FOURTH FIVE-YEAR REVIEW REPORT FOR TYBOUTS CORNER LANDFILL SUPERFUND SITE NEW CASTLE COUNTY, DELAWARE

July 2015

Prepared By:
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7/31/2015
Date

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LIST OF ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
BTAG	Biological Technical Assistance Group
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COC	Contaminant of Concern
CRA	Conestoga-Rovers & Associates
1,2-DCA	1,2-dichloroethane
DNREC	Natural Resources and Environmental Control
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
GMCS	Gas Migration Control System
GPRA	Government Performance and Results Act
GMZ	Groundwater Management Zone
IC	Institutional Control
IW	Interceptor Well
LEL	Lower Explosive Limit
MCL	Maximum Contaminant Level
MOA	Memorandum of Agreement
µg/L	Microgram Per Liter
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
POTW	Publicly Owned Treatment Works
ppb	Parts Per Billion
ppm	Parts Per Million
PRP	Potentially Responsible Party
P	Potomac
PCE	Tetrachloroethene
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
TCE	Trichloroethene
UHZ	Upper Hydraulic Zone
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The Tybouts Corner Landfill Superfund Site (the Site) is located in New Castle in New Castle County, Delaware. From 1968 to 1971, New Castle County disposed of municipal and industrial wastes in two unlined landfill areas, referred to as the main landfill and the west fill area. Waste disposal activities contaminated soil and groundwater with volatile organic compounds (VOCs).

EPA listed the Site on the Superfund program's National Priorities List (NPL) in 1983. The Site's potentially responsible parties (PRPs) extended public water lines to 42 residences near the landfill. EPA selected a long-term remedy to address groundwater contamination in a 1986 Record of Decision (ROD) and amended the remedy in two Explanations of Significant Differences (ESDs) in 1992 and 2000. Cleanup included excavation and consolidation of west fill materials into the main landfill; capping of the main landfill; installation of a slurry wall and interceptor well system; construction and operation of an active landfill gas migration control system (GMCS); institutional controls; and groundwater and landfill gas monitoring. The Site's PRPs led cleanup activities and completed remedy construction in September 1995. Operation of the active landfill GMCS and Site monitoring are ongoing. The triggering action for this five-year review (FYR) was the signing of the previous FYR on September 29, 2010.

The remedy currently protects human health and the environment in the short term because the cap and existing institutional controls (which were not selected by EPA in a decision document) prevent exposure to contaminated soil and groundwater. The active landfill GMCS effectively prevents off-Site migration of unacceptable levels of landfill gas. For the remedy to be protective over the long term, the following actions need to be taken:

- Conduct an evaluation of groundwater further downgradient of TY- 119B to better define and map the leading edge of the groundwater plume and determine if additional actions are necessary.
- Monitor well TY-119A to determine if contamination is migrating vertically into the Potomac (P) 2 Sand at that location and determine if additional actions are necessary.
- Determine if the concentration of 1,2-dichloroethane (1,2-DCA) in TY-204 is attributable to the main landfill.
- Determine the anticipated land use changes and install additional gas monitoring probes along the western edge of the landfill, if needed.
- Document the selection of land and groundwater use restrictions for properties affected by Site-related contamination.

Government Performance and Results Act (GPRA) Measure Review
As part of this FYR, the GPRA Measures have also been reviewed. The GPRA Measures and their status are provided as follows:

Environmental Indicators
Human Health: Human Exposure Controlled and Protective Remedy in Place
Groundwater Migration is Under Control (GMUC): Groundwater Migration is under control.

