Copicut Reservoir lies less than one mile north of the Site. The Site is located over an aquifer that serves as a local drinking water source for private residential wells. Groundwater flows to the east and southeast across the Site, toward the Copicut River and the unnamed tributary (Figure 2).

The overburden consists of permeable sands and gravels ranging in thickness from less than 10 feet to approximately 28 feet. A till layer generally is found below the sands and gravels in contact with the bedrock. The till layer varies between 0 and 25 feet in thickness. Many large boulders were found in the overburden during excavation of the contaminated soils in 1994.

Bedrock fractures have been documented in shallow bedrock but the orientation of the fractures is not known (Metcalf and Eddy, Inc. [M&E], 1994). Groundwater in the fractured bedrock aquifer reportedly flows in a direction similar to that as flow in the overburden aquifer.

3.2 Land and Resource Use

The Site is located within the Aquifer Protection District Area 3. According to Town of Dartmouth zoning by-laws, the purpose of the Aquifer Protection District is to protect existing and potential groundwater supplies and recharge areas, particularly those areas that contribute to the public water supply. Area 3 is the least restrictive of such area designations and includes potential groundwater development areas and those areas that provide recharge to Area 2 (which is the recharge area of a public water supply well). Commercial, industrial, and residential developments are permitted in Area 3 with certain restrictions.

The land surrounding the Site is also subject to the underlying zoning, Single-residence B, which allows only single-family residential uses and is more restrictive than the Aquifer Protection District Area 3 by-laws. No changes to the Site's Aquifer Protection District area designation or to the Site's underlying zoning are anticipated.

The Rod and Gun Club of New Bedford owns approximately 180 acres northeast of the Site. The land is used for hunting, fishing, and target shooting. The Dartmouth Natural Resource

Trust holds 25-acres of land immediately south of the Site bordering the Algonquin Gas Pipeline right-of-way and the Copicut River. A town forest is located about two miles south of the Site, adjacent to I-95. No rare or endangered species, plants, or animals have been reported within a two-mile radius of the Site.

Several residences are located along North Hixville Road within one-quarter mile of the Site. The nearest are three homes situated within approximately 350 feet of the Site: one to the northwest, one to the west, and the other to the southwest (Figure 2). Beyond one-quarter mile of the Site, a number of homes are situated on North Hixville Road north of the Site, as well as near Millers Way, north of Old Fall River Road, and west of the Site. All residences in the area obtain water from private wells located on their property. However, all are located up-gradient or cross-gradient of the Site and are not affected by Site groundwater contamination. The nearest public drinking water supply wells are approximately 3 miles south of the Site along Route 6. As of January 1, 2012, the population of Dartmouth (which includes North Dartmouth) was 35,261.

The Copicut River, classified as Class B by the Commonwealth of Massachusetts, is located along the eastern edge of the Site. Class B waters are designated for protection and propagation of fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Carol's Brook is located along the southern edge of the Site and drains into the Copicut River. The Copicut River drains directly into Cornell Pond approximately one-quarter mile downstream from the Site. Cornell Pond, while not stocked, is popular for sport fishing and has been designated as a secondary water supply for the City of Fall River. Wetland areas have been delineated at the north, east and south boundaries of the Site, around the course of the Copicut River from north of the Site, south toward Cornell Pond and also across North Hixville Road from the Site. Approximately half of the eastern portion of the Site lies within the 100-year floodplain of the Copicut River.

3.3 History of Contamination

Re-Solve, Inc. operated as a waste chemical reclamation facility from 1956 until its closure in 1980. Re-Solve handled a number of hazardous materials, including solvents, waste oils, organic liquids and solids, acids, alkalies, inorganic liquids and solids, and PCBs. Residues from a distillation tower, liquid sludge waste, impure solvents, and burned tires were disposed of

in four on-site unlined lagoons. Oil wastes from the distillation tower were spread, or landfarmed, in one portion of the Site and were also used to control dust throughout the Site. Cooling water from the distillation tower was discharged to a shallow on-site lagoon.

In December 1980, the Massachusetts Division of Hazardous Waste agreed to accept Re-Solve Inc.'s offer to surrender its hazardous waste disposal license on the condition that all hazardous waste be removed from the Site. After the Massachusetts Attorney General sued Re-Solve, Inc. and its principals, in late 1981, Re-Solve, Inc. removed buildings, drums, and other debris from the Site. The Site was then covered with a large quantity of sand. The contents of the four on-site lagoons, cooling pond, and oil spreading operation were not removed.

3.4 Initial Response

EPA commenced a RI/FS to assess the extent of on-site source contamination and evaluate remedial alternatives in the fall of 1982. The RI/FS was completed in June of 1983. This study identified the on-site contamination source as approximately 3,100 cubic yards of lagoon wastes and 3,900 cubic yards of contaminated soil.

In July 1983, a ROD was signed by the EPA Regional Administrator that selected a source control remedy for the Site. This ROD called for the excavation of approximately 7,000 cubic yards of soils contaminated with PCBs at concentrations greater than 50 parts per million (ppm), off-site disposal of contaminated soil, and capping of the Site as the source control remedy (OU1). During the remedial design, however, the estimated quantity of soils with PCB concentrations greater than 50 ppm was increased to 15,000 cubic yards. Excavation activities began in July 1984. After excavating approximately 15,000 cubic yards of PCB contaminated soils, the OU1 remedial action was terminated in 1985 because studies conducted indicated that PCB contamination existed beyond the previously estimated limits of contamination. At that time, the Site was not capped. The USACE documented the completion of the OU1 source control remedial action in a Final Report dated September 21, 1987. The remaining contamination at the Site was to be addressed through a comprehensive second remedial action (see ROD 1987 and OU2 source control below), which superseded OU1.

3.5 Basis for Taking Action

An off-site RI/FS, completed in 1985, indicated that the Site was acting as a continuous source of contamination that was migrating off site and impacting groundwater, surface water, and sediment. When the initial source control remedy was terminated in 1985, a supplemental RI was undertaken to further define the extent of on-site PCB contamination. The Supplemental RI was initiated in September 1985 and completed in February 1987. The results indicated approximately 31,000 cubic yards of soil were contaminated with volatile organic compounds and approximately 61,000 cubic yards of soil were contaminated with PCBs. The report also documented contamination of on-site and off-site groundwater with semi-volatile organic compounds (SVOCs), VOCs and PCBs, contamination of downgradient surface water by VOCs, contamination of sediments by VOCs and PCBs, and PCB contamination of fish.

A second ROD was signed on September 24, 1987 that included a source control component (OU2) and a MOM component (OU3). The source control component included: site security and excavation and treatment of PCB-contaminated soils and sediments by on-site dechlorination; the MOM component included treatment of VOC-contaminated groundwater by an on-site process involving metals removal, air stripping, and carbon adsorption.

The 1987 ROD set cleanup standards for PCBs for Site soil and sediment at 25 ppm and 1 ppm, respectively. Soil standards were developed to address potential risks associated with various human health exposure pathways. Sediment standards were developed to address potential risks associated with freshwater aquatic life and human health (e.g. ingestion of PCB-contaminated fish). However, the extent of sediment excavation was limited to the wetlands immediately adjacent to the WMA (i.e. north of the site and unnamed tributary); other areas (i.e. Copicut River and Cornell Pond) were not excavated because the potential adverse environmental impacts.

Site-related groundwater indicator compounds identified in the MOM component (OU3) of the ROD include trichloroethene (TCE), tetrachloroethene (PCE), and methylene chloride. The ROD called for treatment to 5 parts per billion (ppb) for TCE, PCE, and methylene chloride, which was expected to reduce other contaminants identified in groundwater to non-detectable levels. Additional groundwater cleanup standards identified in the Consent Decree include all Maximum Contaminant Levels (MCLs) established under the Safe Drinking Water Act in effect

at the time of the entry of the Consent Decree (May 31, 1989), including, but not limited to, lead, vinyl chloride, p-dichlorobenzene, and 1,1-dichloroethylene.

The 1987 ROD also required deed restrictions and other institutional controls to ensure non-interference with the performance of the work and prohibit the use of the WMA (situated within the original Re-Solve, Inc., property), including the groundwater beneath the WMA, after completion of the remedial action. A group of Responsible Parties (RPs) formed the "Re-Solve Site Group" (RSG) and assumed responsibility for Site remediation.

On May 31, 1989, a Consent Decree was entered, under which the RSG agreed to perform the EPA-selected remedy and reimburse EPA for certain response costs. This resolved the liability of 224 generator parties (Settling Defendants) who contributed hazardous substances to the Site. In September 1989, the United States entered into an administrative settlement with 170 additional generator parties to help cover the cost of the response actions at the Site. In 1990, an action was filed against 19 parties that had refused to join in the prior settlements. In March 2003 a final settlement was announced with the last of over 400 PRPs named in the various enforcement actions filed in 1989 and 1990 (EPA, 2003). This settlement also included reimbursement for response costs.

4.0 REMEDIAL ACTIONS

This section describes the source control (OU2) and MOM (OU3) remedial actions selected for and implemented at the Site under the 1987 ROD. The OU1 remedial action was terminated and superseded by the more comprehensive OU2 remedial action, as described above.

4.1 Source Control (OU2)

The remedy selected in the 1987 ROD included excavation of PCB-contaminated soils (greater than or equal to 25 ppm to sufficiently address potential risks associated with various human health exposures) located in the unsaturated zone to the seasonal groundwater low, excavation of PCB-contaminated wetland sediment (greater than or equal to 1 ppm to sufficiently address potential risks associated with freshwater aquatic life and human health (e.g. ingestion of PCB-contaminated fish), on-site treatment of soils and sediments using a dechlorination facility, on-site backfilling and grading of treated soils and sediments, and covering the treated soils with 18 inches of gravel. The ROD required that the disturbed wetlands be restored to their original

condition through a wetland restoration program. The ROD determined that it was not technically feasible to remediate PCB-contaminated soils located in the saturated zone, and, consequently, groundwater contamination within the WMA.

Full-scale treatment of PCB-contaminated soils and sediments through on-site low-thermal desorption process (X*TRAX) was completed between June 21, 1993 and July 19, 1994, wetland restoration was performed during the summer of 1994, and Site demobilization was completed on December 21, 1994. During soil excavation activities, DNAPL contamination was found and removed from five separate areas within the waste management area (WMA), and considered in the OU3 MOM remedial design and remedial action (described below). Overall, approximately 36,000 cubic yards of PCB-contaminated soils and sediments were excavated, treated, and backfilled in the WMA. The excavation included the removal of PCB-contaminated soils from adjacent parcels known as the North Access Road and South Gap Areas, which are illustrated on Figure 2. Treated soils and sediments were reduced to an average PCB concentration of 2.8 ppm, well below the 25 ppm performance standard. An 18-inch gravel cover was placed and graded over the treated soils in the WMA and North Access Road.

During a June 21, 1995, inspection, EPA determined that all the OU2 source control closeout issues had been adequately addressed and declared the OU2 source control remedy complete. EPA documented the completion of the OU2 source control remedial action in a “Final Remedial Action Report,” dated February 1996. Following the completion of the OU2 source control remedy, long term O&M activities were performed until the OU3 MOM remedy began in 1997. Once OU3 MOM construction activities began in 1997, source control operations and maintenance activities were considered complete.

The RSG voluntarily constructed a native New England grass/wildflower meadow on the Site during June and July 1999, replacing the 18-inch gravel cap installed within the WMA at the completion of the OU2 source control remedial action. (The meadow did not however replace the gravel cap over the North Access Road Area.) This beneficial ecological reuse was intended to reestablish native species at the Site and enhance wildlife habitat.

4.2 Management of Migration (OU3)

The OU3 MOM component of the 1987 ROD included treatment of VOC-contaminated groundwater by a pump and treat process intended to restore the groundwater outside the WMA to drinking water standards. The ROD did not require restoration of groundwater within the WMA to drinking water standards. As further described below, the MOM system was designed as two tiered extraction system, with the first tier of extraction wells intended to primarily contain contaminants within the WMA and the second tier designed to restore groundwater beyond the WMA to drinking water standards (M&E, 1996).

4.2.1 Remedy Selection

The OU3 MOM remedy in the 1987 ROD specified active restoration of the overburden and bedrock aquifers contaminated with VOCs using on-site treatment involving air stripping and carbon adsorption. Since EPA determined that it was not feasible to remediate PCBs in the saturated zone and groundwater, the OU3 MOM remedy specified implementation of institutional controls on groundwater use within the WMA.

Site-related groundwater indicator compounds identified in the ROD included TCE, PCE, and methylene chloride. Treatment to 5 ppb for TCE, PCE, and methylene chloride was expected to reduce other compounds identified in groundwater to non-detectable levels. Additional groundwater cleanup standards identified in the Consent Decree include all MCLs established under the Safe Drinking Water Act in effect at the time of the entry of the Consent Decree (May 31, 1989), including, but not limited to, MCLs for lead, vinyl chloride, p-dichlorobenzene, and 1,1-dichloroethylene. The three indicator compounds and these four additional compounds are referred to as Site contaminants of concern (COCs), listed in Table 4-1.

The 1987 ROD called for reinjection of treated groundwater into the aquifer to encourage flushing of the contaminants. However, this portion of the remedy was removed during the OU3 MOM design process since the bulk of contaminated soils above the seasonal groundwater low were excavated and treated during the OU2 source control remedy. Also, the DNAPL observed within the WMA during the OU2 Source Control remedial action and the groundwater-modeling simulations prepared by Pappadopolous Associates showed that the inclusion of reinjection wells might pose a risk of remobilizing DNAPL (M&E, 1996). Therefore, treated groundwater is

discharged directly to the Copicut River in compliance with National Pollutant Discharge Elimination System (NPDES) equivalency discharge limits.

Table 4-1
Site Contaminants of Concern
Re-Solve, Inc. Superfund Site
North Dartmouth, Massachusetts

Compounds Identified in 1983 ROD
trichloroethene (TCE)
tetrachloroethene (PCE)
Methylene chloride
Compounds Identified in the Consent Decree
Lead
Vinyl chloride
p-dichlorobenzene
1,1-dichloroethylene

4.2.2 Remedy Implementation

OU3 MOM construction, which took place during 1997 and 1998, included the installation of a two-tiered groundwater extraction system (see Figure 3). The inner group of four groundwater extraction wells, or recovery wells (RW), referred to as Tier I (RW1 to RW4), was installed along the eastern boundary of the WMA to contain the source area contamination and prevent migration beyond the WMA boundary. The outer group of four groundwater extraction wells, referred to as Tier II (RW5 to RW8) was installed along the eastern boundary of the dissolved VOC plume to clean up the contamination to the established cleanup standards. Twenty-five additional monitoring wells were installed to supplement existing wells and to form a network used for both water level measurements and water quality sampling.

The groundwater treatment system included the following process units: phase separator, equalization, metals oxidation, chemical precipitation, sludge thickening, sludge dewatering, multi-media filtration (for supplemental metals removal), air stripping, carbon adsorption, and surface water discharge of treated effluent. A catalytic oxidizer was used to treat the air emissions from the groundwater treatment system.

Full-scale operation of the OU3 MOM remedy commenced on April 27, 1998. Only the four Tier I extraction wells were run for the first three months of operation; the four Tier II wells were started up on July 27, 1998. EPA and the Massachusetts Department of Environmental Protection (MassDEP) conducted a pre-final inspection on June 11, 1998, and identified minor "punch list" items requiring completion. EPA documented overall construction completion, including OU3 MOM Remedial Action, in the "Final Preliminary Close Out Report," dated August 19, 1998.

In December 2006, the catalytic oxidizer used to treat air emissions from the groundwater treatment system was removed from service in order to eliminate unnecessary propane consumption. A November 2006 study had concluded that no health effects would occur at or in the vicinity of the Site if use of the catalytic oxidizer was discontinued (ENSR, 2006). The blower in the catalytic oxidizer remained in use to draw air through the packed tower air stripper and the tank ventilation system.

The RSG implemented pilot testing of various sustainability enhancements from 2002 through 2011 that used natural treatment processes as a means to reduce the energy and chemical use, and residuals generation and disposal associated with the Site groundwater treatment system. Beginning with a field-scale biofilter and phytoremediation (BFP) pilot study, these studies evaluated multiple configurations of biological treatment systems that could be used as an alternative to the conventional treatment system operating at the Site. Based on pilot study results, in 2009, RSG proposed to construct and operate a full-scale ABR system to replace the conventional groundwater treatment system. EPA approved the construction and operation of the ABR system as a full-scale pilot study, but required that the existing treatment system components be maintained within the treatment building to serve as a backup treatment system and, if necessary, to be activated to further treat groundwater (EPA, 2009c). The full-scale pilot ABR system and additional sustainability enhancements were constructed in 2011 and became operational in 2012. Additional details of these systems are described in Section 5.0.

4.2.3 Operation and Maintenance (O&M)

The O&M phase of the OU3 MOM remedy includes O&M of the GWTP, process monitoring of the treatment system, and environmental performance monitoring. Process monitoring includes sampling and analysis of: groundwater from each extraction well; combined influent to the

GWTP; process water at various stages within the treatment system; effluent from the GWTP; and sludge and spent carbon produced during plant operation. Process monitoring is intended to determine the effectiveness of operation of the primary unit processes within the GWTP and compliance with effluent discharge and air emission criteria.

O&M requirements for the ABR system are different than for the GWTP, and chemical use and residuals handling have significantly decreased. Process monitoring requirements have also changed since implementation of the full-scale-pilot ABR system, with samples being collected from different locations and at increased frequency, particularly during the start-up and transition periods. However the overall objectives of the process monitoring remain the same: to determine the effectiveness of operation of the primary unit processes and monitor compliance with effluent discharge and air emission criteria.

Environmental performance monitoring includes sampling and analysis of groundwater, surface water, fish tissue, and residential wells; and wetlands monitoring. Environmental performance monitoring requirements are not affected by ABR system implementation. Monitoring of groundwater provides the basis for evaluating whether the cleanup standards are being attained downgradient of the Tier I (DNAPL source containment) extraction wells and, if so, whether one or more of the Tier II (dissolved plume containment and remediation) extraction wells can be shut down. As the groundwater cleanup proceeds, it is expected that the outer set (Tier II) of extraction wells will be successively shut down, followed by interim monitoring to ensure that cleanup standards continue to be attained downgradient of the wells. The Tier I extraction well system will continue to operate to prevent migration beyond the WMA.

4.3 Institutional Controls

Institutional controls, as required by the 1987 ROD, Consent Decree, and SOW, include site security; agreements requiring owners to provide access to Site property for purposes of implementing remedial actions; and deed restrictions preventing use of Site groundwater, development or uses of the property that would present an unacceptable risk, and interference with the source control or MOM remedies.

Specific Site restrictions recorded at the registry of deeds for the original Re-Solve, Inc. property (which includes the WMA but excludes the North Access Road Area and South Gap Area)

include: a) no drilling or installation of any wells for the extraction of groundwater other than for purposes of the remedial actions; b) no construction and/or use of any buildings or structures except for purposes of implementing the remedial actions; c) no intrusive earthwork activities beyond six inches deep and only for superficial regrading; d) no off-site trucking of on-site soils; e) any landscaping to be accomplished by bringing fill on-site; f) any development plans to be approved by EPA and the Commonwealth of Massachusetts; and g) no residential development of any kind on this property. These restrictions and access to the WMA for the remedial actions have been ensured through two Easement and Restriction Agreements between Re-Solve, Inc. and the Settling Defendants: the first executed on May 22, 1989, and the second executed on July 17, 1995 to clarify the scope of the existing deed restrictions and make the descriptions consistent with that of the Consent Decree and SOW. The easement and deed restrictions are perpetual and will remain in force after the completion of the OU3 MOM.

Institutional controls concerning Site security are also in place on the Site and include fencing, security cameras, a secured front gate, and bilingual warning signs along the perimeter fence and Site boundary. Bilingual warning signs regarding elevated levels of PCBs are provided to the Dartmouth Board of Health for placement along the Copicut River and Cornell Pond.

For properties adjacent to the WMA, land access and prohibition of any actions that would interfere with implementation of the remedy have been ensured through the following agreements, recorded at the Bristol County Registry of Deeds. The property locations are shown on the figure in Appendix B.

- Easement and Non-Interference Agreement, executed on June 11, 1998, between the Settling Defendants and Mr. and Mrs. John Reed for the property located immediately adjacent to the WMA (shown as Easement Areas I and II in Appendix B). [This Agreement supersedes and terminates a 1989 Easement Agreement between the same parties.]

- Easement, Restriction, and Non-Interference Agreement, executed on September 30, 2005, between the Settling Defendants and The Rod and Gun Club of New Bedford, Inc. for Rod and Gun Club property located to the northeast of the WMA, across the Copicut River.

- Restriction and Non-Interference Agreement executed on September 28, 2011 between the Settling Defendants and Mr. John Reed for the North Access Road Area.

These Agreements grant access to property owned by the Reeds and the Rod and Gun Club "to plan for, undertake and conduct that portion of the work and other activities authorized by or related to the Consent Decree," which involves facilitating sampling and maintenance activities in connection with the implementation of the OU3 MOM Remedy, and ensure non-interference in the conduct of such work.

In addition, the 1998 Easement and Non-Interference Agreement between the Settling Defendants and Mr. and Mrs. Reed for Easement Areas I and II (located northwest and southeast of the WMA) prohibits any action that will interfere with performance of work for the MOM remedy. Because of the proximity of the easement areas to the MOM extraction wells and the hydraulic connection between the areas and the WMA, any installation and use of such extraction wells could interfere with the MOM remedy by limiting groundwater treatment, affecting the hydraulic conditions, etc. Although this Agreement does not expressly prohibit installation and operation of extraction wells or extraction of groundwater from the easement areas, the Agreement has been interpreted as restricting the extraction of groundwater for purposes other than those required for operation or monitoring of the MOM remedy.

The 2005 agreement with the Rod and Gun Club prohibits installation and operation of extraction wells and extraction of groundwater from the easement area. And the 2011 Agreement between the Settling Defendants and Mr. Reed for the North Access Road Area prohibits a) residential, agricultural, or other uses of the property that may present an unacceptable risk, b) extraction of groundwater except for purposes of the remedial actions, c) excavation or disturbance of the gravel or other surface cover except for purposes of the remedial actions, d) construction of structures except for purposes of the remedial actions, and e) any activities or uses not consistent with the performance of the remedy.

5.0 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This section describes progress since the last Five-Year Review, including responses to the recommendations made in the last Five-Year Review, changes to the groundwater treatment system, and treatment operations progress.

Responses to Previous Recommendations

This is the fifth Five-Year Review for the Site. The previous Five-Year Review (EPA, 2008) concluded that the OU3 MOM remedy for the Site was functioning as intended by the ROD and as designed, and remains protective of human health and the environment. The OU2 source control remedy was also determined to be functioning as intended by the ROD. However, the fourth Five-Year Review identified a few potential issues and included the following recommendations to address those issues:

- Collect groundwater data using detection limits below inhalation risk-based screening levels to further evaluate potential vapor risks and confirm groundwater does not pose a potential off-site risk via vapor intrusion pathway;

- Conduct a survey of signage at the Site and replace any missing or damaged signs; and

- Evaluate additional measures to address PCB-contaminated soils, including deed restrictions that prohibit future residential and other high-occupancy uses of the relevant parts of the Site [the North Access Road Area], and also deed restrictions that would require maintenance of the layers of uncontaminated soil or gravel cap over the remaining contaminated soil.

Following the fourth Five-Year Review, all recommendations were addressed by the RSG, as described below.

- Groundwater VOC analysis was performed using analytical methods/procedures that achieved very low detection limits for all compounds of concern. Detection limits for all COCs were below or very close to the vapor intrusion screening levels used to evaluate whether groundwater COCs pose a potential unacceptable risk via the vapor intrusion pathway. (See Section 7.2 for additional details and evaluation of the vapor intrusion pathway.)

- Damaged signs were replaced.

- A restriction and non-interference agreement was completed with the owner of the North Access Road Area to place protections on that property equivalent to those on the WMA property. The Agreement, described in Section 4.3 above, implements the protections identified in the 2008 recommendation as well as others that were in place for the WMA.

Changes to the Groundwater Treatment System

There were three notable changes to the groundwater extraction and treatment system since the last Five-Year Review. The combined extraction system pumping rate was reduced by 13 gallons per minute (gpm) – a 27 percent decrease; a full-scale pilot ABR system was implemented as a potential sustainability enhancement that could replace the existing conventional treatment system; and a solar photovoltaic system was installed as another sustainability enhancement, to provide power for Site facilities. These changes are described in the following paragraphs.

In 2007, the RSG requested a reduction in pumping rates in Tier II wells and a systematic shut down of some of these wells. After considerable evaluation, on November 8, 2010, EPA, with MassDEP concurrence, approved a reduction of the combined extraction system pumping rate from 48 gpm to 35 gpm. The reduction was implemented on November 29, 2010 and the extraction system has operated at the reduced rate since that time. The shut-down of wells was not approved. All eight extraction wells remain operational.

In August 2011, during Year 14 of the MOM O&M period, modifications to the groundwater treatment system were initiated by the RSG in order to enhance the sustainability of the long-term remedial action at the Site. The objective was to reduce the environmental impact of the MOM remediation system. The modifications to the treatment system included:

- Constructing a full-scale pilot ABR system to treat Site groundwater.
- Installing a 150-kilowatt (KW) solar photovoltaic system to provide power for Site facilities.

EPA approved the construction and operation of the ABR system as a full-scale pilot study, but required that the existing treatment system components be maintained within the treatment building to serve as a backup treatment system and, if necessary, to be activated to further treat

groundwater. Comprehensive monitoring was required for a 1- to 2-year period to evaluate the ABR system's 1) effectiveness at achieving treatment levels comparable to the conventional treatment system, 2) compliance with the existing GWTP discharge standards, and 3) compliance with ROD ARARs (EPA, 2009). EPA gave no assurance that the MOM remedy would be revised to include ABR, but stated that if the full-scale pilot achieved the stated objectives, then EPA would consider using the system as an optimization, enhancement, or modification to the existing treatment system and documenting a modification to the remedy via an ESD or ROD Amendment (EPA, 2009).

The primary treatment processes of the full-scale pilot ABR treatment system are carbon adsorption and reductive dechlorination. Reductive dechlorination is an anaerobic biodegradation process that results in sequential dechlorination of chlorinated VOCs to transform the contaminants to harmless compounds. The process flow diagram of the ABR system is presented in Appendix C.

The ABR system was constructed from August 2011 to December 2011. The system operated in various transition phases from December 2011 until July 2012. The GWTP was shut down on July 3, 2012 for completion of the transition to the ABR system, and the ABR system began full-scale operation on July 31, 2012. The operation and monitoring of the full-scale-pilot ABR system was performed in accordance with the EPA-approved Transition and Monitoring Plan (Weston, 2011a).

The 150KW solar photovoltaic system was constructed between September 2011 and December 2011. Start-up testing of the system was completed in December 2011. The local electric utility inspected the system and provided approval to operate the solar system in February 2012. The solar array consists of 644 panels, with groups of 14 panels operating in series (Figure 4). The system has been in full time operation since receiving approval.

Treatment Operations Progress

Since the last review, the OU3 MOM remedy has continued to operate in an O&M phase. The fifteenth year of O&M ended in April 2013. However, at the time of this review, the most recent comprehensive O&M evaluation available for evaluation was the Fourteenth Year Operations Report (for the period from May 2011 to April 2012). Monthly operations reports from 2012 and

2013 and groundwater monitoring data collected in May 2013 were reviewed to supplement the evaluation for this Five-Year Review.

Since the last Five-Year Review, environmental monitoring has continued to be performed in accordance with the requirements of the Field Operations Support Plan (FOSP). EPA approved modifications to the original FOSP requirements in September 2000, December 2001, and February 2005 (see Table 5-1). The original and modified environmental monitoring requirements and the monitoring performed during the fourteenth year of O&M are shown in Table 5-1.

Until July 2012, when groundwater treatment transitioned to the ABR system, the GWTP operated consistently, with only occasional interruptions for either routine maintenance or non-routine activities, such as carbon changeouts, filter media changeouts, installation of new equipment, and power outages. Process monitoring during this period was performed in accordance with the FOSP, which verified that the GWTP consistently achieved the required discharge and emissions requirements.

The ABR system has operated consistently since July 31, 2012, albeit with some operational issues. After full-scale operation began, gas bubbles began accumulating in the ABR beds, reducing the allowable flow through each bed and forcing the beds to be operated in parallel instead of in series, as designed. The RSG engineers have been evaluating and troubleshooting the problem and have identified and tested potential solutions. At the time of the Site Inspection, a pilot-scale membrane contactor and full-scale siphon were being evaluated, but a final solution had not been identified at the time of this review. Despite these operational issues, the ABR system has consistently achieved the required effluent discharge limits.

Based on an April 2012 evaluation of Site groundwater, historical monitoring data presented in the Fourteenth Year Operations Report, and data from the May 2013 sampling, the groundwater extraction system is effectively capturing Site contaminants and preventing further migration of contaminants beyond the extraction system capture zone. The extent of the overburden COC plume exceeding MCLs has been reduced relative to baseline conditions; no exceedances of the standards were detected beyond the Tier II extraction wells and the number and magnitude of exceedances have significantly decreased. Similarly, the extent of the COC plume in

bedrock has decreased relative to baseline; only one bedrock well location downgradient of the Tier II extraction wells had any COC concentrations exceeding MCLs and the number and magnitude of exceedances have also decreased.

Table 5-1
Environmental Monitoring
Re-Solve, Inc. Superfund Site
North Dartmouth, Massachusetts
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Monitoring Component	Original FOSP[1] Requirement	Revised Requirement	Performed During the 14th Year of O&M
Quality Monitoring			
Groundwater Quality Monitoring (VOCs, SVOCs, PCBs, and Total Metals)	Quarterly monitoring at 42 wells	Annual Monitoring in May at 46 wells, semi-annual monitoring in Nov. at 19 wells (Approved by EPA February 16, 2005; Effective February 2005)	Annual monitoring in May at 46 wells, semi-annual monitoring in Nov. at 28 wells, no quarterly monitoring in February or August.
Surface Water Quality Monitoring (VOCs)	Quarterly monitoring at SW-1 and SW-3; annual monitoring at SW-2, 6 and 7	Annual monitoring at SW-1, 2, 3, 5, 6 and 7 (Approved by EPA September 14, 2000; Effective May 2000)	Annual monitoring at SW-1, 2, 3, 5, 6 and 7 (No change)
Residential Well Sampling (VOCs)	Annual monitoring at 16 wells	Annual monitoring at 9 wells (Approved by EPA September 2000; Effective May 2000)	Annual monitoring at 9 wells – 8 during May 2011 and 1 during Nov 2011.
Quality Monitoring (cont.)			
Fish Sampling (% Lipids and PCBs)	Annual sampling for modified list of up to 6 species	Semi-Annual sampling for trout, eel, brownhead, perch and largemouth bass (Approved by EPA 2010, effective 2010.) - If fish consumption advisory is lifted by MassDPH: conduct Fishing Derby (catch and release) only. - If PCB advisory is not lifted by Mass DPH: conduct sampling in Year 14 for trout, eel, brownhead, perch and largemouth bass.	Semi-Annual sampling for trout, eel, brownhead, perch and largemouth bass. PCB Advisory not lifted; fish flesh samples sent for analyses.
Hydraulic Monitoring			
Groundwater Level Measurements	Monthly monitoring at 65 wells	Quarterly monitoring at 65 wells (Approved by EPA September 14, 2000; Effective May 2000)	Quarterly monitoring at 65 wells (No change)
Surface Water Measurements	Monthly monitoring at SW-1 through SW-10	Quarterly monitoring at SW-1 through SW-7 (Approved by EPA September 14, 2000; Effective May 2000)	Quarterly monitoring at SW-1 through SW-7 (No change)
Wetlands Water Level and Soil Moisture Measurements	Twice weekly monitoring during March 15 through October 31	Once every other week during March 15 through October 31 (Approved by EPA September 14, 2000; Effective May 2000)	Once every other week during March 15 through October 31 (No change)
Wetlands Assessments	3 events annually (May, July and September)	Monitoring discontinued for Year 13 O&M period.	Monitoring discontinued (No change)

1. Field Operations Support Plan

6.0 FIVE-YEAR REVIEW PROCESS

This section provides a summary of the Five-Year Review process and the actions taken to complete the review.

6.1 Administrative Components

EPA, the lead agency for this Five-Year Review, issued Task Order No. 0084-FR-FE-0118, to Nobis, under EPA Remedial Action Contract (RAC) No. EP-S1-06-03, Task Order 0084, on February 5, 2013, to perform the Five-Year Review. The EPA Task Order Project Officer was Joseph LeMay.

The schedule established by EPA included completion of the review by September 2013.

6.2 Community Notification and Involvement

EPA issued a press release on May 9, 2013, announcing its review of the progress of the Re-Solve Site cleanup.

During implementation of the source control remedy in the early 1990s, there were a number of concerns and complaints of noise, and other issues expressed by the public. During the implementation of the OU3 MOM remedy and recent sustainability enhancements, the Site has received little interest from the public. There has been no official community notification of the preparation of this fifth Five-Year Review other than the press release.

Five interviews were completed. Records of these interviews are in Appendix D. In general, the individuals who were interviewed had no significant concerns or complaints in relation to the Site.

EPA has supported an annual Fishing Derby at Cornell Pond since 1998. The objective of the fishing derby is to involve the public in the collection of the fish species needed for the ongoing environmental monitoring program and to remind the public that there is a Massachusetts Department of Public Health (MassDPH) fish advisory still in effect (since 1986) to not consume eels and to limit consumption of other fish caught in Cornell Pond or the Copicut River. Annual fish sampling was required through 2009. Over the years that EPA and the RSG have

sponsored the fishing derby, the public has actively participated. However, additional fish collection has been required (and performed by RSG) to obtain enough fish for the fish tissue monitoring. EPA has publicized the derby on its website and also through town officials and residents.

In 2010, the RSG petitioned MassDPH to remove its fish advisory for PCBs because the annual fish tissue monitoring data showed that PCB concentrations in fish tissue were well below the U.S. Food and Drug Administration (FDA) fish PCB action level of 2 milligrams per kilogram (mg/kg). In 2010, pending MassDPH's ruling on removing the fish advisory for PCBs, EPA approved a decrease in the required frequency of fish sampling from annual to biannual sampling. The Fishing Derby was conducted in 2010 and 2012, but because sampling was not required, the Fishing Derby was a catch and release event in those years and no samples were collected. As of July 2013, MassDPH had not ruled on the RSG's petition and the fish advisory for PCBs remains in place.

6.3 Document Review

This fifth Five-Year Review consisted of a review of relevant documents including remedy decision documents and monitoring reports, as specified in the EPA SOW for this review, as well as easement and restriction agreements recorded at the Registry of Deeds, and previous Five-Year Review reports for the Site. The list of documents reviewed is provided in Appendix A.

6.4 Data Review

This fifth Five-Year Review included a review of available O&M data that has been collected since start-up of the GWTP. O&M data that was reviewed included process and environmental monitoring data as well as O&M cost records. See Section 7.1.1 for a presentation of specific monitoring results.

6.5 Site Inspection

A Site inspection was conducted on April 25, 2013, with representatives from the RSG's engineering contractor (Weston Solutions, Inc.), Technical Representative (TetraTech, Inc.), and EPA's contractor (Nobis). The inspection of the GWTP included a review of the

groundwater treatment equipment within the building, most of which is currently off-line because treatment is being performed by the full-scale pilot ABR system that was constructed outside the GWTP building (Figure 4). The interior tour included inspection of the pilot-scale membrane contactor and the full-scale siphon recently constructed to aid in removal of excess gas from the ABR units. The outdoor portion of the Site tour included inspection of the ABR system and the solar panels installed in 2011, both tiers of extraction wells, the grass/wildflower meadow, the North Access Road Area, accessible perimeter fencing, the unnamed tributary and associated wetland areas, and the Algonquin Gas Pipeline Right-of-Way. The general location of the treated effluent discharge point was noted, but because of high water, the discharge pipe was not accessible. A Site inspection report, including a Site inspection check list and Site photographs, is included in Appendix E.

The WMA is secured by chain-link fence and locking gates and is posted with bilingual signs. Due to past incidents of vandalism, a security system, including cameras on the exterior corners of the GWTP building, was installed during construction of the OU3 MOM remedy. Since the OU3 MOM remedy has been operating, there have been no incidents of vandalism.

The ABR system and solar panels were constructed in a portion of the restored meadow portion of the WMA. The meadow vegetation seems to have recovered well. The grass was a bit thin in areas excavated during the ABR leak-detection investigation that occurred after the initial seeding. Other areas were growing well. The grass throughout the WMA had been recently mowed at the time of the Site visit. Bird boxes, brush piles and sand piles (for turtles) placed around the upland portions of the meadow as habitat enhancements are still present. The restored east and north wetlands are well-vegetated.

6.6 Interviews

General discussions and observations were documented during the Site inspection on April 25, 2013. Telephone interviews were also completed to supplement the Site inspection interviews. The list of individuals to be interviewed and questions to be asked were developed with input from EPA. The record of interviews regarding this Five-Year Review is provided in Appendix D. The main points of discussion are summarized below.

None of those interviewed had any concerns with the Site and none were aware of any public

concern or interest in the Site. The only noted interest was in regard to the Fishing Derby. Those interviewed were satisfied with how the remedy is functioning and with the restoration of wetlands at the Site. Ms. Allen, MassDEP Remedial Project Manager for the Site, noted that there were some operational problems with the ABR system, but that the system was still meeting effluent discharge standards and that the RSG team was working diligently to improve the operation. She commended the team for being innovative in seeking engineering improvements to the remedy.

Mr. O'Reilly, the Environmental Affairs coordinator for the Town of Dartmouth, stated that there is possible Town interest in use of a portion of the Site as a storage/service facility for the Town. However, Mr. O'Reilly is aware of the reduction in space at the Site because of the solar panels installed in 2012. Mr. O'Reilly is also aware that future use of the property by the Town may not occur until the cleanup is complete. Regarding land-use changes in the area, Mr. O'Reilly stated that a subdivision was completed a few years ago to the southwest of the Site, but the area near the Site is mainly single family homes and there haven't been any changes. He also noted that there have been some watershed protection efforts to the north and east of the Site.

7.0 TECHNICAL ASSESSMENT

This section provides a technical assessment of the remedies implemented at the Site. The technical assessment criteria are outlined in the *Comprehensive Five-Year Review Guidance* (EPA, 2001).

7.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the review of Site-related documents, data, O&M procedures, ARARs, and Site inspection notes indicates that the remedy is functioning as intended by the ROD.

With respect to the OU2 source control remedy, this judgment has been made based on evaluations of the site access controls (fencing, gates, signs), security systems, and the condition of the soil cover materials (wildflower meadow in WMA and gravel cover in North Access Road Area and restored wetlands during the Site inspection, and review of deed restrictions that remain in place in the two areas (the WMA and North Access Road areas)

where PCB-contaminated soils remain on Site at concentrations that may pose an unacceptable human health risk.

With respect to the OU3 MOM remedy operating at the Site (i.e., pumping and treating contaminated groundwater), this judgment has been made based on an evaluation of environmental and process monitoring data that has been collected during operation of the OU3 MOM remedy in accordance with the FOSP and the ABR Transition and Monitoring Plan (Weston, 2011a); and through a review of O&M procedures and documentation.

This section provides a summary of the information that was evaluated for this Five-Year Review.

7.1.1 Remedial Action Performance and Monitoring Results

Remedial action performance and monitoring information that is collected as part of the OU3 MOM O&M phase includes both environmental quality and process monitoring data. The environmental parameters that are monitored as part of the OU3 MOM O&M include sampling and analysis of groundwater, surface water, fish tissue, residential wells, wetlands restoration, and groundwater and surface water elevations. The process monitoring parameters include groundwater extraction rates, influent contaminant concentrations, and effluent contaminant concentrations. Results of the environmental and process monitoring, with an emphasis over the past five years, are discussed below. Below is a list of the latest data available:

- Groundwater and residential well samples collected in April 2012 and May 2013.
- Surface water samples collected in August 2012.
- Weekly DNAPL monitoring at well point.
- Fish Tissue samples collected in September 2011.
- Wetlands assessment monitoring April 2012.
- Treatment plant influent samples collected monthly.
- Treatment plant effluent samples collected in 2012 and 2013.
- Treatment plant sludge sampled as needed.

Groundwater Quality Monitoring. Groundwater quality data from on-site and off-site monitoring wells have been collected on a semi-annual basis since 2005; before that, samples were

collected quarterly. Initially, a network of 42 monitoring wells was monitored. During the latter part of the fifth year of operations (in 2002), 4 wells were added to the network. At present, each of these 46 wells is monitored on an annual basis, and 28 of these wells are monitored on a semi-annual basis. Monitoring wells are analyzed for chlorinated volatile organic compounds (CVOCs) and benzene, toluene, ethylene, and xylene (BTEX) compounds as part of the performance monitoring program. In May 2013, a subset of 12 wells was also analyzed for 1-4-dioxane. The baseline monitoring event performed in August 1997 included analysis for VOCs, SVOCs, PCBs, and metals.

The most recent complete environmental monitoring round that was available at the time of this Five-Year Review occurred in May 2013. The May 2013 environmental monitoring round was a full monitoring event, including all 46 monitoring wells in the network, as well as sampling of nine (9) residential wells; these data are provided in Appendix F. An evaluation of groundwater data collected during this event revealed detections of COCs that exceed MCLs in 4 overburden monitoring wells (MW-1A, MW-6, MW-7, and MW-12A). None of these MCL exceedances occurred in wells located downgradient of the Tier II extraction wells. A review of bedrock groundwater data revealed MCL exceedances in 8 of the bedrock monitoring wells (MW-1B, MW-9B, MW-12B, MW-11B, MW-13B, JS, JB, and W-6D). Only one of the bedrock monitoring wells (W-6D) where an MCL exceedance was detected was located downgradient of the Tier II extraction wells (See Figure 3). The 2013 groundwater monitoring data were generally comparable to the results from sampling in April 2012.

A quantitative trend analysis has been included in several past annual operations reports to evaluate trends in CVOC concentrations in a subset of Site monitoring wells. However, it was noted in recent years that as the length of time of the monitoring increased, the results of the quantitative analysis began to be biased by more recent results. In several cases, significant concentration declines in early years were ignored by the analysis in favor of small changes in recent years. Because of concerns with the accuracy of the quantitative trend analysis, the RSG requested that trend analysis be performed visually beginning with the Fourteenth Year Operations Report (Weston, 2012). The results of the visual trend analysis of 42 wells, reported in the Fourteenth Year Operations Report, indicated:

- There was a significant downward trend in 4 of the wells (JB, MW-1B, MW-3A, W-5D) where concentrations had decreased but were still detectable.