Sitewide Ready for Anticipated Use
The Site achieved the Sitewide Ready for Anticipated Use Measure on April 15, 2010.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Tybouts Corner Landfill		
EPA ID: DED000606079		
Region: 3	**State:** PA	**City/County:** New Castle/New Castle County

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the Site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" selected above, enter Agency name:** Click here to enter text.
Author name: Kate Lose, with additional support provided by Skeo Solutions
Author affiliation: EPA Region 3
Review period: 02/05/15 - 6/30/2015
Date of site inspection: 02/18/2015
Type of review: Policy
Review number: 4
Triggering action date: 09/29/2010
Due date *(five years after triggering action date)*: 09/29/2015

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:

OU(s): OU1	Issue Category: Monitoring			
	Issue: Benzene concentrations remain elevated in the furthest downgradient well that is sampled, TY-119B.			
	Recommendation: Conduct an evaluation of groundwater further downgradient of TY-119B to better define the leading edge of the groundwater plume and determine if additional actions are necessary.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/29/2017

OU(s): OU1	Issue Category: Monitoring			
	Issue: A downward vertical groundwater gradient at well TY-119B may indicate vertical migration of contamination into the P2 Sand.			
	Recommendation: Monitor well TY-119A to determine if contamination is migrating vertically into the P2 Sand at that location and determine if additional actions are necessary.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/29/2017

OU(s): OU1	Issue Category: Monitoring			
	Issue: 1,2-dichloroethane concentrations have gradually increased in well TY-204.			
	Recommendation: Determine if the concentration of 1,2-dichloroethane in TY-204 is attributable to the main landfill.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/29/2017

OU(s): OU1	Issue Category: Operations and Maintenance			
	Issue: Based on the recent property transfer and expected land use change at parcels adjacent to the landfill, additional gas monitoring probes may be needed.			
	Recommendation: Determine the anticipated land use changes and install additional gas monitoring probes along the western edge of the landfill, if needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/29/2017

OU(s): OU1	Issue Category: Institutional Controls			
	Issue: The requirement of land and groundwater institutional controls needed to ensure protectiveness is not documented in a decision document.			
	Recommendation: Document the selection of land and groundwater use restrictions in a decision document			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	12/29/2015

Sitewide Protectiveness Statement (if applicable)	
Protectiveness Determination: Short-term Protective	*Addendum Due Date (if applicable):* Click here to enter date.
The remedy currently protects human health and the environment in the short term because the cap and institutional controls (which were not selected by EPA in a decision document) prevent exposure to contaminated soil and groundwater. The active landfill GMCS effectively prevents off Site migration of unacceptable levels of landfill gas. For the remedy to be protective over the long term, the following actions need to be taken: 1) Conduct an evaluation of groundwater further downgradient of TY-119B to better define and map the leading edge of the plume. 2) Monitor Well TY-119A to determine if contamination is migrating vertically into the P2 Sand at that location. 3) Determine if the concentration of 1,2-DCA in TY-204 is attributable to the landfill. 4) Determine the anticipated land use changes and install additional gas monitoring probes along the western edge of the landfill, if needed. 5) Document the selection of land and groundwater use restrictions for properties affected by Site related contamination.	

Fourth Five-Year Review Report
for
Tybouts Corner Landfill Superfund Site

1.0 Introduction

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. FYR reports document FYR methods, findings and conclusions. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

EPA prepares FYRs pursuant to Section 121 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

EPA interpreted this requirement further in the NCP, 40 C.F.R. §300.430(f)(4)(ii), which states:

> 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 initiation of the selected remedial action.

EPA Region 3, with contractor support from Skeo Solutions, conducted the FYR and prepared this report regarding the remedy implemented at the Tybouts Corner Landfill Superfund Site (the Site) in New Castle, New Castle County, Delaware. EPA conducted this FYR from February to June 2015. EPA is the lead agency for developing and implementing the remedy. The Delaware Department of Natural Resources and Environmental Control (DNREC), as the support agency representing the State of Delaware, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the fourth FYR for the Site. The triggering action for this policy review is the previous FYR. The FYR is required because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. The Site consists of one operable unit (OU).

2.0 Site Chronology

Table 1 lists the dates of important events for the Site.