- No significant trend was detected for CVOC concentrations in 38 of the wells. These wells fall into three general categories: 11 wells, which had measurable concentrations at the start, have declined over time and have been at or near non-detectable concentrations for years; 15 wells where CVOC concentrations have been below detection limits for nearly the entire history of monitoring; and 12 wells that have exhibited fluctuating concentrations – most of these locations had significantly higher CVOC concentrations in the early years of monitoring and now fluctuate at detectable, but much lower concentrations.

- For the third year in a row, none of the monitoring wells exhibited an upward trend.

Nine residential water wells within a 1 mile distance from the site were sampled in May 2013 as part of the annual sampling event. Two VOCs (chloroform and 1,4-dichlorobenze) were detected at concentrations above laboratory reporting limits – each in one residential well sample. In both cases, the detected concentrations were approximately two orders of magnitude below the applicable drinking water standards (MCLs). A review of this round of sampling, as well as a review of residential well sampling results since the baseline sampling event in 1997, revealed very few detections of VOCs in the residential water supplies in the vicinity of the Site, and none approaching federal MCLs.

Groundwater Elevations. Groundwater elevations have been monitored at 65 wells since start-up of the OU3 MOM remedy in 1998. Groundwater elevation measurements were collected monthly for the first two years of operations, and have been collected quarterly since August 2000. An evaluation of groundwater elevation data for Year 14 indicates that the groundwater extraction system, pumping at a combined rate of 35 gpm, continues to capture and contain the dissolved phase contaminant plume as it did before the reduction in pumping rate from 48 gpm.

Surface Water Elevations. Surface water elevations and flow rates have been monitored from ten surface water stations since start-up of the OU3 MOM remedy in 1998. For the first two years of operations, surface water elevations and flow rates were measured monthly from all ten surface water locations. Since August 2000, surface water elevation and flow rate have been measured quarterly at seven locations. An evaluation of current and historical surface water levels and stream flow rates indicates that drawdown from the groundwater extraction system

does not appear to be negatively impacting the wetlands restoration effort. Field observations made during the Site inspection support this determination.

Groundwater Extraction Rates. In 2010, a reduction in the combined groundwater extraction rate from 48 gpm to 35 gpm was approved. Groundwater quality data from 2012 and 2013 and groundwater elevation data presented in the Fourteenth Year Operations Report support the conclusion that the COC contaminant plume continues to be adequately captured at the reduced extraction rate.

DNAPL Well Point Monitoring. In 1993, DNAPL was discovered in a well point located southeast of the present GWTP building during the implementation of the OU1 source control remedy. At the time of the detection, DNAPL was removed (Charbonnier, 2003). Weekly monitoring of the well point for the presence of DNAPL has continued since that time. However, no DNAPL has been observed in this DNAPL well point since January 2000.

Surface Water Quality Monitoring. The surface water quality monitoring program currently consists of annual monitoring at six surface water stations. The baseline surface water monitoring event included analysis for VOCs, SVOCs, PCBs, and metals; the routine annual performance monitoring includes only VOCs. Sample data collected during the most recent monitoring round (August 2012) indicates that vinyl chloride was detected above the reporting limit of 0.5 micrograms per liter (µg/L), and the remaining VOCs were not detected above reporting limits (Weston, 2012). These reporting limits are below the relevant Ambient Water Quality Criteria (AWQC). Generally, the concentrations of VOCs detected in surface water samples collected from each of the sampling stations have decreased since start-up of the OU3 MOM remedy in 1998.

Fish Tissue Monitoring. In 2010, EPA approved a decrease in the required frequency of fish sampling from annually to once every two years. The fish tissue monitoring program consists of sampling from the Copicut River and Cornell Pond for trout, eel, brown bullhead, perch, pickerel, bluegill, and large-mouth bass, which are analyzed for PCBs and percent lipids. However, no specimens of sufficient size of these species have been captured in the Copicut River since the September 2002 sampling event. Samples of bullhead, eel, largemouth bass, yellow perch, and bluegill sunfish were captured from Cornell Pond during the most recent sampling event in

September 2011 and submitted to the laboratory for analysis. No pickerel were caught during the 2011 sampling event.

Results from the September 2011 sampling indicated a range of 0.030 to 1.2 mg/kg PCBs in various fish collected from Cornell Pond (Weston, 2012). An evaluation of PCB concentrations detected in fish tissue samples collected throughout the thirteenth year monitoring period (since start-up of the OU3 MOM remedy in 1998) indicates that very seldom has a fish tissue sample contained PCBs at a concentration that exceeds the FDA action limit of 2 mg/kg PCBs. Samples of American eel that were collected in 2001 and 2005 and large-mouth bass that were collected in 2000 and 2001 exceeded the 2 mg/kg action limit, but sampling results from the most recent event suggest that PCB concentrations in fish tissue from Cornell Pond and the Copicut River are currently below the FDA action limit and have decreased since the RI. The RI fish tissue data was evaluated under the 1987 ROD relative to the potential risks associated with freshwater aquatic life and human health (e.g. ingestion of PCB-contaminated fish) including the FDA action limit. Fish tissue data are presented on Table 7-1.

Wetland Assessment. Subsequent to the OU3 MOM baseline wetland assessment conducted in July 1997, routine assessments have been performed over the intervening years (1998 – 2009). Since the OU3 MOM groundwater treatment system became fully operational in July 1998, there has been no documented evidence of negative impacts on the wetlands. Therefore, there has been no need to implement any of the mitigation measures outlined in the OU3 MOM FOSP (April 1997). The assessments that were performed indicated that the portions of the wetlands that were excavated and restored during the Source Control Remedy continue to mature and prosper. Based on the assessment results, the RSG proposed that the wetlands assessment program be discontinued. EPA approved the proposal in March 2010. June and September 2009 wetlands assessments were the final wetlands assessments conducted at the Site (Weston, 2012).

Treatment Plant Influent and Effluent Sample Collection. Treatment system influent samples have been collected annually for VOCs each April since 2001. Prior to April 2001, influent samples were collected on a monthly basis from January 2000 to March 2001. No treatment influent samples were collected in 1999, and one sample was collected approximately five months after start-up in October 1998. Influent concentrations of total VOCs that have been

measured during operation of the treatment system (1,000 µg/L to 2,100 µg/L) have been well below the design influent concentration of 54,000 µg/L for total VOCs.

Effluent samples have been collected monthly since July 1998 to comply with NPDES permit equivalency requirements. The samples are routinely analyzed for VOCs, SVOCs, PCBs, metals, and total suspended solids. The frequency of effluent sampling increased with the transition to treatment in the ABR System. Process monitoring of the ABR system, including effluent, is conducted in accordance with the Transition and Monitoring Plan (Weston, 2011a). The frequency of effluent monitoring during ABR operation varies from weekly to monthly depending on the operation phase, with greater frequency at the start of operations.

Data from effluent samples that were collected between May 2011 and March 2013 were available for this Five-Year Review. This data showed that no contaminants exceeded reporting limits during the range of time provided. The previous Five-Year Review also reported consistent achievement of discharge standards.

Table 7-1
Fish Tissue Sampling Analytical Summary
Re-Solve, Inc. Superfund Site
North Dartmouth, Massachusetts

Range of PCB Concentrations (mg/kg)	Copicut River	Cornell Pond					
	Brook Trout	American Eel	Brown Bullhead	Pickerel	Large-mouth Bass	Yellow Perch	Blue Gill
Baseline (1997)	0.15 – 0.30	0.42 – 0.84	NC	NC	0.04 – 0.17	0.04 – 0.08	NC
1st Year (1998	0.08 – 0.24	0.24 – 0.69	0.08 – 0.12	NC	0.03 – 0.11	0.02 – 0.04	NC
2nd Year (1999)	0.16 – 0.59	0.51 – 0.76	0.06 – 0.32	0.03 – 0.08	0.06 – 0.22	0.11 – 0.47	NC
3rd Year (2000)	0.05 – 0.47	0.38 – 0.65	0.12 – 0.12	NC	0.03 – 2.20	0.06 – 0.11	NC
4th Year (2001)	0.062	0.44 – 2.09	0.24	NC	0.20 – 2.20	0.20 – 0.37	0.148
5th Year (2002)	0.32	0.26 – 0.36	0.055 – 0.079	NC	0.067 – 0.20	0.073 – 0.10	0.052 – 0.10
6th Year (2003)	NC	0.14 – 0.32	0.059	0.05	0.060 – 0.087	0.051	--
7th Year (2004)	NC	0.05	0.075 – 0.10	NC	0.051 – 0.120	0.059 – 0.085	0.093 – 0.20
8th Year (2005)	NC	0.52 – 6.60	0.08 – 0.110	NC	0.13 – 0.25	0.054 – 0.097	0.05
9th Year (2006)	NC	0.66 – 0.70	0.064 – 0.280	NC	0.098	0.06 – 0.10	0.05

10th Year (2007)	NC	0.24 – 0.84	0.057 – 0.110	NC	0.025– 0.095	0.025– 0.083	0.025– 0.053
11th Year (2008)	NC	0.71 – 0.95	0.073-0.170	NC	0.05 – 0.15	0.72 – 0.80	--
12th Year (2009)	NC	0.1	0.066 – 0.083	NC	--	0.059 – 0.066	0.230 – 0.370
13th Year (2010)	NS	NS	NS	NS	NS	NS	NS
14th Year (2011)	NC	0.052 – 1.2	0.033 – 0.170	NC	0.030 – 0.20	0.041 – 0.058	0.056 – 0.074
15th Year (2012)	NS	NS	NS	NS	NS	NS	NS

-- = not detected

NC = none collected

NS = no samples analyzed

FDA action limit for PCBs = 2 mg/kg

Source: Weston, 2012

Other Treatment Plant Monitoring. The sludge that was generated in the GWTP prior to transition to the ABR system was run through a filter press and tested for total solids, metals, VOCs, and PCBs prior to transport off-site in 55-gallon drums. The drummed filter cake was transported off-site for disposal as non-hazardous, non-TSCA waste.

The phase separator is monitored weekly for DNAPL, but none has been detected.

VOC air emissions from the GWTP air stripper were monitored annually until their concentrations were lowered and no longer required treatment through the GWTP catalytic oxidizer. In 2006, catalytic oxidizer treatment was discontinued. GWTP air emissions monitoring increased when the catalytic oxidizer was removed from service to further monitor VOC emissions. Increased air monitoring included the following: Sampling and Analysis of the Combined Air Stream from the Tank Vent System and the Air Stripper by TO-14; and an increase in the frequency of sampling and analysis to quarterly for the first year, semi-annually for one year thereafter, and then annually thereafter. See EPA's Fourth Five Year Review, dated September 30, 2008.

With the transition to treatment in the ABR system, there is no longer a GWTP air stripper and stack for emissions. The ABR is a generally a closed, passive treatment system (no air stripper) with primary VOC treatment from anaerobic degradation and Granular Activated Carbon (GAC) sorption. Each of the two beds associated with the ABR has a passive air vent. Any VOC releases from the ABR air vents would be minuscule relative to the prior GWTP air stripper

which did not require treatment. The current ABR monitoring plan will collect air samples from each vent during Phase 5 ABR operation and monitoring to determine whether VOCs are being released to the atmosphere. This sampling event is expected to occur by summer 2014. Where appropriate, additional ABR air emissions sampling may be scheduled in the future to further evaluate any potential VOC emissions.

7.1.2 System Operations and Maintenance

The GWTP has operated continuously, with brief shutdowns for repairs and maintenance, and infrequent shutdowns of a few days for events such as when new filter media was added to the multi-media filter vessels, carbon was changed out, and other planned maintenance events. There was a planned shutdown of the groundwater extraction and treatment system from July 3 to July 31, 2012 for completion of transition to the ABR system. The ABR system started full-scale operation on July 31, 2012; the original groundwater treatment system remains off-line.

Chemical usage is tracked and reported on a monthly basis. Variations in usage from month to month have been minor and reflect adjustments to the operation of the system such as improvements in the metals precipitation process, and acid to backwash the multi-media filters. The pH of the effluent is continuously recorded to ensure compliance with the effluent discharge limits. Increases in effluent pH typically seen immediately following carbon changeouts are tracked closely, as is the elevation in arsenic concentrations in the effluent, also associated with new carbon.

The GWTP operated very reliably between 1998 and July 2012. Preventative maintenance was completed routinely by the O&M subcontractor. This resulted in a very effective system that consistently met the effluent and emission limits established during the design effort.

As discussed in Section 5.0, the ABR system has operated consistently since July 31, 2012, albeit with some operational issues. Throughout the operation period, RSG engineers have worked to evaluate the operational issues and identify solutions. Despite the operational issues, the ABR system has consistently achieved the required effluent discharge limits.

7.1.3 Costs of System Operations/O&M

The OU3 MOM 60% Design (M&E, 1994) included an estimate of annual operating costs of approximately $460,000, based on continuous operation at 40 gpm. The components of the estimated costs included labor (34%), sampling and analysis (29%), energy (25%), chemicals and carbon (8%), and sludge disposal (4%). The annual costs for the fourteenth year of operation of the GWTP, ending August 2012, prior to full-scale operation of the ABR system, were approximately $452,340 (Symmes, 2013a). The Year 14 costs are consistent with costs in recent years. The costs for the fifteenth year of operation, beginning just after transition to the ABR system, are estimated to be approximately $427,436. The Year 14 and 15 costs are summarized in the Table 7-2.

Table 7-2
Years 14 and 15 Operations and Maintenance Costs
Re-Solve, Inc. Superfund Site
North Dartmouth, Massachusetts

Cost Item	Year 14 Cost (Pre-ABR)	Percent of Total Annual Cost	Year 15 Estimate (ABR)	Percent of Total Annual Cost
Labor	$ 313,446	69%	$ 300,565	70%
Energy	$ 39,067	9%	$ 37,152	9%
Chemicals/Carbon	$ 36,752	8%	$ 31,119	7%
Sludge Disposal	$ 19,125	4%	$ 2,700	1%
Equipment	$ 28,000	6%	$ 24,000	6%
Analytical	$ 15,950	4%	$ 31,900	7%
Total Cost (approximate)	$ 452,340	100%	$ 427,436	100%

Source: Symmes, 2013a

While the Year 14 labor costs are significantly higher than the labor costs estimated in the OU3 MOM 60% Design (M&E, 1994), the estimated cost for the sampling and analysis may have not included labor for sample collection as well as analysis. The actual labor costs presented above do include sample collection. In addition, the labor associated with preventative maintenance may be higher than that estimated in the design. However, the preventative maintenance appears to result in a well-functioning system with minimal down time.

The post-ABR costs are estimated to be lower than the pre-ABR costs in most categories. The only category with higher costs post-ABR is analytical costs. This is the result of increased

sampling requirements associated with the transition to a new and innovative treatment system. Over time, these costs are expected to decrease to a level closer to that prior to transition to the ABR system. The largest decrease in post-ABR costs was in the sludge disposal category; this savings is anticipated to continue because the ABR system does not require a metals removal process which produces sludge. The energy cost decrease after initiation of ABR treatment was modest. Although the electricity use significantly decreased with transition to the ABR system, the Year 15 energy cost did not decrease similarly because of increased propane use to heat the groundwater in the ABR system during the winter and early spring months. The propane usage is expected to decrease somewhat in future years as heating is optimized through greater reliance on the heating coils within the ABR units (Symmes, 2013b). Similarly, the chemical/carbon usage costs are expected to decrease somewhat as both chemical (caustic) usage and carbon usage are optimized.

7.1.4 Opportunities for Optimization

Since the GWTP began operation in April 1998, a number of minor changes have been made to the system to optimize the operation over time. However, in an effort to maximize the sustainability of groundwater treatment at the Site by reducing energy use and the long term operating costs, and to reduce the environmental impact of the remediation system, a full-scale pilot ABR treatment system and a 150-KW solar photovoltaic system were installed at the Site in 2011.

As discussed in Section 7.1.3 above, the ABR system has significantly reduced the generation of sludge that must be disposed of off-site. However, the reductions in energy and chemical use were more modest. Considering that the Year 15 estimated costs reflect the first year of operation, optimization of various elements of operations should decrease these costs somewhat. One potential significant optimization would be to heat the water on-site using a solar heating system. The RSG has explored this option, but concluded that the economics are not favorable for such a system at this time (Symmes, 2013b).

The installation of solar photovoltaic panels was initiated in October 2011. Installation was completed in December 2011, and commercial operation of the system began in February 2012. The system operates on a net-metering basis such that electricity produced by the solar system that is not used on-Site by the MOM system is supplied to the local electricity grid. The system

generated a total of 177,118 KWH between its start-up in February 2012 through December 2012, slightly more electricity than was used at the Site during that period.

7.1.5 Early Indicators of Potential Remedy Problems

No early indicators of potential remedy problems were identified during the Five-Year Review process.

7.1.6 Implementation of Institutional Controls

Institutional controls that are in place at the Site and the North Access Road Area to maintain the protectiveness of the remedy include:

- Site security systems including fencing, signage, security cameras, and secured gates;

- Deed restrictions on building construction, groundwater extraction, intrusive work beyond 6 inches; residential, agricultural, or other uses of the property that would present an unacceptable risk; and any other activities or uses not consistent with the performance of the remedy.
- Easement and Non-interference Agreements on both properties allowing access for the purposes of implementing and monitoring the remedy and prohibiting interference with the remedy.

In addition, institutional controls that are in place on adjacent properties owned by Mr. and Mrs. John Reed (Easement Areas I and II) and the Rod and Gun Club of New Bedford (Appendix B) include:

- Easement and Non-interference Agreements on the Reed properties allowing access for the purposes of implementing and monitoring the remedy and prohibiting interference with the remedy. Unauthorized well installation and groundwater extraction in these areas would be considered interference with work under the Consent Decree.

- Easement, Restriction, and Non-interference Agreement on the Rod and Gun Club property allowing access for the purposes of implementing and monitoring the remedy, prohibiting groundwater extraction, and prohibiting interference with the remedy.

Observations made during the Site inspection indicate that the fencing at the perimeter of the Site is in very good condition and is marked with warning signs. All gates are locked during the day, except for the main entrance gate which is left unlocked when treatment system personnel are on Site. No evidence of trespassing was observed during the inspection or reported by the plant O&M staff. An inspection of the Site and interviews with Site O&M personnel produced no evidence to suggest that Site groundwater is being used in any way that is in violation of the deed restriction that has been placed on the Site.

7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of the Remedy Selection Still Valid?

No, the exposure assumptions and toxicity data used at the time of the remedy selection are no longer valid. Toxicity values, exposure assumptions, exposure pathways to be considered, and methods of evaluating risk have changed since the time of the remedy selection. Potential dermal contact with groundwater used as a household water source, inhalation of VOCs during household water use, incidental ingestion of surface water and sediment, inhalation of dust, and the vapor intrusion pathway were not evaluated. Potential residential exposures to contaminated soil remaining at the residentially zoned areas of the Site at the North Access Road Area and South Gap Area (see Figure 2) were not evaluated prior to the ROD. Soil cleanup levels used at the time of the remedy selection for PCBs are no longer valid. Groundwater cleanup levels used at the time of the remedy selection for VOCs (MCLs) remain valid for the contaminants identified as indicator contaminants in the ROD for the protection of future use of groundwater as drinking water, but are not designed to be protective of potential vapor intrusion exposures.

Despite changes that have occurred to make the exposures assumptions, toxicity data, and certain clean-up levels used at the time of the remedy selection no longer valid, the RAOs used at the time of the remedy selection are still valid. Deed restrictions and/or non-interference agreements are in place prohibiting use of groundwater as drinking water at the WMA, the North Access Road Area, the New Bedford Rod and Gun Club property, and the Reed properties located northwest and southeast of the WMA (Easement Areas I and II on Appendix B). Groundwater is not used as drinking water at the Site or these adjacent properties, located primarily downgradient of the WMA. Groundwater is used for drinking water at nearby

residential properties located west, northwest, and southwest of the WMA (Figure 2); however these properties are located upgradient and cross-gradient of the WMA relative to groundwater flow. As discussed in Section 7.1.1, sampling of nine nearby residential water wells in May 2013 detected only very low concentrations of two VOCs (chloroform and 1,4-dichlorobenze) at concentrations well below the applicable drinking water standards (MCLs). A review of this and previous rounds of residential well sampling revealed very few detections of VOCs in the residential water supplies in the vicinity of the Site, none approaching federal MCLs.

Evaluation of 2013 and 2012 shallow groundwater data from monitoring wells between the Site and off-site buildings confirms that groundwater does not pose a potential risk via the vapor intrusion pathway (as further described below). Evaluation of residential risks to soil at the South Gap Area indicates no restrictions are needed at the South Gap Area to protect human health. Institutional controls, including signs, fencing, deed restrictions and non-interference agreements on the Site and on neighboring (mainly downgradient) properties, intended to prevent current and future residential exposures to soils and groundwater in this area, appear to be effective in restricting human contact with contaminated media (groundwater, soil, surface water, sediment, and fish) at the Site.

Changes in Exposure Pathways. The ROD identified exposure scenarios for existing Site conditions and potential Site development conditions (residential). The primary routes of human exposure to contamination that were identified at the time of the ROD, and that are applicable after the removal of most PCB-contaminated soils and sediments, were inhalation of VOCs released from surface water, dermal contact with surface water, and human ingestion of fish. The primary route of human exposure identified under potential Site development conditions was the ingestion of on-site groundwater.

Soils. Contaminated soils located at the North Access Road Area and South Gap Area were excavated as part of the source-control remedy; however, some soils contaminated with PCBs were detected in post-excavation confirmatory sampling at levels below action limits (e.g., the highest level at the North Access Road Area was 22 ppm). Property at both areas is zoned residential. An 18-inch gravel cap has been placed over the contaminated soils at the North Access Road Area. No cap was placed at the South Gap Area. Risks from potential future exposures in these areas were not originally evaluated; however, in the 2008 Five-Year Review, calculations were done for future residential risks from dermal and ingestion exposures to the

contaminated soils at each of these areas. Results indicated that cancer risks were within the EPA's target cancer risk range at both areas and that no adverse non-cancer human health effects were anticipated for future residents or other receptors at the South Gap Area. The non-cancer hazard indices for future residents at the North Access Area exceeded the target hazard index of 1. This indicates a potential for adverse non-cancer health effects for future residents at the North Access Road Area. In response to this evaluation, a deed restriction and non-interference agreement was recorded for the North Access Road property on September 28, 2011, prohibiting residential, agricultural, or other uses that may present an unacceptable risk to human health and, except for purposes of the remedial actions, prohibiting groundwater extraction, excavation or disturbance of surface material covers, and construction of structures. The current conditions at the North Access Road Area are considered protective in the short-term because the area is not currently used as a residential property and because of the presence of the gravel cap and access-limiting fencing. The 2011 deed restriction provides protection in the long-term against future exposures at the North Access Road Area. Because of the lack of risks, no restrictions are needed at the South Gap Area to protect human health.

Vapor. The vapor intrusion pathway was not evaluated in the original public health evaluation of the Draft Off-site Remedial Investigation Supplement (Camp Dresser & McKee, 1987). Groundwater clean-up goals for the Site (MCLs) are based on drinking water exposures. Drinking water standards used as clean-up levels are not designed to be protective of the vapor intrusion pathway.

The 2008 Five-Year Review provided an evaluation of the vapor intrusion pathway, utilizing the approach presented in EPA's OSWER *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (EPA, 2002). This approach included a comparison of Site groundwater monitoring well data versus target groundwater concentrations from the guidance or (for those contaminants without concentrations in the guidance) calculated target groundwater concentrations for the protection of residential indoor air. Based on that comparison, the 2008 Five-Year Review recommended analysis to lower detection limits at perimeter wells to ensure that contaminant detection limits are sufficiently low as to allow evaluation of the vapor intrusion pathway. In subsequent sampling, the RSG used analytical methods that achieved lower detection limits.

Since the 2008 Five-Year Review, EPA has developed the *Vapor Intrusion Screening Level (VISL) Calculator* (EPA, 2012), using updated toxicity factors, as a follow-up to the 2002 Vapor Intrusion Guidance. The calculator can be adjusted by the user to choose the receptor of interest and the desired risk level. Comparison of May 2013 as well as 2012 monitoring well groundwater data to residential VISLs based on $1x10^{-6}$ cancer risk or hazard quotients of 1.0 indicate that vapor intrusion is not a concern beyond the boundaries of the Site. The only exceedances of VISLs were identified at interior wells. Exceedances were not present at any of the perimeter wells. Further, all residences situated in the vicinity of the Site are located upgradient or cross gradient of the WMA, therefore, the higher concentrations present in the interior of the Site could not migrate toward the residences. The VISLs used for this comparison are shown on Table 7-3.

Table 7-3
EPA Residential Vapor Intrusion Screening Values
Re-Solve, Inc. Superfund Site
North Dartmouth, Massachusetts

Chemical	Target Indoor Air (10^{-6} risk) (µg /m^3)	Target Soil Gas Concentration (AF=0.1) (µg /m^3)	Target Groundwater Concentration (µg /L)
Tetrachloroethene (PCE)	9.4E+00	9.4E+01	1.3E+01
Trichloroethene (TCE)	4.3E-01	4.3E+00	1.1E+00
Vinyl chloride	1.6E-01	1.6E+00	1.4E-01

Assuming Shallow Soil Gas to Indoor Air Attenuation Factor =0.1
µg/m^3 – micrograms per cubic meter

In evaluating the vapor intrusion pathway, the following considerations have guided the inquiry:

- institutional controls are in place that prevent building construction, groundwater extraction, excavation beyond six inches deep, and residential development on the original Re-Solve, Inc., property;

- groundwater flow direction is to the east/southeast towards the Copicut River and extensive wetlands and away from occupied off-site buildings;

- dissolved contaminants in groundwater undergo attenuation processes such as dilution, dispersion and degradation;

- shallow overburden monitoring wells between the Site and off-site buildings/dwellings have historically been non-detect with low detection limits (0.5 µg/L – 2 µg/L) and continue to be non-detect with current low detection limits of (0.5 µg/L – 1 µg/L); and

- the distance from these monitoring wells to the off-site buildings ranges between 100 feet and 200 feet). Since the buildings are up-gradient and cross-gradient of the WMA and of these monitoring wells, the groundwater near the buildings should be less impacted than the groundwater at these monitoring well locations, and Site groundwater contamination could not migrate toward the residences.

Since the vapor intrusion risk-based screening levels for TCE (1.1 µg/L) and PCE (1.3 µg/L) are higher than the detection limits for TCE and PCE (0.5 µg/L for each), and TCE and PCE have not been detected in the monitoring wells between the Site and off-site buildings, it is certain that TCE and PCE do not pose an unacceptable inhalation risk. Of minor consideration is the observation that detection limits for vinyl chloride (0.5 µg/L) slightly exceed the $1x10^{-6}$ cancer risk-based screening level of 0.14 µg/L for residential exposures via the vapor intrusion pathway at all wells. Vinyl chloride was not been detected in the monitoring wells between the Site and off-site buildings (all results were non-detect with a detection limit of 0.5 µg/L). Therefore, the potential cancer risk can be no greater than $3.6x10^{-6}$ for vinyl chloride at these well locations. These potential risk levels are well below the site-specific risk level of $1x10^{-5}$ used in the development of the Site remedy. Therefore, any potential vinyl chloride vapor intrusion exposures would not pose an unacceptable risk.

<u>Institutional controls.</u> Site fencing, signage, land access restrictions, deed restrictions, and non-interference agreements have been established as required by the ROD, Consent Decree, and SOW (see Section 4.3). These institutional controls appear to be largely effective in restricting human contact with contaminated media (groundwater, surface water, sediment, and fish) at the Site. The Site is fenced with barbed wire and secured gates, with warning signs present along the entire length of the fence line. Security cameras are mounted on the outside of the treatment building and provide surveillance of the WMA property from a monitor located in the building's control room. Deed restrictions are on file at the Bristol County Registry of Deeds,

prohibiting building construction, groundwater extraction, excavation beyond six inches deep, and residential development at the original Re-Solve, Inc. property and separately for the North Access Road Area. Restriction and/or Non-interference Agreements are in place for adjacent Reed properties (Easement Areas I and II) and the Rod and Gun Club of New Bedford property prohibiting groundwater extraction and interference with the remedy. Observations made during the Site inspection and records review indicate that these controls in place on the WMA and adjacent properties are intact and effective at eliminating human exposure pathways that could impact the protectiveness of the OU3 MOM remedy.

Changes in Land Use. Land use in the vicinity of the Site is still residential in nature, zoned by the Town of Dartmouth as Single Residence B, SRB. This land use is consistent with prior zoning and the assumptions of the ROD.

New Contaminants and/or Contaminant Sources. No new contaminant sources have been identified since start-up of the OU3 MOM remedy. However, a new contaminant, 1,4-dioxane, has been identified. This emerging contaminant is not included in the VOC analyte list for the long-term monitoring analysis. However, EPA requested that a subset of the Spring 2013 groundwater samples be analyzed for 1,4-dioxane in order to evaluate its presence. Samples collected from twelve monitoring wells located along the center-lines of the contaminant plume in May 2013 were analyzed for 1,4-dioxane. Sampling results detected low concentrations of 1,4-dioxane in groundwater at five of the twelve monitoring wells. The maximum concentration of 3.2 µg/L was detected at MW-14B, a bedrock monitoring well located approximately 100 feet east of the Tier 2 Recovery Well 8 (RW-8). The concentrations detected at the other four monitoring wells were below 0.3 µg/L. This maximum concentration (3.2 µg/L) exceeds the Massachusetts Office of Research and Standards Guidelines (ORSG) value of 0.3 µg/L. However, this maximum concentration equates to a 5×10^{-6} cancer risk level, which is below the ROD (p. 2 and 51) groundwater cancer risk cleanup standard of 1×10^{-5}. MW-14B is located within the estimated Tier II capture zone (Figure 3.3 from Year 14 report). The most recent valid VOC analysis from MW-14B (November 2011, November 2010, and May 2010) documented all VOCs below MCLs at very low concentrations (e.g. TCE ranging from 0.40 – 0.45 µg/L, vinyl chloride ranging from 0.27 – 0.44 µg/L, cis1,2-DCE ranging from 4.5 – 4.9 µg/L) (14th Year Operations Report, November 2012; 13th Year Operations Report, October 2011). There is currently no federal or state MCL for 1,4-dioxane.

Changes in Standards or Newly Promulgated Standards. As part of this Five-Year Review, ARARs for the Site presented in the ROD were reviewed, and a review of current ARARs was conducted. With respect to the completed OU2 source control remedy, soil- and sediment-specific ARARs cited in the ROD (and those that were added in the ESD) have been met. However, since the 1987 ROD and 1993 ESD, EPA has promulgated a new standard for remediation of PCBs (40 C.F.R. § 761.61). The new standard sets a presumptive cleanup standard of 1 ppm for soil cleanups in high occupancy areas, 25 ppm for low occupancy areas, and 50 ppm for low occupancy areas with certain fencing and signage. Alternatively, under the standard, PCB contamination above these limits may be left in place beneath caps meeting certain design specifications, or different numerical limits may be used at a particular site based on a site-specific risk assessment approved by EPA. Although the original 25 ppm cleanup standard was set based on a site-specific risk assessment, this standard may no longer be protective over the long term given potential residential and other uses of certain parts of the Site. Accordingly, a deed restriction and non-interference agreement was recorded for the North Access Road property on September 28, 2011, prohibiting residential, agricultural, or other uses that may present an unacceptable risk to human health, groundwater extraction, excavation or disturbance of surface material covers, and construction of structures. The 2011 deed restriction provides protection in the long-term against future exposures. Such restrictions were already in place for the WMA.

ARARs identified in the 1987 ROD and current ARARs that are applicable to the OU3 MOM remedy include the following:

- Resource Conservation and Recovery Act (RCRA),
- Toxic Substances Control Act (TSCA),
- Clean Water Act (including NPDES, AWQC, Best Available Technology (BAT))
- Executive Order 11990 (Protection of Wetlands),
- Safe Drinking Water Act (including MCLs and wetland protection), and
- Clean Air Act.

RCRA and *TSCA* are the applicable regulations that were used to determine the proper disposal procedures for filter cake that accumulates from the filter press or for disposal of spent carbon from the vapor-phase carbon adsorption units. With the transition of treatment to the full-scale ABR system, these regulations determine disposal procedures for liquid phase carbon

adsorption units. DNAPL, if recovered, would also be subject to the disposal requirements established by RCRA (and TSCA, if PCBs were present). As mentioned in Section 7.1.1 (Other Treatment Plant Monitoring), no DNAPL has been collected from the phase separator since the GWTP has been in operation. DNAPL removed from the well point located immediately southeast of the treatment plant facility has been collected and disposed of in accordance with RCRA and TSCA regulations. As indicated in Section 7.1.1, no DNAPL has been found in the well point since January 2000. These regulations, as currently constituted, continue to maintain the protectiveness of the remedy.

The *Clean Water Act* is the statutory basis for the NPDES permit program, which determines the maximum allowable effluent discharge limits for water treated on-site. The NPDES permit equivalency limits that are being used were developed in 1998 shortly after the second Five-Year Review for the Site. These limits were calculated using a system flow rate of 50 gpm, with AWQC and BAT limits as the basis for the calculation of permit equivalency limits. Although the system flow rate has been reduced to 35 gpm, the calculated permit equivalency limits are expected to remain applicable.

The AWQC (now known as National Recommended Water Quality Criteria) that are applicable to the Site include fresh water Criteria Maximum Concentrations (CMCs), fresh water Criteria Continuous Concentration (CCC), and human health criteria based on the consumption of fish. EPA updated the AWQC, which were used to develop equivalency limits for inorganic contaminants, in 2009 (EPA, 2009). Changes to the AWQC for inorganic contaminants since 1998 were identified in the 2008 Five-Year Review. No further changes have occurred that are applicable to contaminants at this Site. Therefore, the NPDES permit equivalency limits being used for inorganic contaminants in effluent are assumed to be protective of human health and the environment.

BAT limits were used as the basis for the development of discharge permit equivalency limits for most of the organic contaminants for which limits were established. The previous Five-Year Review indicated that BAT limits for VOCs and SVOCs that are included in the effluent sampling data have not changed since 1995. Current BAT limits for direct discharge point sources that do not use end-of-pipe biological treatment (40 CFR 414 - Organic Chemicals, Plastics, and Synthetic Fibers) were unavailable at the time of this Five-Year Review. Since it is assumed that BAT limits have remained unchanged since inception of the OU3 MOM remedy, the permit

equivalency limits being used to evaluate organic contaminant levels in effluent originating from the GWTP remain protective of human health and the environment.

The NPDES permit equivalency limit used to evaluate the concentrations of PCBs in effluent was lowered from 0.5 µg/L to 0.004 µg/L following the 2003 Five-Year Review, based on the publishing of a lower AWQC for PCBs in 2002 and the improved ability of commercial laboratories to report lower detection limits. The current AWQC for human consumption of fish for PCBs remains at the 0.000064 µg/L level established in 2002. The discharge from the MOM treatment system is tested semi-annually using Method 1668A. The resulting concentration was below the 0.004 µg/L limit each time in Year 14.

The *Clean Water Act* and *Executive Order 11990* are the applicable regulations that provided the guidelines for excavation in wetlands and the subsequent restoration of wetlands. No new or modified requirements are contained within these regulations that impact the protectiveness of the OU3 MOM remedy.

The *Safe Drinking Water Act* is the legislation that enabled the establishment of MCLs, which are the relevant and appropriate regulations for groundwater located outside of the boundaries of the WMA. No new or modified MCLs have been established for Site indicator compounds since the last Five-Year Review, so the protectiveness of the remedy is not affected.

The *Clean Air Act* was an ARAR established in the ROD that served primarily to regulate air emissions from the on-site thermal desorption unit used during the source control remedial action and to establish contaminant loading limits for air emissions from the catalytic oxidizer during the MOM remedy. Although the catalytic oxidizer was no longer in use during this Five-Year Review period, until July 2012, air emissions were still generated through the air stripper and monitored in accordance with EPA's approval to disconnect the catalytic oxidizer. Compliance with this ARAR continued to maintain the protectiveness of the remedy while the air stripper was in operation.

With the transition to treatment in the ABR, there is no longer a GWTP air stripper and stack for emissions. The ABR is a generally a closed, passive treatment system (no air stripper) with primary VOC treatment from anaerobic degradation and GAC sorption. Each of the two beds associated with the ABR has a passive air vent. Any VOC releases from the ABR air vents

would be minuscule relative to the prior GWTP air stripper emissions which did not require treatment. The current ABR monitoring plan will collect air samples from each vent during Phase 5 ABR operation and monitoring to determine whether VOCs are being released to the atmosphere. This sampling event is expected to occur by summer 2014. Where appropriate, additional ABR air emissions sampling may be scheduled in the future to further evaluate any potential VOC emissions or clean air act compliance.

Changes in Toxicity and Other Contaminant Characteristics. EPA recommended toxicity values for several of the indicator contaminants (most recently methylene chloride, TCE, and PCE) have changed since the 1987 ROD. However, chemical-specific concentration thresholds used to assess the risk associated with contaminants present at or in the vicinity of the Site include MCLs, NPDES permit equivalency limits, and FDA action limits for PCBs in fish. MCLs were used as clean-up goals for protection of exposures through ingestion of groundwater as drinking water, rather than using the risk evaluation to develop site-specific goals. Therefore, changes in toxicity or other contaminant concentrations would not impact the protectiveness of the remedy for these potential exposures since a site-specific risk evaluation was not used to develop the concentration threshold. NPDES effluent limits were recalculated in 1998 shortly after the 1998 (second) Five-Year Review report using 50 gpm as the system flow rate. The most recent procedures established by the NPDES permit program recommended and implemented changes to the limits for PCBs following the 2003 (third) Five-Year Review. No further changes to limits for PCBs are necessary. The current NPDES effluent limits are considered protective of human health and the environment.

The 1987 ROD selected the PCB 1 ppm sediment cleanup standard based upon the following factors: range of PCB sediment concentration associated with adverse impacts to benthic organism; location and concentration of PCB contamination; and adverse environmental impacts. In addition, the 1987 ROD also conducted a separate evaluation of human health potential risks associated with ingestion of PCB-Contaminated Fish. The risk evaluation was used as a basis for action, but was not used directly in determining cleanup standards for sediment. The recent fish tissue PCB levels (Table 7.1) demonstrate significant reduction of PCB level in fish (i.e. an order of magnitude lower) when compared with historic Remedial Investigation PCB levels in fish (e.g. Eel @ 20 ppm, Brown Bullhead @ 1.1 ppm). The reduction in PCB concentration in fish tissue, in conjunction with the MassDPH fishing advisories in place for PCBs and mercury have likely resulted in a reduction in human health

risk due to fish ingestion. However, because risk assessment methods for fish consumption have changed since the 1987 ROD, the degree of risk reduction is not known. In the future, it is recommended that the human health risk associated with ingestion of PCB-contaminated fish be evaluated further with current risk evaluation procedures and assumptions (including consumption habits and yields from the water body) in order to fully document the degree of risk reduction. The current biannual fish monitoring program associated with the cleanup will continue to collect and monitor fish.

Since 1987, EPA has issued guidance (EPA RAGS F, 2005) recommending use of inhalation unit risk factors and reference concentrations as inhalation toxicity factors for evaluating inhalation exposures, rather than inhalation cancer slope factors and inhalation reference doses, which were used prior to the ROD to evaluate inhalation of VOCs released from surface water. As noted above, vapor intrusion was not evaluated. However, evaluation of recent overburden groundwater monitoring samples from the perimeter of the Site utilizing updated toxicity information indicates vapor intrusion is not a concern at this time and is not anticipated to be a concern in the future.

Changes in the toxicity values used to evaluate risks from PCBs have occurred since the ROD. However, these were incorporated into the evaluation of PCB risks for the North Access Road Area and South Gap Area in the 2008 Five-Year Review. No changes in PCB toxicity information have occurred since those 2008 evaluations.

Changes in Risk Assessment Methods. Subsequent to the draft Off-site Remedial Investigation Supplement (Camp Dresser & McKee, 1987) and the 1987 ROD, changes have occurred in the formulas used to calculate dermal and inhalation risks from exposures to groundwater during household water use, and the methods for evaluating the vapor intrusion pathway and fish ingestion. However, since the target cleanup levels for groundwater outside of the WMA were based on MCLs rather than site-specific risk-based concentrations, changes in risk assessment methods would not affect the protectiveness of the remedy for exposures to groundwater used as drinking water.

As noted above, the vapor intrusion pathway evaluation of recent overburden groundwater monitoring samples from the perimeter of the Site indicates vapor intrusion is not a concern.

As also noted above, risk assessment methods for fish consumption have changed since the 1987 ROD, and the degree of risk reduction is not known. In the future, it is recommended that the potential human health risk associated with ingestion of PCB-contaminated fish be evaluated further with current risk evaluation procedures and assumptions (including consumption habits and yields from the water body) in order to fully document the degree of risk reduction.

Expected Progress Toward Meeting RAOs. The OU1 and OU2 source control remedies successfully removed PCB-contaminated soils and sediments above action levels, as documented in the September 1987 USACE Final Report, February 1996 OU2 Source Control Remedial Action Report, and August 1998 Preliminary Close Out Report. And institutional controls prevent building construction, groundwater extraction, excavation beyond six inches deep, and residential development at the original Re-Solve, Inc. property as well as the North Access Road Area.

Source Control. The following is a summary of the remedial response objectives for the OU2 Source Control remedy (the OU1 remedy was terminated and superseded by OU2) that were established in the ROD with a brief assessment of the progress that has been made towards meeting these objectives.

Prevent or mitigate the continued release of hazardous substances, pollutants and contaminants to the overburden and bedrock groundwater aquifers and to the wetlands, the unnamed tributary, Copicut River and Cornell Pond. The OU1 remedy removed approximately 15,000 cubic yards of PCB-contaminated soils and sediments. The OU2 remedy removed, treated and backfilled approximately 36,000 cubic yards of PCB-contaminated soils and sediments, remediated and restored approximately 1 acre of wetlands (i.e., North and East Wetlands), and installed an 18-inch gravel cap.

Reduce risks to human health associated with direct contact with contaminants in surface and sub-surface soils and sediments. PCB-contaminated soils above action levels were removed, treated to average PCB concentration of 2.8 ppm, and backfilled and capped on-site with 18 inches of gravel. Institutional controls also prevent building construction, groundwater extraction, excavation beyond six inches deep, and residential development at the

original Re-Solve, Inc. property as well as the North Access Road Area. These restrictions are considered protective in the long-term.