Table 1: Chronology of Site Events

Event	Date
Site owners operated sand and gravel quarry at Site	Prior to 1968
New Castle County disposed of municipal and industrial waste at Site	1968-1971
DNREC discovered volatile organic compounds (VOCs) in domestic supply well several hundred feet east of main landfill	April 1976
EPA listed Site on Superfund program's National Priorities List (NPL)	September 8, 1983
EPA selected interim measures to address contaminated residential drinking water wells	September 13, 1984
EPA entered into consent decree with PRPs for extension of public water supply line to residences near landfill	December 19, 1984
PRPs constructed public water line	January 1985
EPA completed Site's remedial investigation and feasibility study (RI/FS)	June 1985
EPA signed Record of Decision (ROD) to address contaminated groundwater	March 6, 1986
The U.S. District Court for the District of Delaware approves several Consent Decrees under which the PRPs will design and implement the 1986 ROD and additionally implement land use restrictions to protect the operation and integrity of the remedy.	April 19, 1989
EPA issued Explanation of Significant Differences (ESD) to replace upgradient trench with slurry wall and downgradient trench with interceptor wells	May 14, 1992
PRPs completed remedial design and started remedial action	November 25, 1992
The Court approves a modification to the Consent Decree to incorporate the 1992 ESD	December 16, 1994
PRPs completed remedy construction and EPA released Site's Preliminary Close-out Report	September 11, 1995
EPA issued second ESD to enhance remedy with permanent active landfill gas migration control system (GMCS) along landfill's northern, eastern and southern boundaries	July 26, 2000
EPA signed first FYR	September 29, 2000
PRPs began operation of active landfill GMCS	December 2000
The Court approves a modification to the Consent Decree to incorporate the 2000 ESD.	December 17, 2001
EPA signed second FYR Report	September 29, 2005
EPA signed third FYR Report	September 29, 2010
EPA provided comfort letter to potential purchaser of Site property	September 16, 2011
Red Lion Ventures, LLC and Red Lion Open Space purchased Site property	April 30, 2014

3.0 Background

3.1 Physical Characteristics

The Site is located about 10 miles south of Wilmington near the intersection of U.S. Route 13 and Delaware Route 71 (Red Lion Road) in New Castle, New Castle County, Delaware (Figure 1). New Castle County disposed of municipal and industrial wastes in two unlined landfill areas at the Site, referred to as the main landfill (Parcel 1004900062) and the west fill area (Parcel 1005300030) (Figure 2). Current Site features include a fenced and capped 47-acre landfill, the vacant former west fill area and remedy-related structures. The Site is surrounded by dense woodlands to the south and residential development to the north. Additional Site-related parcels, located next to the main landfill and west fill parcels, include Parcels 1004900128 and 1200200011 (Figure 3).

Red Lion Creek runs west to east, south of the Site. Pigeon Run, a tributary to Red Lion Creek, flows along the western boundary of the main landfill. The landfill surface is relatively flat and slopes to the south toward Red Lion Creek. The creek enters the Delaware River two miles downstream from the Site.

The geology at the Site consists of three formations: the Columbia, Merchantville and Potomac. The Columbia Formation is the uppermost geological unit underlying the Site. Groundwater in the Columbia Aquifer flows through the Columbia Formation to the southeast. The Merchantville Formation underlies the Columbia Formation and consists of sandy silt. The groundwater flow system in the Potomac Formation is often separated from the Columbia Aquifer by the Merchantville Formation, which impedes, but does not totally eliminate, downward migration of groundwater. The first two sand beds encountered in the Upper Hydrological Zone (UHZ) of the Potomac Aquifer are referred to as the Potomac No. 1 (P1) Sand and Potomac No. 2 (P2) Sand. Groundwater within the P1 and P2 Sands generally flows to the southeast beneath the Site.

3.2 Land and Resource Use

Prior to 1968, the Site was used as a sand and gravel quarry. Between 1968 and 1971, the New Castle County Department of Public Works used the former quarry area as a municipal landfill. The Site is currently not in use and supports only remedy-related activities. The land area surrounding the Site is primarily residential. The closest residence is about 150 feet northeast of the Site. Residences and businesses near the Site obtain drinking water from the municipal water supply. The Potomac Aquifer serves as the region's primary source of potable water.

Red Lion Ventures LLC and Red Lion Open Space purchased the four parcels that make up the Site in April 2014 (Figure 3). The new owners have expressed interest in developing part of the property, but development plans have not been finalized.

3.3 History of Contamination

Between 1968 and 1971, the New Castle County Department of Public Works disposed of municipal, domestic and industrial wastes at the Site. The main landfill area is located near the confluence of Pigeon Run and Red Lion Creek, in a triangular area northeast of Pigeon Run. The smaller landfill area, referred to as the west fill area, covered 4 acres and was located west of Pigeon Run (Figures 1, 2 and 3). Industrial wastes disposed of at the Site contained trichloroethylene, vinyl chloride, 1,2-dichloroethane (1,2-DCA), benzene and other organic and inorganic chemicals. New Castle County stopped landfilling activities at the Site in 1971.

In May 1976, DNREC discovered volatile organic compounds (VOCs) in a domestic supply well 400 feet east of the main landfill. EPA testing in 1983 and 1984 identified contamination in a second residential well located 150 feet north of the main landfill. EPA added the Site to the Superfund program's National Priorities List (NPL) in September 1983.

3.4 Initial Response

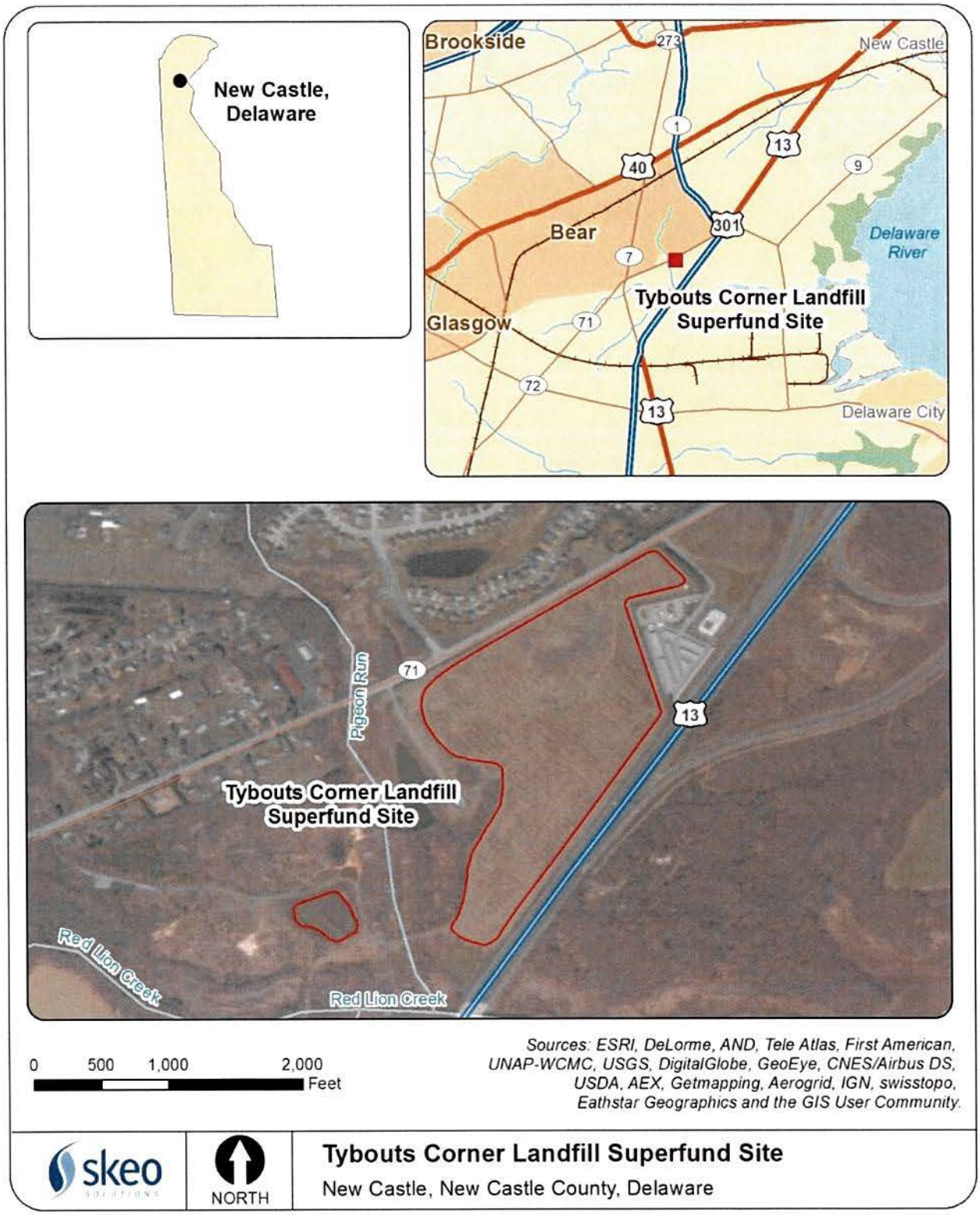
Between January 1983 and June 1985, EPA performed a combined remedial investigation and feasibility study (RI/FS) to assess the nature and extent of Site contamination and explore appropriate cleanup options.