Reduce risks to freshwater aquatic life associated with contact with PCB contaminated sediments and subsequent bioaccumulation. Freshwater aquatic life includes both sediment dwelling organisms and those at higher trophic levels. The OU2 remedy removed PCB-contaminated sediments above action levels from adjacent wetlands (i.e., North and East Wetlands), and successfully restored the wetlands.

Reduce the volume, toxicity or mobility of hazardous substances, pollutants and contaminants. The OU2 remedy significantly reduced the volume and mobility of PCB-contaminated soils and sediments through the X*TRAX low-thermal desorption treatment process. Soils contaminated with PCBs were significantly reduced to an average concentration of 2.8 ppm.

Management of Migration. The following is a summary of the remedial response objectives for the OU3 MOM remedy that were established in the ROD with a brief assessment of the progress that has been made towards meeting these objectives.

Reduce risks to human health associated with dermal contact and subsequent absorption with surface water, ingestion of groundwater and inhalation of volatiles released from groundwater and surface water. Analytical results from surface water samples collected as part of the OU3 MOM environmental monitoring program have demonstrated a substantial decrease in VOCs since implementation of the remedy. Implementation of the source control remedy and operation of the OU3 MOM remedy have had a positive impact on the quality of surface water in the vicinity of the Site, and the risks to human health from dermal contact or inhalation of VOCs appear to have been considerably reduced.

Since the OU3 MOM system began operations, the treatment system has substantially reduced VOC concentrations in overburden and modestly reduced VOC concentrations in bedrock, based upon the May 2013 groundwater data. Among the overburden monitoring wells, 4 wells (MW-1A, MW-6, MW-7, and MW-12A) had VOC concentrations exceeding MCLs. Some of these wells have exhibited fluctuations with VOC concentrations. None of these MCL exceedances occurred in wells located downgradient of the Tier II extraction wells. Among the

bedrock wells, 8 wells (MW-1B, MW-9B, MW-12B, MW-11B, MW-13B, JS, JB, and W-6D) had VOC concentrations exceeding MCLs. Only one of these bedrock wells (W-6D) was located downgradient of the Tier II extraction wells. TCE was present in this well, located east of the Copicut River, at a concentrations 10 µg/L (compared to an MCL of 5 µg/L). The nearest downgradient residential dwelling from W-6D is situated approximately two thousand feet (2,000') to the southeast.

A new contaminant, 1,4-dioxane, has been identified in Site groundwater. This emerging contaminant is not included in the VOC analyte list for the long-term monitoring analysis. However, samples collected from 12 monitoring wells located along the center-line of the contaminant plume in May 2013 were analyzed for 1,4-dioxane. Sampling results detected low concentrations of 1,4-dioxane in groundwater at five of the 12 monitoring wells. The maximum concentration of 3.2 µg/L was detected at MW-14B, a bedrock monitoring well located approximately 100 feet east of RW-8, near the edge of the estimated Tier II capture zone. The concentrations detected at the other four monitoring wells were below 0.3 µg/L. This maximum concentration (3.2 µg/L) exceeds the Massachusetts Office of Research and Standards Guidelines (ORSG) value of 0.3 µg/L. However, this maximum concentration equates to a 5×10^{-6} cancer risk level, which is below the ROD (p. 2 and 51) groundwater cancer risk cleanup standard of 1×10^{-5}. There is currently no federal or state MCL for 1,4-dioxane.

Despite the presence of contaminants in some monitoring wells that are above MCLs, no evidence was encountered during this fifth Five-Year Review to suggest that human exposure to contaminants through ingestion or inhalation of VOCs during household water use is occurring. Analytical results of groundwater samples that were collected from residential water wells in the vicinity of the Site showed two VOCs (chloroform and 1,4-dichlorobenze) detected at concentrations above laboratory reporting limits – each in one residential well sample. In both cases, the detected concentrations were approximately two orders of magnitude below the applicable drinking water standards (MCLs). A review of the recent and historical residential well sampling results, revealed very few detections of VOCs in the residential water supplies in the vicinity of the Site, none approaching federal MCLs. Also, institutional controls appear to be effective in preventing the use of groundwater beneath the Site for any purpose. As discussed above, groundwater data collected from overburden monitoring wells between the Site and off-site building had detection limits slightly higher than inhalation risk-based screening values for

vinyl chloride. However, based on distance to nearest residences, groundwater flow direction, and expected attenuation, vapor intrusion is not identified as a concern.

Eliminate or minimize the threat posed to public health and the environment from the current and potential future extent of contaminant migration in groundwater and surface water. This objective was intended to restore the groundwater in both the overburden and bedrock aquifers beyond the WMA to drinking water standards. The GWTP was designed to remediate the dissolved phase VOC plume in the overburden aquifer while minimizing the mobility of DNAPL, encountered on the Site during implementation of the source control remedy.

Based on data collected over the first fifteen years of operation, it appears that the OU3 MOM groundwater extraction well network is controlling the migration of contaminated groundwater beyond the WMA. The groundwater treatment systems have been successfully treating dissolved phase VOCs in the overburden. While a complete review and evaluation of the hydrogeological assumptions is beyond the scope of the Five-Year Review, a hydraulic capture assessment was performed by the RSG before the reduction in the extraction rate was approved by EPA in 2010. The estimated capture zone is shown on Figure 3. Based on an evaluation of recent groundwater quality data relative to the estimated capture zone, it appears that the groundwater extraction and treatment system is successfully capturing the groundwater that has been impacted by the Site. DNAPL delineation studies performed in 1993, 1999, and 2002 and recent monitoring data suggest that the DNAPL areas at the Site have not expanded or migrated significantly over the past fifteen years (Weston, 2012-Yr 14 rpt).

An environmental monitoring program, including collection of groundwater, surface water, residential well water, and fish samples, continues on a schedule approved by the agencies to assess the effectiveness of the OU3 MOM remedy in meeting the ROD-specified RAOs. By restricting the migration of VOC-contamination through the groundwater extraction system and treating dissolved phase contamination via the GWTP, the OU3 MOM remedy appears to be working towards achieving the objective of eliminating the threat to human health and the environment from groundwater and surface water.

***Maintain air quality at protective levels for on-site workers and the public during site remediation*.** The O&M staff is 40-hour health and safety trained and medically monitored

under Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard, and occupies the treatment plant building during regular business hours, five days per week. Operation and maintenance of the groundwater treatment system represents the greatest potential risk for human exposure to hazardous air emissions. No evidence was encountered during the Five-Year Review to suggest that harmful exposures are occurring in the treatment building. Air quality was monitored daily (using a photoionization detector) within the treatment building for the first month of operations and was determined to be satisfactory. Since then, real-time monitoring of air inside the treatment building occurs only during maintenance events for which air monitoring is required (i.e., confined space entry). The O&M contractor indicated that this has occurred approximately twice yearly, and indoor air quality has never triggered any concern. Additionally, potential for exposure to air emissions has decreased since the air stripper went off-line and the ABR system began treating groundwater.

7.3 Question C: Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No. No new information has become available that could impact the protectiveness of the remedy.

7.4 Technical Assessment Summary

The OU1 and OU2 source control remedies successfully removed PCB-contaminated soils and sediments above action levels, as documented in the September 1987 USACE Final Report, February 1996 OU2 Source Control Remedial Action Report, and August 1998 Preliminary Close Out Report. Institutional controls on the WMA and North Access Road properties (see Section 4.3) prevent building construction, groundwater extraction, excavation beyond six inches deep, and residential development at the original Re-Solve, Inc., property. These controls provide long-term protection from exposure to PCB-contaminated soil and sediment remaining in these areas.

Based on a recent and historical groundwater monitoring data and trend analysis of contaminant levels in monitoring wells and treatment system influent performed by the RSG, the OU3 MOM remedy appears to be generally decreasing the concentration of dissolved VOCs in groundwater located within the environmental monitoring and extraction well network. The trend

analysis of historical groundwater monitoring well results has shown that contaminant concentrations observed in more than half of the wells evaluated (27 of 42) have decreased since startup of the remedy. Fifteen wells have shown contaminant concentrations below detection limits for the entire monitoring program.

Fluctuating contaminant levels that have been observed at several monitoring wells suggest that a continuing source of DNAPL exists in groundwater beneath the Site. However, DNAPL delineation studies performed in 1993, 1999, and 2002 and recent monitoring data suggest that the DNAPL areas at the Site have not expanded or migrated significantly over the past fifteen years (Weston, 2012).

A reduction in dissolved VOC concentrations in groundwater and effective capture of the groundwater plume by the extraction system appears to have reduced the discharge of contaminants to the Copicut River. Sample data collected during the most recent monitoring round (August 2012) indicates that vinyl chloride was the only VOC detected above the reporting limit (0.5 µg/L) (Weston, 2012). The reporting limits for all of the VOCs monitored are below the relevant AWQC. Generally, the concentrations of VOCs detected in surface water samples collected from each of the sampling stations have decreased since start-up of the OU3 MOM remedy in 1998. A decrease in contaminant concentrations in fish tissue sampled as part of the environmental monitoring program since the RI also supports the conclusion that the remedy is helping to improve environmental conditions in surface water bodies that have been negatively impacted by Site contamination.

Based on an evaluation of recent groundwater quality data relative to the estimated capture zone developed by the RSG for the revised 35 gpm extraction rate, it appears that the groundwater extraction and treatment system is successfully capturing the groundwater that has been impacted by the Site.

A full-time O&M technician is on-site to monitor the performance of the groundwater treatment system and anticipate complications that may compromise the performance of the system. A preventative maintenance schedule has been established, and the O&M contractor has demonstrated the ability to deal effectively and expeditiously with non-routine maintenance issues. O&M costs have generally fallen in line with projections that were made during the 60% design phase of the project. Transition to the ABR system changes the O&M requirements;

however, based on past performance, the effectiveness of the O&M technician to monitor performance and perform required maintenance is expected to remain consistent.

The exposure pathways and land use assumptions that were stated in the ROD are still valid. Land use at and in the vicinity of the Site is consistent with prior zoning and the assumptions of the ROD. Institutional controls appear to be effective in preventing unacceptable access and uses of the original Re-Solve, Inc. property and the adjacent properties on which controls have been placed and in preventing use of the groundwater on these properties.

Comparison of May 2013 monitoring well groundwater data to residential VISLs based on $1x10^{-6}$ cancer risk or hazard quotients of 1.0 indicate that vapor intrusion is not a concern beyond the boundaries of the Site. The only exceedances of VISLs were identified at interior wells. Exceedances were not present at any of the perimeter wells. Further, all residences situated in the vicinity of the Site are located upgradient or cross gradient of the WMA. Therefore, the higher concentrations present in the interior of the Site could not migrate toward the residences.

In summary, the groundwater treatment appears to be effective in capturing and treating the dissolved phase VOC plume and minimizing the mobility of DNAPL, all of which appears to be improving the quality of surface water, groundwater, and fish tissue sampled downgradient of the Site. The system is able to do this at a flow rate that does not compromise the restored wetlands by lowering groundwater and surface water levels, and for a cost that falls within a reasonable range of projections. Evaluation of recent groundwater monitoring well data with low detection limits indicates that vapor intrusion is not a concern for the residences located in the vicinity of the Site. A limited number of monitoring wells were sampled in 2013 to evaluate the presence of 1,4-dioxane. The contaminant 1,4-dioxane was detected at low levels in several wells with the maximum concentration (3.2 µg/L) at one well. This maximum concentration exceeds the Massachusetts ORSG value of 0.3 µg/L, but is below the ROD groundwater cancer risk cleanup standard of $1 x10^{-5}$ ($5 x 10^{-6}$). There is currently no federal or state MCL for 1,4-dioxane. It is recommended that the annual groundwater monitoring program be expanded to included 1,4 dioxane so that this compound can be monitored along with the other VOC compounds in the groundwater at the Site.

Based on the data and documents reviewed, observations from the Site inspection, and the interviews conducted, the OU3 MOM remedy is functioning as intended by the ROD and as

designed and remains protective of human health and the environment. The OU2 source control remedy is also functioning as intended by the ROD.

8.0 ISSUES

No issues have been identified under this FYR that affect current and future protectiveness.

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

No issues or recommendations have been identified under this Five-Year Review that affect current and future protectiveness. However, as stated in Sections 7.2 and 7.4, it is recommended that: the human health risk associated with ingestion of PCB-contaminated fish be evaluated further with current risk evaluation procedures and assumptions (including consumption habits and yields from the water body) in order to fully document the degree of risk reduction; and the annual groundwater monitoring program be expanded to included the recently detected compound, 1,4 dioxane, so that this compound can be monitored along with the other VOC compounds in groundwater at the Site.

10.0 PROTECTIVENESS STATEMENTS

The OU2 source control remedy at the Re-Solve, Inc. Superfund Site is protective of human health and the environment.

The OU2 source control remedy was declared complete by EPA in 1996 and judged protective by EPA in the 1998 Five-Year Review (OU1 was terminated and superseded by OU2). Physical controls and institutional controls are in place in the two areas where PCB-contaminated soils remain at concentrations that may pose an unacceptable human health risk (WMA and North Access Road Area). The physical controls, including the soil cover (gravel or wildflower meadow), site fencing, gates, signs, and security systems, are effective in restricting access to and disturbance of the areas. The institutional controls prevent any intrusive earthwork or landscaping activities that could disturb the soils, future development that could result in unacceptable exposures, and groundwater extraction. The restrictions on the two properties are self-renewing so will remain in effect in perpetuity, helping to ensure the long-term protectiveness of the remedy.

The OU3 MOM remedy for the Site is protective of human health and the environment.

The MOM groundwater extraction system is effectively capturing the dissolved phase contaminant plume and preventing further migration of DNAPL and dissolved phase contaminants beyond the system capture zone. The wetlands have been successfully restored and do not appear to be adversely impacted by operation of the extraction system. A pilot groundwater treatment system has been in operation for approximately one year. Despite some operational problems it has consistently achieved effluent discharge limits, and measures are in place to ensure that effective treatment continues. Restrictions on the use of Site groundwater are in place on all the properties above the contaminant plume, effectively minimizing the risk of exposure to contaminated groundwater and limiting the potential for interference with the remedy.

The Site-wide remedy at the Re-Solve, Inc. Superfund Site is protective of human health and the environment.

Physical controls and institutional controls are in place that effectively prevent human exposure to contaminants in soil or groundwater that may pose an unacceptable health risk. The institutional controls also prevent any actions that could interfere with the operation or effectiveness of the remedy. The groundwater extraction system is effectively capturing Site contaminants and preventing further migration of contaminants beyond the extraction system capture zone and the groundwater treatment system consistently achieves the required effluent discharge limits.

11.0 NEXT REVIEW

The sixth Five-Year Review for the Site will be conducted in September 2018, within 5 years of the signature date of this Five-Year Review.

FIGURES

USGS Topographic Map
Fall River Massachusetts,
Rhode Island
Revised 1985

0 500 1,000 2,000
Feet
1 inch = 2,000 feet

N

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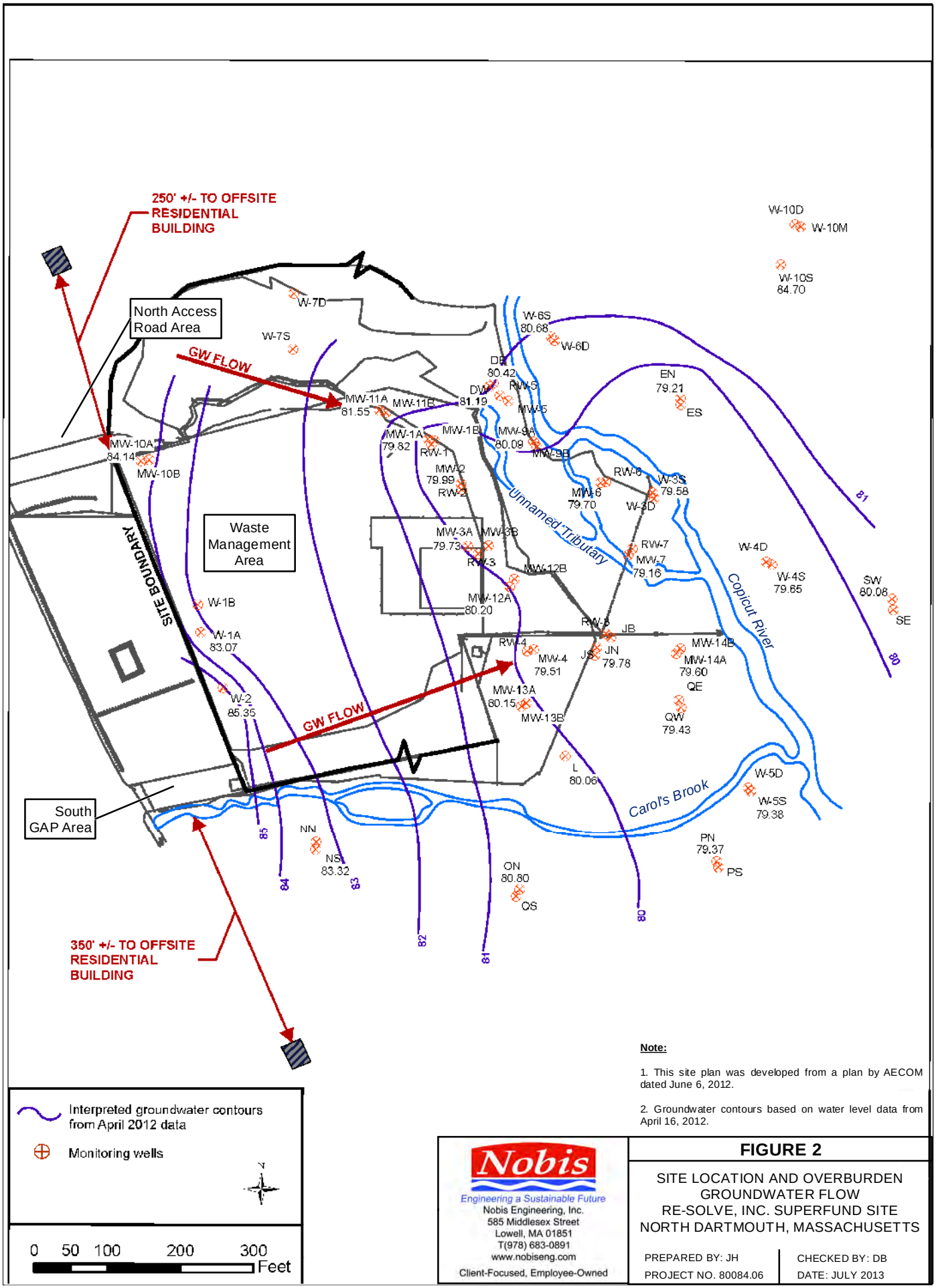
FIGURE 1

SITE LOCATION MAP
RE-SOLVE, INC. SUPERFUND SITE

NORTH DARTMOUTH, MASSACHUSETTS

PREPARED BY: JH	CHECKED BY: DB
PROJECT NO. 80084.06	DATE: JULY 2013

Path: R:\80000 Task Orders\80084 Re-Solve FY R\Technical Data and Guidance\GIS\Figures\Fig_1_Re-Solve_Locus.mxd Date Printed: 7/11/2013



Note:

1. This site plan was developed from a plan by AECOM dated June 6, 2012.

2. Groundwater contours based on water level data from April 16, 2012.

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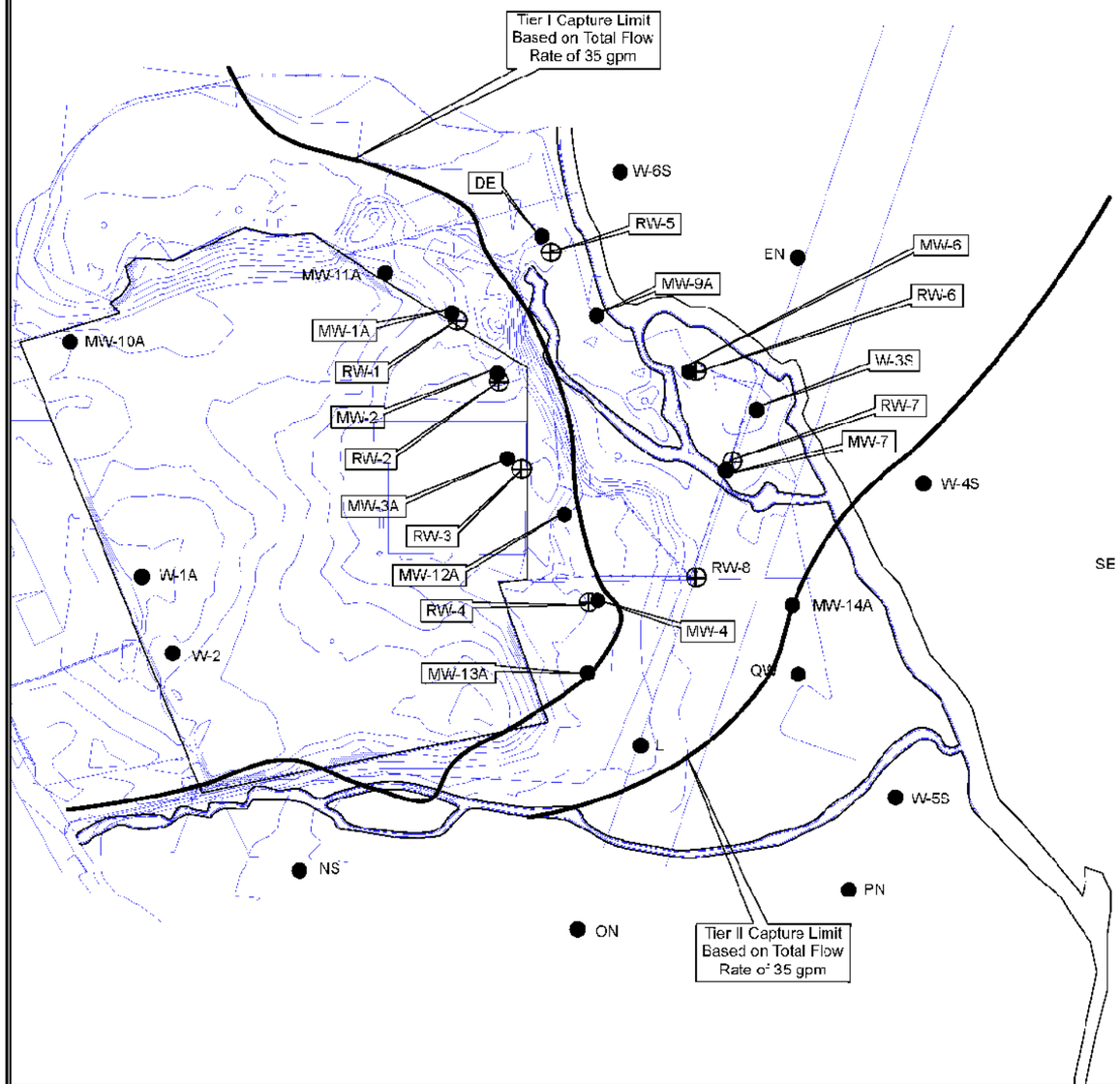
FIGURE 2

SITE LOCATION AND OVERBURDEN GROUNDWATER FLOW
RE-SOLVE, INC. SUPERFUND SITE
NORTH DARTMOUTH, MASSACHUSETTS

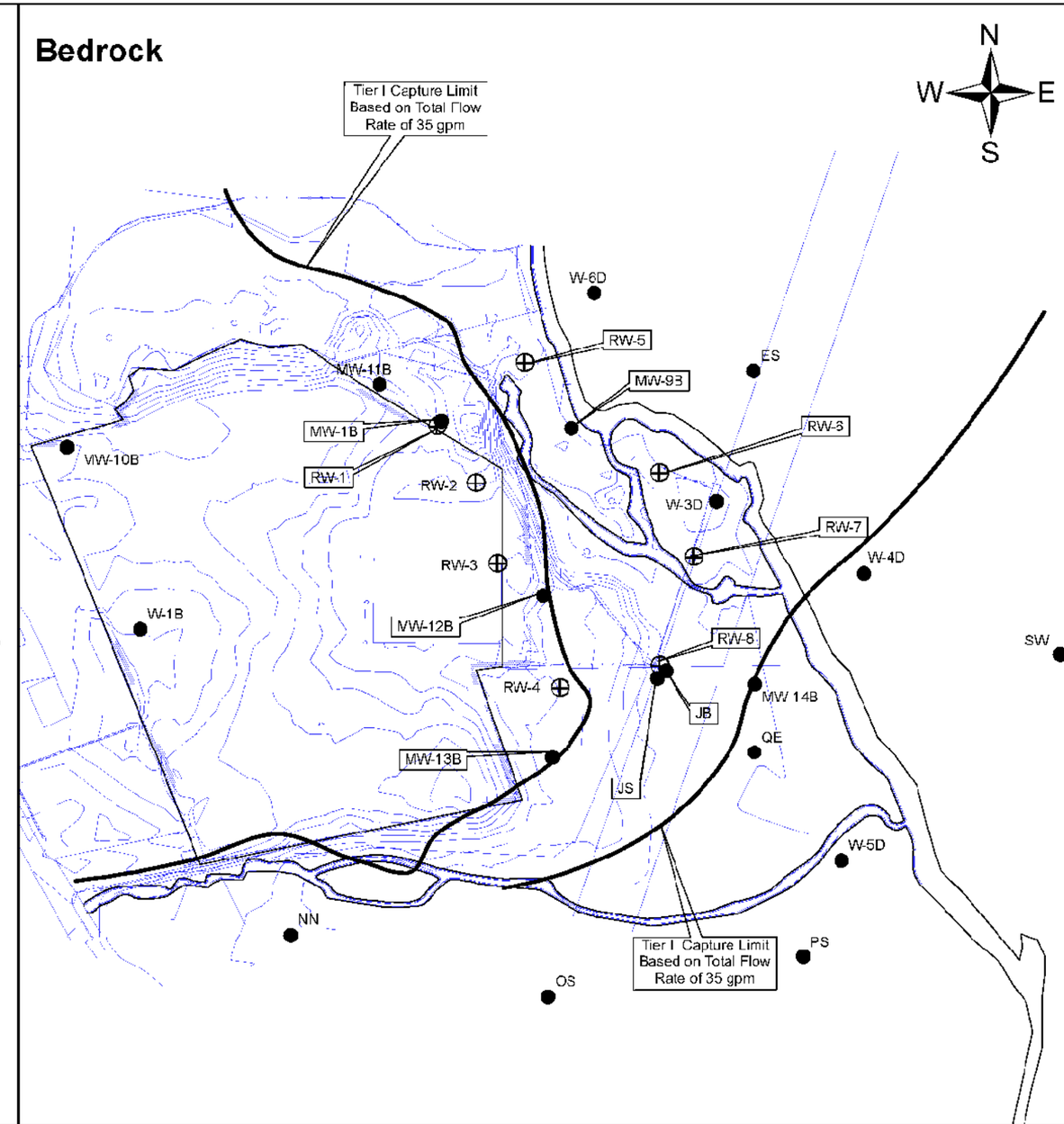
PREPARED BY: JH | CHECKED BY: DB
PROJECT NO. 80084.06 | DATE: JULY 2013

Path: R:\80000 Task Orders\80084 Re-Solve FY\Technical Data and Guidance\GIS\Figures\Fig_2_Re-Solve_GW.mxd Date Printed: 7/11/2013

Overburden



Bedrock



LEGEND

- ⊕ Recovery Well
- ● Monitoring Well
- River
- WMA Outline
- Base Map

0 100 200 400 Feet

Note:

This site plan was developed from a plan by AECOM dated September 2012.

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FIGURE 3

MONITORING AND
RECOVERY WELL LOCATIONS
RE-SOLVE, INC. SUPERFUND SITE
NORTH DARTMOUTH, MASSACHUSETTS

PREPARED BY: JH	CHECKED BY: DB
PROJECT NO. 80084.06	DATE: JULY 2013

N

0 25 50 100

Feet

1 inch = 100 feet

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FIGURE 4

AERIAL VIEW
RE-SOLVE, INC. SUPERFUND SITE
NORTH DARTMOUTH, MASSACHUSETTS

PREPARED BY: JH | CHECKED BY: DB

PROJECT NO. 80084.06 | DATE: JULY 2013

Path: R:\80000 Task Orders\80084 Re-Solve FY R\Technical Data and Guidance\GIS\Figures\Fig_4_Re-Solve_Site.mxd Date Printed: 7/11/2013

APPENDIX A

DOCUMENT REVIEW LIST/REFERENCES

DOCUMENTS REVIEWED/REFERENCES CITED

Camp Dresser & McKee, 1983. *Final Remedial Investigation and Feasibility Study*. Camp Dresser & McKee. June 30, 1983.

Camp Dresser & McKee, 1987. *Draft Off-Site Remedial Investigation.* Camp Dresser & McKee. January 1987.

Camp Dresser & McKee, 1987a. *Draft Off-Site Remedial Investigation Supplement.* Camp Dresser & McKee. February 1987.

Camp Dresser & McKee, 1987b. *Draft Off-Site Feasibility Study.* Camp Dresser & McKee. June 1987.

Charbonnier, 2003. Email correspondence regarding DNAPL wellpoint between Joe Charbonnier, ENSR and Phoebe Call, TtNUS. September 9, 2003.

ENSR, 1999. MOM Remedial Action First Year Operations Report. ENSR. December 29, 1999.

ENSR, 2001a. Second Year Operations Report Management of Migration Remedial Action. ENSR International. February 19, 2001.

ENSR, 2001b. Third Year Operations Report Management of Migration Remedial Action. ENSR International. December, 2001.

ENSR, 2002a. Review of the Management of Migration Remedial Action. ENSR International. December 2002.

ENSR, 2002b. Fourth Year Operations Report Management of Migration Remedial Action. ENSR International. December 2002.

ENSR 2006. Eighth Year Operations Report Management of Migration Remedial Action. ENSR Corporation. October 2006.

EPA, 1987. *Record of Decision Summary.* U.S. Environmental Protection Agency. September 24, 1987.

EPA, 1989. *Consent Decree*. U.S. Environmental Protection Agency. February 8, 1989.

EPA, 1993. *Scope of Work for Remedial Design and Remedial Action at ReSolve, Inc, Superfund Site* (Appendix 2, filed with the Explanation of Significant Differences). U.S. Environmental Protection Agency. June 11, 1993.

EPA, 2001. *Comprehensive Five-Year Review Guidance*, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC, EPA 540-R-01-007, OSWER Directive 9355.7-03B-P, June 2001.

.

EPA, 2002. OSWER *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils*. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, DC, EPA/530/D-02/004. November 2002.

EPA, 2003. "U.S. Enters into Settlement for Re-Solve, Inc. Superfund Site." Press Release from U.S. Environmental Protection Agency, Region I.

EPA RAGS E, 2004. *Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)* U.S. Environmental Protection Agency, Washington, DC, EPA/540/R/99/005, July 2004.

EPA RAGS F, 2005. *Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual Part F, Supplemental Guidance for Inhalation Risk Assessment)* U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. Washington DC. EPA-540-R-070-001. 2005.

EPA RAGS F, 2009. *Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual Part F, Supplemental Guidance for Inhalation Risk Assessment (Final)* U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. Washington DC. EPA-540-R-070-002. OSWER 9285.7-82. January 2009.

EPA, 2009a. National Primary Drinking Water Regulations list of Contaminants and their MCLs. Office of Ground Water and Drinking water. Washington DC. EPA-816-F-09-0004. May 2009.

EPA, 2009b. National Recommended Water Quality Criteria, EPA Office of Water. 2009. http://water.epa.gov/scitech/swguidance/standards/criteria/current/

EPA, 2009c. Response to RSG's Sustainability Enhancements. EPA. Correspondence from J. LeMay (EPA) to M. Last. July 24, 2009

EPA, 2009d. Conditional Approval of Sustainability Enhancements. EPA. Correspondence from J. LeMay (EPA), to M. Last. November 24, 2009

EPA, 2012. *OSWER Vapor Intrusion Screening Level (VISL) Calculator Version 1.0, November 2011 RSLs* Office of Superfund Remediation and Technology Innovation, March 2012.

EPA, 2013a. EPA's Regional Screening Levels for Chemical Contaminants at Superfund Sites www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm, May 2013.

EPA, 2013b. Integrated Risk Information System, On-Line Data Base. Web address: www.epa.gov/iris/index.html.

HNUS, 1993. *Five-Year Review Report.* Halliburton NUS Corporation. June 1993.

HNUS, 1996. *Final Remedial Action Report, Source Control Remedial Action*. Halliburton NUS Corporation. February 1996.

MADEP, 2012. *Standards and Guidelines for Contaminants in Massachusetts Drinking Waters.* Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Department of Environmental Protection, Massachusetts Office of Research and Standards. Spring 2012. http://www.mass.gov/dep/water/dwstand.pdf

M&E, 1994. *Intermediate (60%) Design Report.* Metcalf & Eddy, July 1994.

M&E, 1996. *MOM RO Implementation Plan*. Metcalf & Eddy, March 1996.

Nobis, 2008. *Five-Year Review Report.* Nobis Engineering. September 2008.

Symmes, 2013a. Email correspondence regarding Re-Solve MOM O&M costs, between Fred Symmes, Weston and Diane Baxter, Nobis. July 1, 2013.

Symmes, 2013b. Personal communication via telephone regarding optimization of energy and other operations costs of Re-Solve full-scale ABR system costs, between Fred Symmes, Weston and Diane Baxter, Nobis. July 10, 2013.

TtNUS, 1998. Final Preliminary Closeout Report, Management of Migration. Tetra Tech NUS, Inc. 1998.

TtNUS, 1998. *Five-year Review Report.* Tetra Tech NUS, Inc. September 1998.

TtNUS, 1999. Final Remedial Action Report, Management of Migration Remedial Action. Tetra Tech NUS, Inc. May 1999.

TtNUS, 2003. *Five-year Review Report*. Tetra Tech NUS, Inc. September 2003.

Weston, 2011a. Transition and Monitoring Plan, Sustainability Enhancements for Management of Migration Groundwater Treatment System, ReSolve, Inc. Superfund Site. Weston Solutions, AECOM, and Watermark Environmental. May 2011.

Weston 2011b. Thirteenth Year Operations Report, MOM Remedial Action. Weston Solutions. October 2011.

Weston 2012a. Fourteenth Year Operations Report, MOM Remedial Action. Weston Solutions. September 2012.

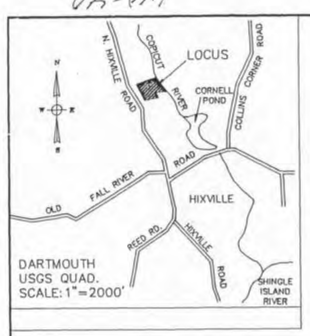
Weston, 2012b. Monthly Operations Reports May through December, Quarterly Monitoring Results October through December. Weston Solutions, Inc.

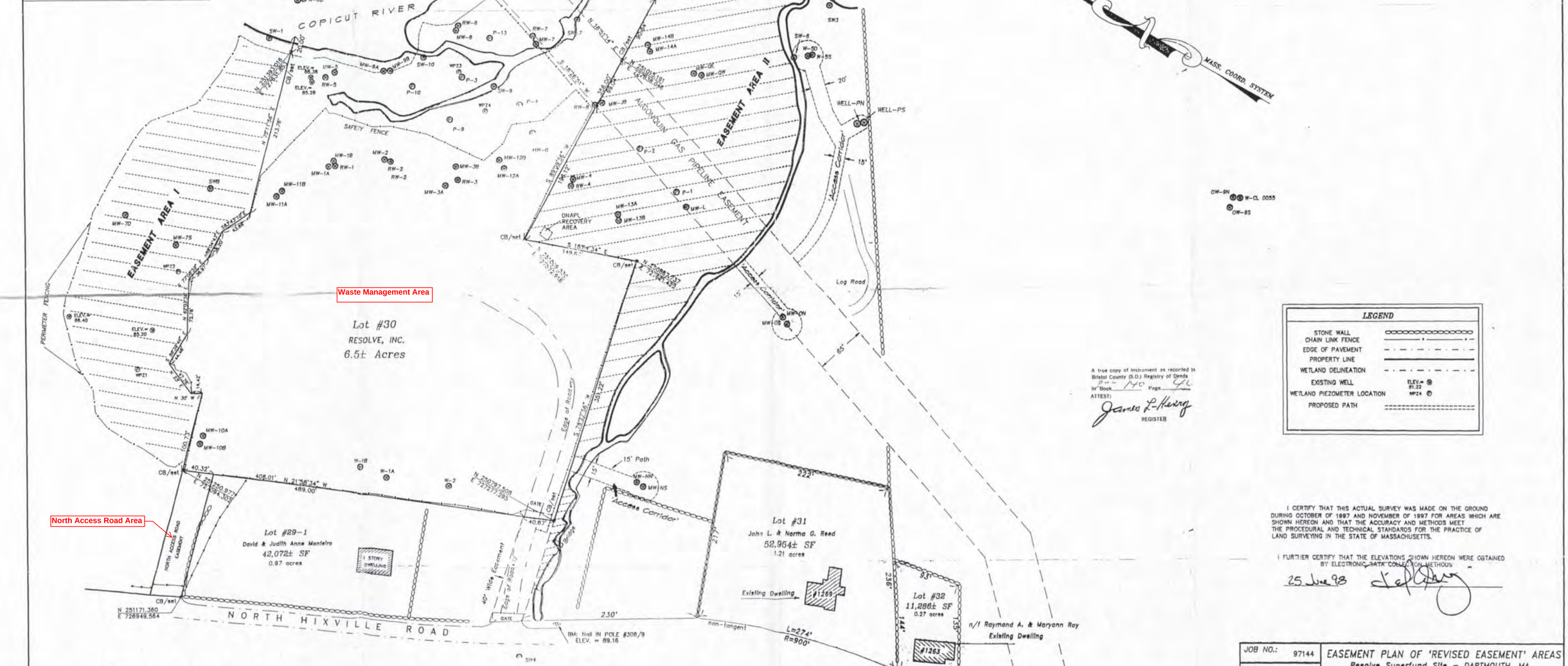
Weston, 2013. Monthly Operations Reports. Weston Solutions, Inc. January through March.

APPENDIX B

DEED RESTRICTION AREA LOCATIONS

140-141





NOTE:
1.) ALL ELEVATIONS AT WELL LOCATIONS REFER TO TOP OF CAP ELEVATION.
2.) N 250929.184 (y) REPRESENTS MASSACHUSETTS E 727851.371 (x) GEODETIC CONTROL DATA
3.) ALL ELEVATIONS ARE REFERED TO VERTICAL DATUM AS CONTROLLED BY MASS. GEODETIC SURVEY OF 1929 (NGVD)
4.) BENCHMARK: VERTICAL CONTROL DISK #M6ACC – ELEV. = 82.62

REC'D & RECORDED
1998 JUN 25 PM 12 32
BRISTOL COUNTY
SOUTHERN DISTRICT
REGISTRY OF DEEDS

A true copy of instrument as recorded in Bristol County (S.D.) Registry of Deeds in Book 1470 Page 90
ATTEST:
James L. Herring
REGISTER

LEGEND

STONE WALL	
CHAIN LINK FENCE	
EDGE OF PAVEMENT	
PROPERTY LINE	
WETLAND DELINEATION	
EXISTING WELL	ELEV.= 81.22
WETLAND PIEZOMETER LOCATION	MP24
PROPOSED PATH	

I CERTIFY THAT THIS ACTUAL SURVEY WAS MADE ON THE GROUND DURING OCTOBER OF 1997 AND NOVEMBER OF 1997 FOR AREAS WHICH ARE SHOWN HEREON AND THAT THE ACCURACY AND METHODS MEET THE PROCEDURAL AND TECHNICAL STANDARDS FOR THE PRACTICE OF LAND SURVEYING IN THE STATE OF MASSACHUSETTS.

I FURTHER CERTIFY THAT THE ELEVATIONS SHOWN HEREON WERE OBTAINED BY ELECTRONIC DATA COLLECTION METHODS

25 June 98

JOB NO.:	97144
DRAWN:	
REVIEWED:	DAM
DATE:	2 DEC 97
REVISED:	8 JAN 98
CADD FILE:	97144.DWG
DWG. #	1454
SCALE:	1" = 60'

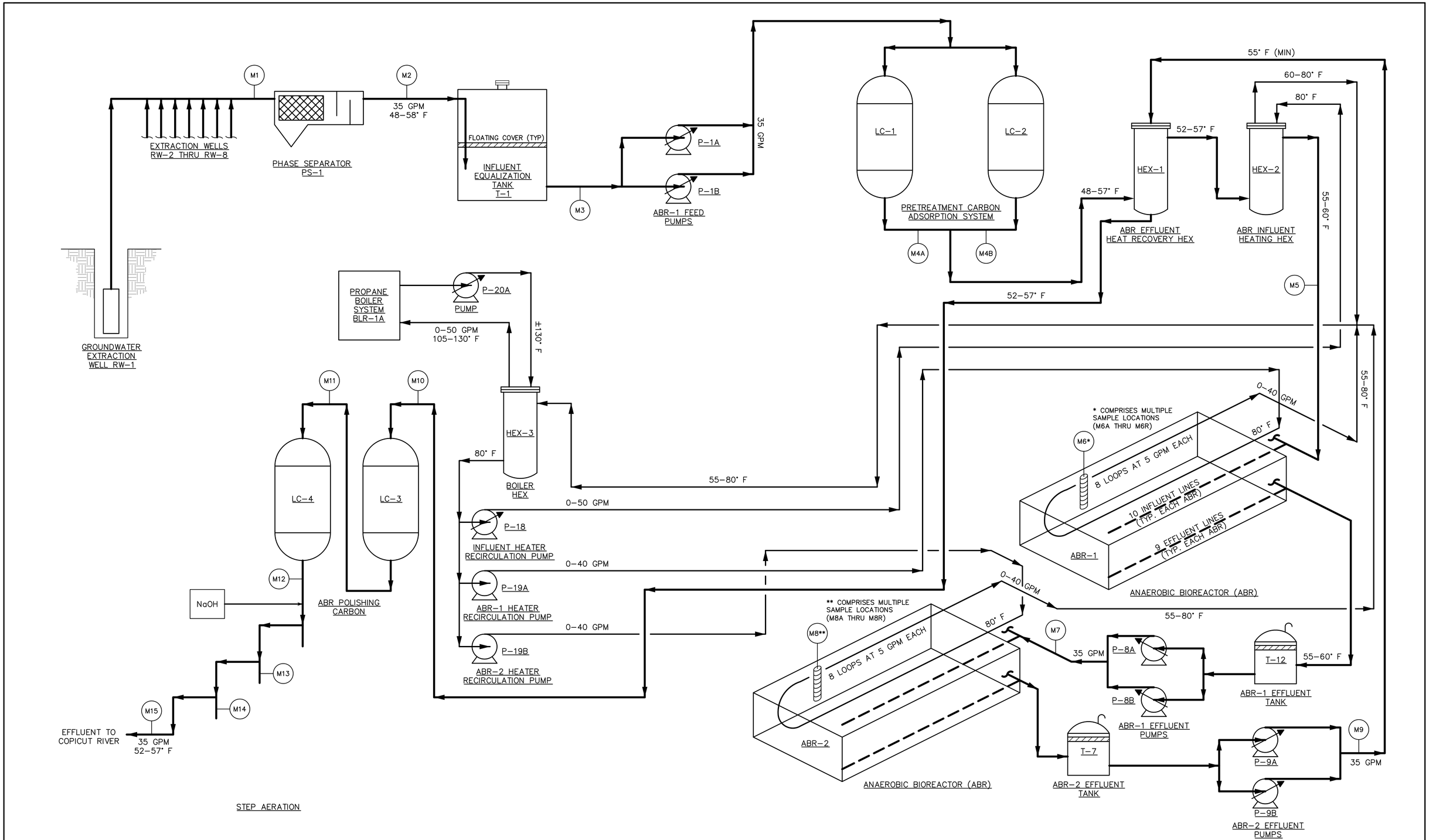
EASEMENT PLAN OF 'REVISED EASEMENT' AREAS
Resolve Superfund Site – DARTMOUTH, MA
Prepared for
ENSR – Consulting*Engineering*Remediation
35 NAGOG PARK ACTON, MA. 01720

DANSON
SURVEYING & ENGINEERING CO.
201 Middle Street
New Bedford, MA 02740
508-994-6989
FAX 508-991-4424

140-90

APPENDIX C

ABR SYSTEM PROCESS FLOW DIAGRAM



NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION
0	5/6/11	FRS	ISSUED FOR CONSTRUCTION				

MANAGEMENT OF MIGRATION
RESOLVE, INC. SUPERFUND SITE
NORTH DARTMOUTH, MASSACHUSETTS

WESTON SOLUTIONS
MANCHESTER NEW HAMPSHIRE

		DATE
CHECKED	BFF	05/2011
DES. ENG.	TAC	02/2011
PROJ. ENG.	BFF	02/2011
PROJ. MGR.	FRS	02/2011
APPROVED		
APPROVED		

CLIENT APPROVALS — DATE
ISSUED FOR — DATE

STATE OF NEW HAMPSHIRE
FREDERICK R. SYMMES
No. 9340
PROFESSIONAL ENGINEER
MASSACHUSETTS TEMPORARY
PERMIT NO. 2011-060-PE

SUSTAINABILITY ENHANCEMENTS PROCESS FLOW DIAGRAM

DRAWN	DATE	DRAWING NO.	REV. NO.
TAC	DEC 2010	G–1	0
SCALE: NONE	W.O. NO.: 11606.001.009	SHT. ___ OF ___	

M:\Design\DWG\RESOLVE\2010\Design\Sustainability Enhancements PFD.dwg, Layout1, 5/6/2011 10:37:20 AM, GRAWGER, 1:1

APPENDIX D

INTERVIEW RECORDS

INTERVIEW DOCUMENTATION FORM

The following is a list of individual interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
Michael O'Reilly	Environmental Affairs Coordinator	Town of Dartmouth	7/03/13
Arthur Thibedeaux	Resident	Town of Dartmouth	6/28/13
John Reed	Resident	Town of Dartmouth	6/28/13
Donald Perry	Director/Planning Department	Town of Dartmouth	6/27/13
Dorothy Allen	Remedial Project Manager	MassDEP	7/11/13

INTERVIEW RECORD

Site Name: Re-Solve, Inc. Superfund Site	**EPA ID No.: MAD980520621**	
Subject: Fifth Five-Year Review	**Time:10:15 am**	**Date: 7/03/13**
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit: N/A**	☒ Incoming ☐ Outgoing	

Contact Made By:

Name: Deb Chisholm	**Title: Project Scientist**	**Organization: Nobis Engineering,**

Individual Contacted:

Name: Mike O'Reilly	**Title: Environmental Affairs Coordinator**	**Organization: Town of Dartmouth**

Telephone No: 508-910-1822 **Fax No:** **E-Mail Address:**	**Street Address: Town Hall, 400 Slocum Road** **City, State, Zip: Dartmouth, MA 02747**

Summary Of Conversation

Q1: What is your overall impression of the project and Site?
A1: Mr. O'Reilly hasn't visited the site in a couple of years, but understands the fishing derby still continues annually.
Q2: Are you aware of any issues/ concerns with the Site?
A2: Mr. O'Reilly is not aware of any concerns with the site. It has been very quiet.

Q3: How do you feel the remedy is functioning at the Site?
A3: It was Mr. O'Reilly's impression that that things were running smoothly.

Q4: Have there been any changes in the surrounding properties or land use in the last 5 years, or are any changes anticipated?
A4: There was a subdivision to the southwest of the site that was completed a few years ago, but the area near the Site is mainly single family homes and there haven't been any changes. There have been some watershed protection efforts to the north and east of the site.

Q5: What has been the public interest and involvement with the Site in the last 5 years?
A5: Mr. O'Reilly was not aware of any public interest in the site.

Q6: Does the Town have any particular property and/or re-use interests with the Site?
A6: The Town continues to be interested in using a portion of the site as a storage/service facility for the Town. However, Mr. O'Reilly is aware of the reduction in space at the Site because of the solar panels. Mr. O'Reilly is also aware that future use of the property by the Town may not occur until the cleanup is complete.

Q7: Are you satisfied with the wetlands restoration at the Site?
A7: Mr. O'Reilly said the wetlands restoration was well done and reestablished very quickly.

Q8: Are you aware of any changes or proposed changes in the remedy?
A8: Mr. O'Reilly indicated he hadn't spoken with EPA about the Site and was unaware about any changes to the remedy.

INTERVIEW RECORD

Site Name: Re-Solve, Inc. Superfund Site	**EPA ID No.: MAD980520621**	
Subject: Fifth Five-Year Review	**Time: 10:00 am**	**Date: 6/28/13**
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit: N/A**	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Deb Chisholm	**Title: Project Scientist**	**Organization: Nobis Engineering, Inc.**

Individual Contacted:

Name: Arthur Thibedeaux	**Title: Resident**	**Organization: Town of Dartmouth**

Telephone No: 508-678-5054 **Fax No:** **E-Mail Address:**	**Street Address: 1223 Old Fall River Road** **City, State, Zip: Dartmouth, MA 02747**

Summary Of Conversation

Q1: What is your overall impression of the project and Site?
A1: Arthur stated that they think they have a handle on it. He indicated he was told in 1990 it would take 20 years to clean up and it's not done yet. He was glad that the results from fish samples were better.

Q2: Are you aware of any issues/ concerns with the Site?
A2: Arthur indicated he was not aware of any issues or concerns with the site.

Q3: How do you feel the remedy is functioning at the Site?
A3: Arthur stated that the improving fish sample results were a good sign.

Q4: Have there been any changes in the surrounding properties or land use in the last 5 years, or are any changes anticipated?
A4: Arthur was not aware of any new land use in the area.

Q5: What has been the public interest and involvement with the Site in the last 5 years?
A5: Arthur stated he was only familiar with the annual fishing derby because he helps gather the fishermen to participate.

INTERVIEW RECORD

Site Name: Re-Solve, Inc. Superfund Site	**EPA ID No.: MAD980520621**	
Subject: Fifth Five-Year Review	**Time: 12:45 pm**	**Date: 6/27/13**
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit: N/A**	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Deb Chisholm	**Title: Project Scientist**	**Organization: Nobis Engineering, Inc.**

Individual Contacted:

Name: John Reed	**Title: Resident**	**Organization: Town of Dartmouth**

Telephone No: 508-671-8130 **Fax No:** **E-Mail Address:**	**Street Address:**

Summary Of Conversation

Q1: What is your overall impression of the project and Site?
A1: John's impression was that the remedy was operating the way it should be but that it costs a lot of money.

Q2: Are you aware of any issues/ concerns with the Site?
A2: John stated he was not aware of any issues or concerns with the site.

Q3: How do you feel the remedy is functioning at the Site?
A3: John indicated he thinks the remedy is functioning good.

Q4: Have there been any changes in the surrounding properties or land use in the last 5 years, or are any changes anticipated?
A4: John stated the nothing has changed much and nothing is selling in the area nearby, but thinks it may be because of the contamination at the site causing a devaluation of property.

Q5: What has been the public interest and involvement with the Site in the last 5 years?
A5: John indicated there has not been a lot of public involvement or interest with the site. It seems the longer it takes to clean it up, the less interest there is in the site. John has spoken with a lot of people and no one knows the site is there.

INTERVIEW RECORD

Site Name: Re-Solve, Inc. Superfund Site	**EPA ID No.: MAD980520621**	
Subject: Fifth Five-Year Review	**Time: 1:00 pm**	**Date: 6/27/13**
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit: N/A**	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Deb Chisholm	**Title: Project Scientist**	**Organization: Nobis Engineering, Inc.**

Individual Contacted:

Name: Donald Perry	**Title: Director of Planning Department**	**Organization: Town of Dartmouth**

Telephone No: 508-910-1816 **Fax No:** **E-Mail Address:**	**Street Address: Town Hall, 400 Slocum Road** **City, State, Zip: Dartmouth, MA 02747**

Summary Of Conversation

Q1: What is your overall impression of the project and Site?
A1: Don's impression was that the site was cleaned up.

Q2: Are you aware of any issues/ concerns with the Site?
A2: Don was not aware of any concerns with the Site.

Q3: How do you feel the remedy is functioning at the Site?
A3: Don believed the Site was cleaned up.

Q4: Have there been any changes in the surrounding properties or land use in the last 5 years, or are any changes anticipated?
A4: Don indicated the surrounding residential area has been stable for the last five years.

Q5: What has been the public interest and involvement with the Site in the last 5 years?
A5: Don was not aware of any public interest in the site.

Q6: Does the Town have any particular property and/or re-use interests with the Site?
A6: Don was not aware if any interest by the Town but referred me to Mr. O'Reilly, the Environmental Affairs Coordinator for the Town.

Q7: Are you satisfied with the wetlands restoration at the Site?
A7: Don was not aware of the wetlands restoration.

Q8: What has been the public interest and involvement with the Site in the past 5 years?
A8: Don was not aware of any public interest or involvement with the Site.

Q9: Are you aware of any changes or proposed changes in the remedy?
A9: Don was not aware of any changes to the remedy.

INTERVIEW RECORD

Site Name: Re-Solve, Inc. Superfund Site	**EPA ID No.: MAD980520621**	
Subject: Fifth Five-Year Review	**Time:1:10 PM**	**Date: 7/11/13**
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit: N/A**	☒ Incoming ☐ Outgoing	

Contact Made By:

Name: Diane Baxter	**Title: Project Manager**	**Organization: Nobis Engineering,**

Individual Contacted:

Name: Dorothy Allen	**Title: Remedial Project Manager**	**Organization: Massachusetts Department of Environmental Protection**

Telephone No: 617-292-5795 **Fax No:** **E-Mail Address:**	**Street Address:** **One Winter Street** **Boston, MA 02108**

Summary Of Conversation

Q1: What is your overall impression of the project and Site?
A1: Ms. Allen's impression of the project is that the team responsible for remedy O&M is a conscientious group of people who are responsive to any questions and concerns raised. They have been innovative in looking for alternative engineering solutions to meet project objectives.

Q2: Are you aware of any issues/ concerns with the Site?
A2: Ms. Allen commented that the remedies for OU2 and OU3 are being handled properly, but noted that DNAPL will not be fully addressed by the MOM remedy.

Q3: How do you feel the remedy is functioning at the Site?
A3: Ms. Allen noted that the ABR system is enduring some operational problems, but that the engineering team is working to improve the operation. Despite the problems, effluent discharge requirements are being met, as there are adequate backup systems to ensure that any untreated contaminants are removed before discharge.

Q4: Are you aware of any changes in the surrounding properties or land use in the last 5 years, or are any changes anticipated?
A4: Ms. Allen was not aware of any changes in land use.

Q5: What has been the public interest and involvement with the Site in the last 5 years?
A5: Ms. Allen was not aware of any public interest in the site apart from the annual Fishing Derby.

Q6: Are you satisfied with the wetlands restoration at the Site?
A6: Ms. Allen is very satisfied with the wetlands restoration. It reestablished very quickly and is very wet despite operation of the groundwater extraction system.

Q8: Are you aware of any changes or proposed changes in the remedy?
A8: Ms. Allen is aware of the potential for the full-scale pilot ABR system to become a permanent change to the remedy and is aware of the recent installation of the solar photovoltaic system.

APPENDIX E

SITE INSPECTION REPORT AND PHOTOS

Re-Solve, Inc. Site Inspection – April 25, 2013

Attendees:

James Saylors – Weston Solutions, RSG O&M Contractor
Mike Worthy – TetraTech, RSG Technical Representative
Fred Symmes – Weston Solutions, RSG Engineering/O&M Contractor Project Manager
Diane Baxter – Nobis Engineering, Inc., Project Manager
Lauren Soos – Nobis Engineering, Inc., Project Engineer
Cindy Woods – Avatar Environmental, Inc. (Nobis Team-Subcontractor), Risk Assessor
Dorothy Allen – Massachusetts Department of Environmental Protection, Remedial Project Manager

The site inspection was completed on April 25, 2013. Nobis arrived on Site at 10:00 am. Others were already there. J. Saylors provided a health and safety briefing. F. Symmes provided a tour of the GWTP building. He pointed out process equipment that was taken out of service as part of the ongoing ABR full-scale pilot study and new equipment recently constructed to aid in removal of excess gas from the ABR units (pilot scale membrane contactor and full-scale siphon).

F. Symmes and M. Worthy provided Nobis with a tour of the Site, including the ABR system and solar panels installed in 2011, both tiers of extraction wells, the grass/wildflower meadow, the north access road area, accessible perimeter fencing, the unnamed tributary and associated wetland areas, and the Algonquin Gas Pipeline Right-of-Way. The general location of the treated effluent discharge point was pointed out, but because of high water, the discharge pipe was not accessible.

Grass in ABR area is growing well, but is thinner in areas that were re-excavated during leak-detection investigation. Grass/flowers elsewhere have grown in well. Area was recently mowed.

Several issues were discussed during the site inspection. These are briefly summarized below.

ABR and solar systems were installed in wildflower meadow area. After construction, area was seeded with same wildflower mix used previously.

Status of North Access Road Area Deed Restrictions – M. Worthy stated that additional restrictions were put in place in 2011 so that the permanent protections that exist in the WMA would be extended to the North Access Road area.

Water use on site: Potable water used on Site drinking water is trucked in twice per year; it is used for washing and toilet, but not for drinking. Bottled water used for drinking. Septic tank on site is pumped twice per year.

DPH has not ruled on RSG's petition to remove fish advisory for PCBs.

The pH of area groundwater and the river is about 6, but pH discharge limit is 6.5, so addition of caustic is required to meet discharge standard.

Residential well sampling – 9 wells sampled annually. RSG provided in-home water treatment systems at 4 nearby homes. Systems include UV lamp for VOC destruction.

Nobis discussed elements of the Site Inspection Check List with the RSG representatives and confirmed that the current health and safety plan, applicable MSDS', current O&M manual, and updated maintenance logs are located on-site and are readily available; various security measures remain in place (cameras, motion sensors, perimeter fence) and no security issues have occurred at the Site during the past several years.

Nobis left the Site about 12:30 pm.

See Photos and Site Inspection Checklist Below

Date: April 25, 2013	**Location:** South Solar Field, Looking Southwest

Description: Solar panels within the south solar field.

Date: April 25, 2013	**Location:** ABR-1

Description: Piezometers with transducers and temperature data loggers within ABR-1.

Date: April 25, 2013	**Location:** North Access Road, Looking West

Description: The north entrance to the Site.

Date: April 25, 2013	**Location:** Copicut River, Looking East

Description: The Copicut River located at the Site.

Date: April 25, 2013	**Location:** RW-05, Looking South

Description: Groundwater extraction well, RW-05.

Date: April 25, 2013	**Location:** Site Fence, Looking South

Description: Gas main easement.

Date: April 25, 2013	**Location:** GWTP

Description: Oil/water separator and influent tank.

Date: April 25, 2013	**Location:** GWTP

Description: Influent tank for ABR-1.

Date: April 25, 2013	**Location:** ABRs, Looking West
Description: ABR-1 (foreground) and ABR-2 (background).	

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Re-Solve, Inc. Superfund Site	**Date of inspection: April 25, 2013**
Location and Region: N. Dartmouth, MA/Region 1	**EPA ID: MAD980520621**
Agency, office, or company leading the five-year review: EPA/Nobis Engineering, Inc.	**Weather/temperature: partly cloudy, approx. 64°F**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other_____
- ☐ Monitored natural attenuation
- ☒ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** James Saylors (Name) Operator (Title) 4/25/13 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☒ Report attached _____
   __No operational problems reported.

2. **O&M staff** Frederick Symmes, PE (Name) Project Manager (Title) 4/25/13 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☒ Report attached- Provided tour of GWTP building and modifications underway to improve operation of anaerobic bioreactor (ABR) system; led tour of Site & provided overview of groundwater treatment system and facility changes since last five year review (ABR system and solar panels).

2. **Re-Solve Site Group Technical Representative** Mike Worthy (Name) (Name) 4/25/13 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☒ Report attached Provided status of fishing advisory, changes in institutional controls implemented since last FYR, security system/access controls summary (no security issues). Noted that area groundwater and surface water have pH of ~ 6, but effluent discharge limit is 6.5, so caustic addition is required to meet discharge limit.

See Site Inspection Summary for Additional Information.

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency MassDEP
Contact Dorothy Allen Remedial Project Manager 4/25/13 (617) 292-5795
Name Title Date Phone no.
Problems; suggestions; ☒ Report attached _No problems; believes that RSG is doing a good job operating system. See attached interview record

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

4. **Other interviews** (optional) ☐ Report attached.

Interviews of two Town of Dartmouth officials, two Town residents, and Dorothy Allen of MassDEP were performed by phone, separate from site visit. See Appendix D for details.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☒ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A
   ☒ Contingency plan/emergency response plan ☒ Readily available ☒ Up to date ☐ N/A

   Remarks_____

3. **O&M and OSHA Training Records** ☒ Readily available ☒ Up to date ☐ N/A

   Remarks_____

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits_____	☐ Readily available	☐ Up to date	☐ N/A

Remarks_____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

   Remarks_____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

   Remarks_____

7. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date ☐ N/A

   Remarks_____

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

   Remarks_____

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☐ N/A
☒ Water (effluent)	☒ Readily available	☒ Up to date	☐ N/A

Remarks_____

10. **Daily Access/Security Logs** ☒ Readily available ☒ Up to date ☐ N/A

    Remarks_____

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☒ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____

2. **O&M Cost Records**

☐ Readily available ☒ Up to date
☒ Funding mechanism/agreement in place
Original O&M cost estimate___See Report Section 7.1.3____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: __See Report Section 7.1.3_____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks_Perimeter fencing and gate in good condition_____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks_Signs posted and visible _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) ____self-reporting by on-site personnel, security__ cameras_____
Frequency _daily_____
Responsible party/agency _Weston Solutions, RP Contractor_____
Contact __James Saylors_____ _Operator_____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached
_No incidents have occurred on-site since implementation of MOM_____

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks_____

2. **Land use changes on site** ☒ N/A
Remarks_____

3. **Land use changes off site** ☒ N/A
Remarks_____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks_____

B. Other Site Conditions

Remarks _____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. Pumps, Wellhead Plumbing, and Electrical

☒ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A

Remarks Continuous monitoring by O&M Contractor, RW wells secured by locks and alarms

2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances

☒ Good condition ☐ Needs Maintenance

Remarks Continuous monitoring by O&M Contractor

3. Spare Parts and Equipment

☒ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. Collection Structures, Pumps, and Electrical

☐ Good condition ☐ Needs Maintenance

Remarks_____

2. Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances

☐ Good condition ☐ Needs Maintenance

Remarks_____

3. Spare Parts and Equipment

G☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks_____

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☒ Bioremediation
   ☐ Air stripping ☒ Carbon adsorbers
   ☐ Filters multi-media filters
   ☐ Additive (*e.g.*, chelation agent, flocculent) anionic polymer
   ☐ Others
   ☒ Good condition ☐ Needs Maintenance
   ☒ Sampling ports properly marked and functional
   ☒ Sampling/maintenance log displayed and up to date
   ☒ Equipment properly identified
   ☒ Quantity of groundwater treated annually Approximately 18 million gallons
   ☐ Quantity of surface water treated annually
   Remarks Treatment train has changed since last five year review. Air stripping and metals removal equipment remains on site, but plant flow is now treated in full-scale pilot anaerobic bioreactor system, with carbon pre and post-treatment.

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☒ Good condition ☐ Needs Maintenance
   Remarks

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks Could not directly observe discharge point due to high water elevation at time of inspection.

5. **Treatment Building(s)**
   ☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
   ☒ Chemicals and equipment properly stored
   Remarks

6. **Monitoring Wells** (pump and treatment remedy)
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks

D. Monitoring Data

1. Monitoring Data
   ☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
   ☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☒ N/A

Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

See Report

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

See Report Section 7.1

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. None
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. See Report Section 7.1.4

APPENDIX F

MAY 2013 GROUNDWATER DATA

MAY 2013 - MONITORING WELL SAMPLING RESULTS
RESOLVE, INC. SUPERFUND SITE
NORTH DARTMOUTH, MASSACHUSETTS

SAMPLE LOCATION	MW-1A			MW-1B						MW-2			MW-3A			MW-4			MW-6					
ANALYTE	May-13			May-13			May-13 Duplicate			May-13			May-13			May-13			May-13			May-13 Duplicate		
Lab Sample ID	500-56829-13			500-56892-15			500-56892-16			500-56829-19			500-56915-11			500-56873-5			500-56873-2			500-56873-3		
(µg/L)	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL
Dichlorodifluoromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chloromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Vinyl Chloride	3.6		0.50	0.26	J	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.39	J	0.50	420		5.0	440		5.0
Chloroethane	1.4		1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.1		1.0	1.2		1.0
Trichlorofluoromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloroethene	1.0	U	1.0	26		1.0	26		1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	19		1.0	17		1.0
Acetone	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Methylene Chloride	5.0	U	5.0	2.0	U	2.0	2.0	U	2.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Methyl-tert-butyl ether	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
trans-1,2-Dichloroethene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.4		1.0	1.3		1.0
1,1-Dichloroethane	1.8		1.0	1.2		1.0	1.1		1.0	1.8		1.0	1.0	U	1.0	1.0	U	1.0	29		1.0	28		1.0
cis-1,2-Dichloroethene	3.0		1.0	85		1.0	83		1.0	1.0	U	1.0	1.0	U	1.0	44		1.0	910		10	960		10
Chloroform	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1,1-Trichloroethane	1.0	U	1.0	27		1.0	27		1.0	1.0	U	1.0	1.0	U	1.0	0.89	J	1.0	180		1.0	180		1.0
1,1-Dichloropropene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Carbon Tetrachloride	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Benzene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	1.0		0.50	0.50	U	0.50	0.50	U	0.50	0.36	J	0.50	0.35	J	0.50
1,2-Dichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Trichloroethene	0.50	U	0.50	430		5.0	420		5.0	0.50	U	0.50	0.50	U	0.50	1.1		0.50	70		0.50	68		0.50
1,2-Dichloropropane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
4-Methyl-2-pentanone	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Toluene	1.1		0.50	1.0		0.50	0.89		0.50	0.67		0.50	0.50	U	0.50	0.50	U	0.50	0.44	J	0.50	0.50		0.50
1,1,2-Trichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	4.4		1.0	4.2		1.0
Tetrachloroethene	0.50	U	0.50	260		5.0	260		5.0	0.50	U	0.50	0.61		0.50	3.3		0.50	4.5		0.50	4.5		0.50
1,1,1,2-Tetrachloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	4.3		1.0	4.1		1.0
Ethylbenzene	0.95		0.50	0.50	U	0.50	0.50	U	0.50	1.3		0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.51		0.50
m/p-Xylene	1.4		1.0	1.0	U	1.0	1.0	U	1.0	1.0		1.0	1.0	U	1.0	1.0	U	1.0	0.27	J	1.0	0.83	J	1.0
o-Xylene	0.76		0.50	0.50	U	0.50	0.50	U	0.50	0.69		0.50	0.50	U	0.50	0.50	U	0.50	1.5		0.50	1.5		0.50
Styrene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Isopropylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	0.74	J	1.0	0.73	J	1.0
n-Propylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,4-Trimethylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.2		1.0	1.0	U	1.0	1.0	U	1.0	1.6		1.0	1.6		1.0
1,3,5-Trimethylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
sec-Butylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.9		1.0	1.8		1.0
1,3-Dichlorobenzene	1.4		1.0	1.0	U	1.0	1.0	U	1.0	3.4		1.0	1.0	U	1.0	1.0	U	1.0	34		1.0	33		1.0
1,4-Dichlorobenzene	4.7		1.0	1.0	U	1.0	1.0	U	1.0	3.3		1.0	1.0	U	1.0	1.0	U	1.0	17		1.0	17		1.0
n-Butylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
p-Isopropyltoluene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,3-Trichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.9		1.0	1.7		1.0
1,2,4-Trichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	6.6		1.0	6.0		1.0
Hexachlorobutadiene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Napthalene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0

MAY 2013 - MONITORING WELL SAMPLING RESULTS
RESOLVE, INC. SUPERFUND SITE
NORTH DARTMOUTH, MASSACHUSETTS

SAMPLE LOCATION	MW-7			MW-9A			MW-9B						MW-10A			MW-10B			MW-11A			MW-11B		
ANALYTE	May-13			May-13			May-13			May-13 Duplicate			May-13			May-13			May-13			May-13		
Lab Sample ID	500-56829-10			500-56915-9			500-56915-6			500-56915-7			500-56915-8			500-56915-10			500-56829-26			500-56829-28		
(µg/L)	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL
Dichlorodifluoromethane	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chloromethane	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Vinyl Chloride	27		0.50	0.39	J	0.50	25	U	25	25	U	25	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	62		0.50
Chloroethane	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Trichlorofluoromethane	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloroethene	1.0	U	1.0	1.0	U	1.0	450		50	420		50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	3.7		1.0
Acetone	5.0	U	5.0	5.0	U	5.0	250	U	250	250	U	250	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Methylene Chloride	5.0	U	5.0	5.0	U	5.0	250	U	250	250	U	250	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	2.0
Methyl-tert-butyl ether	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
trans-1,2-Dichloroethene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	2.9		1.0
1,1-Dichloroethane	0.76	J	1.0	1.0	U	1.0	43	J	50	41	J	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	44		1.0
cis-1,2-Dichloroethene	16		1.0	0.72	J	1.0	9,400		500	9,700		50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	310		10
Chloroform	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.6		1.0
1,1,1-Trichloroethane	1.6		1.0	1.0	U	1.0	7,300		50	6,800		50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	100		1.0
1,1-Dichloropropene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Carbon Tetrachloride	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Benzene	0.50	U	0.50	0.50	U	0.50	25	U	25	25	U	25	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.5	U	0.50
1,2-Dichloroethane	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Trichloroethene	4.4		0.50	0.50	U	0.50	17,000		250	17,000		250	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	5.0		0.50
1,2-Dichloropropane	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
4-Methyl-2-pentanone	5.0	U	5.0	5.0	U	5.0	50	U	50	50	U	50	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Toluene	0.50	U	0.50	0.50	U	0.50	28		25	33		25	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	2.2		0.50
1,1,2-Trichloroethane	1.0	U	1.0	1.0	U	1.0	98		50	82		50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Tetrachloroethene	1.2		0.50	0.50	U	0.50	15,000		250	15,000		250	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	1.6		0.50
1,1,1,2-Tetrachloroethane	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chlorobenzene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Ethylbenzene	0.50	U	0.50	0.13	J	0.50	43		25	47		25	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	27		0.50
m/p-Xylene	1.0	U	1.0	1.0	U	1.0	20	J	50	18	J	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	18		1.0
o-Xylene	0.50	U	0.50	0.50	U	0.50	41		25	40		25	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	17		0.50
Styrene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Isopropylbenzene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	0.81	J	1.0
n-Propylbenzene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	0.98	J	1.0
1,2,4-Trimethylbenzene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	3.8		1.0
1,3,5-Trimethylbenzene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.1		1.0
sec-Butylbenzene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,3-Dichlorobenzene	1.0	U	1.0	0.63	J	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.5		1.0
1,4-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0		1.0
n-Butylbenzene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
p-Isopropyltoluene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,3-Trichlorobenzene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.1		1.0
1,2,4-Trichlorobenzene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	3.4		1.0
Hexachlorobutadiene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Napthalene	1.0	U	1.0	1.0	U	1.0	50	U	50	50	U	50	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0

MAY 2013 - MONITORING WELL SAMPLING RESULTS
RESOLVE, INC. SUPERFUND SITE
NORTH DARTMOUTH, MASSACHUSETTS

SAMPLE LOCATION	MW-12A			MW-12B						MW-13A			MW-13B			MW-14A			MW-14B			DE		
ANALYTE	May-13			May-13			May-13 Duplicate			May-13			May-13			May-13			May-13			May-13		
Lab Sample ID	500-56829-21			500-56829-23			500-56829-24			500-56873-8			500-56915-3			500-56915-5			500-56915-4			500-56829-25		
(µg/L)	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL
Dichlorodifluoromethane	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
Chloromethane	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
Vinyl Chloride	47		0.50	5.0	U	5.0	5.0	U	5.0	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	UR[5]	0.50	0.50	U	0.50
Chloroethane	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
Trichlorofluoromethane	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
1,1-Dichloroethene	1.2		1.0	60		10	58		10	1.0	U	1.0	4.9		1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
Acetone	5.0	U	5.0	50	U	50	50	U	50	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.1	J[5]	5.0	5.0	U	5.0
Methylene Chloride	2.0	U	2.0	50	U	50	50	U	50	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	UR[5]	5.0	5.0	U	5.0
Methyl-tert-butyl ether	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
trans-1,2-Dichloroethene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
1,1-Dichloroethane	0.66	J	1.0	21		10	19		10	1.0	U	1.0	2.0		1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
cis-1,2-Dichloroethene	160		1.0	130		10	120		10	1.0	U	1.0	4.9		1.0	1.0	U	1.0	3.3	J[5]	1.0	1.0	U	1.0
Chloroform	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
1,1,1-Trichloroethane	16		1.0	930		10	890		10	1.0	U	1.0	80		1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
1,1-Dichloropropene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
Carbon Tetrachloride	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
Benzene	0.5	U	0.50	5.0	U	5.0	5.0	U	5.0	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	UR[5]	0.50	0.50	U	0.50
1,2-Dichloroethane	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
Trichloroethene	2.5		0.50	5100		50	5200		50	0.50	U	0.50	380		5.0	0.75		0.50	0.32	J[5]	0.50	0.50	U	0.50
1,2-Dichloropropane	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
4-Methyl-2-pentanone	5.0	U	5.0	25.0	U	25	25.0	U	25	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	UR[5]	5.0	5.0	U	5.0
Toluene	0.5	U	0.50	5.0	U	5.0	5.0	U	5.0	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	UR[5]	0.50	0.50	U	0.50
1,1,2-Trichloroethane	1.0	U	1.0	8.3		5.0	14		5.0	1.0	U	1.0	0.97	J	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
Tetrachloroethene	2.0		0.50	3700		50	3700		50	0.50	U	0.50	230		5.0	0.50	U	0.50	0.50	UR[5]	0.50	0.50	U	0.50
1,1,1,2-Tetrachloroethane	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
Chlorobenzene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
Ethylbenzene	0.5	U	0.50	5.0	U	5.0	5.0	U	5.0	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	UR[5]	0.50	0.50	U	0.50
m/p-Xylene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
o-Xylene	0.5	U	0.50	5.0	U	5.0	5.0	U	5.0	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	UR[5]	0.50	0.50	U	0.50
Styrene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
Isopropylbenzene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
n-Propylbenzene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
1,2,4-Trimethylbenzene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
1,3,5-Trimethylbenzene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
sec-Butylbenzene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
1,2-Dichlorobenzene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
1,3-Dichlorobenzene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
1,4-Dichlorobenzene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
n-Butylbenzene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
p-Isopropyltoluene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
1,2,3-Trichlorobenzene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
1,2,4-Trichlorobenzene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
Hexachlorobutadiene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0
Napthalene	1.0	U	1.0	10	U	10	10	U	10	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UR[5]	1.0	1.0	U	1.0

MAY 2013 - MONITORING WELL SAMPLING RESULTS
RESOLVE, INC. SUPERFUND SITE
NORTH DARTMOUTH, MASSACHUSETTS

SAMPLE LOCATION	EN			ES			JB			JS						L			NN			NS		
ANALYTE	May-13			May-13			May-13			May-13			May-13 Duplicate			May-13			May-13			May-13		
Lab Sample ID	500-56829-5			500-56829-2			500-56829-1			500-56829-3			500-56829-4			500-56829-6			500-56829-18			500-56829-17		
(µg/L)	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL
Dichlorodifluoromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chloromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Vinyl Chloride	0.50	U	0.50	0.50	U	0.50	3.6		0.50	51		0.50	54		0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
Chloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Trichlorofluoromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloroethene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	0.65	J	1.0	0.57	J	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Acetone	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Methylene Chloride	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Methyl-tert-butyl ether	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
trans-1,2-Dichloroethene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloroethane	1.0	U	1.0	1.0	U	1.0	0.75	J	1.0	2.7		1.0	2.6		1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
cis-1,2-Dichloroethene	1.0	U	1.0	1.0	U	1.0	3.6		1.0	51		1.0	52		1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chloroform	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1,1-Trichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	11		1.0	11		1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloropropene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Carbon Tetrachloride	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Benzene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
1,2-Dichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Trichloroethene	0.50	U	0.50	0.50	U	0.50	1.1		0.50	3.4		0.50	3.4		0.50	0.50	U	0.50	0.50	U	0.50	0.52		0.50
1,2-Dichloropropane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
4-Methyl-2-pentanone	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Toluene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
1,1,2-Trichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Tetrachloroethene	0.50	U	0.50	0.50	U	0.50	1.0		0.50	6.2		0.50	6.3		0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
1,1,1,2-Tetrachloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Ethylbenzene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	1		0.50	1.1		0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
m/p-Xylene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	0.67	J	1.0	0.70	J	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
o-Xylene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.31	J	0.50	0.38	J	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
Styrene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Isopropylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
n-Propylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,4-Trimethylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,3,5-Trimethylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
sec-Butylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,3-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,4-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
n-Butylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
p-Isopropyltoluene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,3-Trichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,4-Trichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Hexachlorobutadiene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Napthalene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0

MAY 2013 - MONITORING WELL SAMPLING RESULTS
RESOLVE, INC. SUPERFUND SITE
NORTH DARTMOUTH, MASSACHUSETTS

SAMPLE LOCATION	ON			OS			PN			PS			QE			QW			SE			SW		
ANALYTE	May-13			May-13			May-13			May-13			May-13			May-13			May-13			May-13		
Lab Sample ID	500-56829-14			500-56829-12			500-56829-27			500-56829-29			500-56829-9			500-56829-11			500-56873-11			500-56873-10		
(µg/L)	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL
Dichlorodifluoromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chloromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Vinyl Chloride	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.76		0.50	0.50	U	0.50	0.50	U	0.50
Chloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Trichlorofluoromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloroethene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Acetone	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Methylene Chloride	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Methyl-tert-butyl ether	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
trans-1,2-Dichloroethene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
cis-1,2-Dichloroethene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chloroform	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1,1-Trichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloropropene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Carbon Tetrachloride	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Benzene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
1,2-Dichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Trichloroethene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
1,2-Dichloropropane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
4-Methyl-2-pentanone	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Toluene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
1,1,2-Trichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Tetrachloroethene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
1,1,1,2-Tetrachloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Ethylbenzene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
m/p-Xylene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
o-Xylene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
Styrene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Isopropylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
n-Propylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,4-Trimethylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,3,5-Trimethylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
sec-Butylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,3-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,4-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
n-Butylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
p-Isopropyltoluene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,3-Trichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,4-Trichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Hexachlorobutadiene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Napthalene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0

MAY 2013 - MONITORING WELL SAMPLING RESULTS
RESOLVE, INC. SUPERFUND SITE
NORTH DARTMOUTH, MASSACHUSETTS

SAMPLE LOCATION	W-1A			W-1B			W-2			W-3D			W-3S			W-4D			W-4S		
ANALYTE	May-13			May-13			May-13			May-13			May-13			May-13			May-13		
Lab Sample ID	500-56873-4			500-56873-1			500-56873-6			500-56829-7			500-56829-8			500-56873-7			500-56873-9		
(µg/L)	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL
Dichlorodifluoromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chloromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	UJ[4]	1.0	1.0	U	1.0
Vinyl Chloride	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
Chloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Trichlorofluoromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloroethene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Acetone	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Methylene Chloride	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Methyl-tert-butyl ether	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
trans-1,2-Dichloroethene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.2		1.0	1.0	U	1.0
cis-1,2-Dichloroethene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	4.7		1.0	1.0	U	1.0
Chloroform	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1,1-Trichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloropropene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Carbon Tetrachloride	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Benzene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
1,2-Dichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Trichloroethene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	1.4		0.50	0.50	U	0.50
1,2-Dichloropropane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
4-Methyl-2-pentanone	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Toluene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
1,1,2-Trichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Tetrachloroethene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
1,1,1,2-Tetrachloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Ethylbenzene	0.50		0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
m/p-Xylene	0.77	J	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
o-Xylene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
Styrene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Isopropylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
n-Propylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,4-Trimethylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,3,5-Trimethylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
sec-Butylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,3-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,4-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
n-Butylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
p-Isopropyltoluene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,3-Trichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,4-Trichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Hexachlorobutadiene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Napthalene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0

MAY 2013 - MONITORING WELL SAMPLING RESULTS
RESOLVE, INC. SUPERFUND SITE
NORTH DARTMOUTH, MASSACHUSETTS

SAMPLE LOCATION	W-5D			W-5S			W-6D			W-6S		
ANALYTE	May-13			May-13			May-13			May-13		
Lab Sample ID	500-56915-2			500-56915-1			500-56829-20			500-56829-22		
(µg/L)	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL	RESULT	QUAL	RL
Dichlorodifluoromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chloromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Vinyl Chloride	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
Chloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Trichlorofluoromethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloroethene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Acetone	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Methylene Chloride	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Methyl-tert-butyl ether	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
trans-1,2-Dichloroethene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
cis-1,2-Dichloroethene	1.1		1.0	1.0	U	1.0	0.63	J	1.0	1.0	U	1.0
Chloroform	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1,1-Trichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,1-Dichloropropene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Carbon Tetrachloride	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Benzene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
1,2-Dichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Trichloroethene	0.50	U	0.50	0.50	U	0.50	10		0.50	0.50	U	0.50
1,2-Dichloropropane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
4-Methyl-2-pentanone	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0	5.0	U	5.0
Toluene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
1,1,2-Trichloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Tetrachloroethene	0.50	U	0.50	0.50	U	0.50	2.2		0.50	0.50	U	0.50
1,1,1,2-Tetrachloroethane	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Chlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Ethylbenzene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
m/p-Xylene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
o-Xylene	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50	0.50	U	0.50
Styrene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Isopropylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
n-Propylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,4-Trimethylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,3,5-Trimethylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
sec-Butylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,3-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,4-Dichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
n-Butylbenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
p-Isopropyltoluene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,3-Trichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
1,2,4-Trichlorobenzene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Hexachlorobutadiene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0
Napthalene	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0

Notes:

QUAL = Qualifiers
RL = Reporting Limit
U = Analyte was not detected at or above the reporting limit.
J = Estimated value below the reporting limit or a tentatively identified compound.
J^4/UJ^4 Estimate results since Matrix Spike / Matrix Spike Duplicate (MS/MSD) criteria was not met.
J^5/UR^5 = Postive results were estimated (J) and non-detets rejected (R) due to 0% surrogate recovery for dibromofluoromethane
µg/L = micrograms per liter

RESIDENTIAL WELL SAMPLING RESULTS
2013 ANNUAL SAMPLING
Resolve Superfund Site
North Dartmouth, Massachusetts

Lab ID	Sample ID	Sample Location	Sample Date	Analyte	Result	Qualifier	Units	Reporting Limit
680-90209-1	PW0-0513	PW-0	05/08/13	Chloroform	0.39	J	µg/L	0.50
				Naphthalene	1.0	UJ[2]	µg/L	1.0
680-90167-10	PW01-0513	PW-1	05/07/13	All VOCs	ND	U	µg/L	0.50 to 1.0
680-90167-7	PW09-0513	PW-9	05/07/13	All VOCs	ND	U	µg/L	0.50 to 1.0
680-90167-8	PW14-0513	PW-14	05/07/13	All VOCs	ND	U	µg/L	0.50 to 1.0
680-90167-5	PW28-0513	PW-28	05/07/13	1,4-Dichlorobenzene	0.81		µg/L	0.50
680-90167-6	PW28-0513-E	PW-28	05/07/13	1,4-Dichlorobenzene	0.92		µg/L	0.50
680-90167-4	PW39-0513	PW-39	05/07/13	All VOCs	ND	U	µg/L	0.50 to 1.0
680-90167-1	PW48-0513	PW-48	05/07/13	Naphthalene	1.0	UJ[4]	µg/L	1.0
680-90167-2	PW56-0513	PW-56	05/07/13	All VOCs	ND	U	µg/L	0.50 to 1.0
680-90167-3	PW58-0513	PW-58	05/07/13	All VOCs	ND	U	µg/L	0.50 to 1.0

Note:
ND = Not Detected.
U = Analyte was not detected. Sample reporting limit is shown.
J = Estimated value below the reporting limit or a tentatively identified compound.
J[2]/UJ[2] = Estimated results since Lab Control Spike (LCS) did not meet QC criteria.
UJ[4] = Estimate result since Matrix Spike / Matrix Spike Duplicate (MS/MSD) criterion was not met.
µg/L = micrograms per liter.