In September 1984, EPA selected an initial remedial measure to address contaminated residential water supply wells. In January 1985, the PRPs constructed a public water line.

3.5 Basis for Taking Action

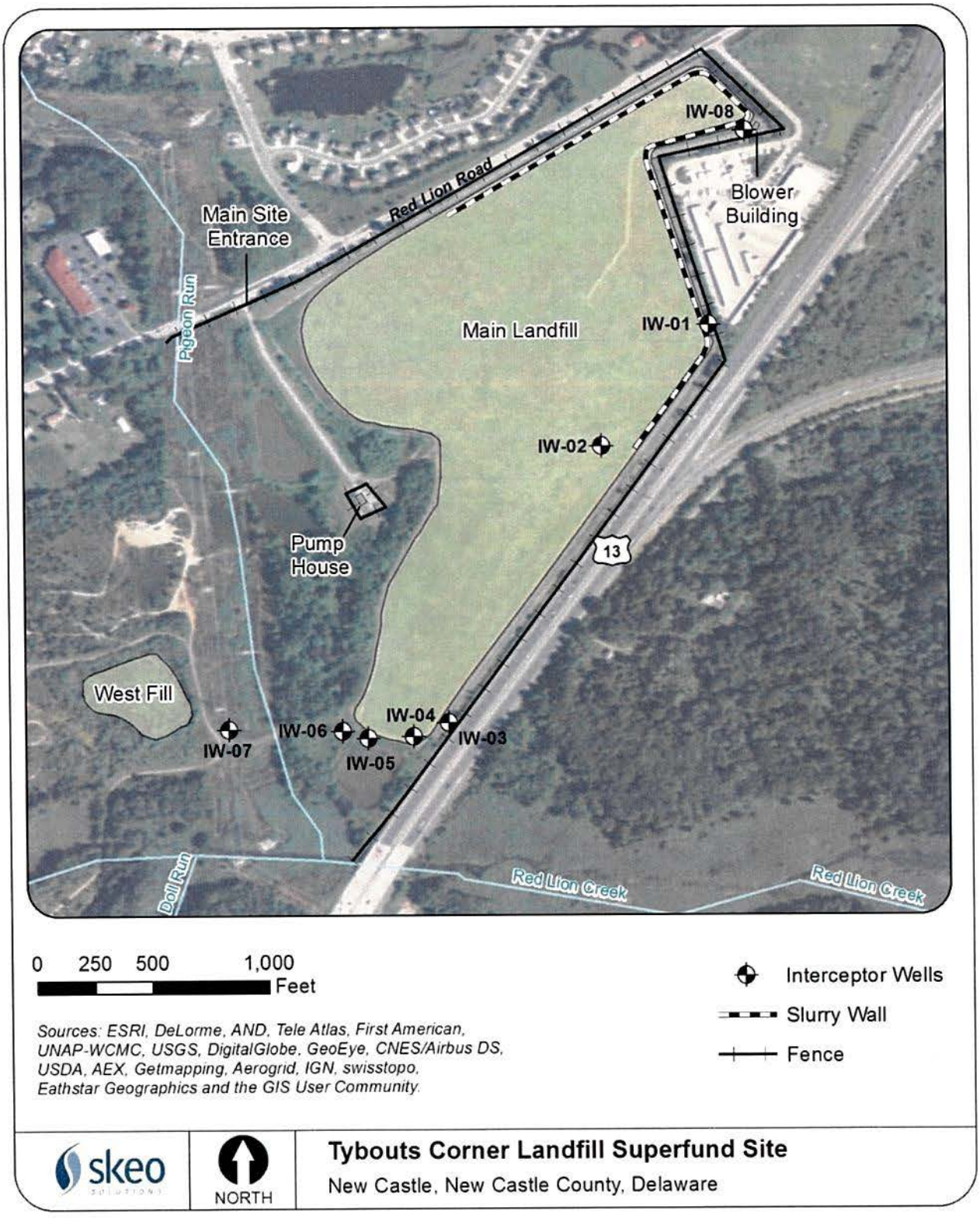
The 1985 RI identified the main and west fill areas as the source of contamination. The risk assessment showed that exposure to contaminated groundwater presented a significant human health risk, primarily due to VOCs. The risk assessment also identified the potential for contaminated leachate to migrate to the underlying Potomac aquifer. Investigation findings determined that the plume of contaminated groundwater extends from the main landfill to the southeast. The primary potential impacts on ecological biota included degradation of water quality due to biological and chemical oxygen demand, as a result of leachate discharged from the Site.

Figure 1: Site Location Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Figure 2: Detailed Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

4.0 Remedial Actions

In accordance with the NCP, the overarching goals for any remedial action are protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). EPA considered a number of remedial alternatives for the Site, and final selection was made based on an evaluation of each of the proposed alternatives, comments received from the public, information provided by the DNREC, feasibility, cost-effectiveness and the effectiveness of the remedy to limit exposure to contaminated drinking water.

4.1 Remedy Selection

EPA selected a remedy to address Site-wide groundwater contamination in the March 1986 Record of Decision (ROD). The ROD listed the following remedial action objectives (RAOs):

- Elimination or appreciable reduction of vertical infiltration of rainfall through the main and west fills.
- Elimination or control of lateral migration of groundwater into the main and west fill areas.
- Elimination or control of the contaminated groundwater presently in the Columbia Aquifer and the UHZ of the Potomac Aquifer.

The remedy in the ROD consisted of the following:

- Consolidation of the west landfill into the main landfill. Excavation would include all wastes and contaminated soil. The amount of contaminated soil to be removed would be based on a Site-specific chemical fate and transport analysis.
- Analysis of the west fill area to ensure that no soil is left in place that could cause groundwater to exceed groundwater cleanup standards.
- Backfilling of the west fill area with clean fill.
- Construction of a multi-layer Resource Conservation and Recovery Act (RCRA) cap over the consolidated main fill area to significantly reduce or eliminate vertical infiltration of precipitation.
- Installation of a drain or trench system to prohibit lateral groundwater migration through the fill and to collect existing leachate from the fill.
- On-Site treatment or off-Site discharge to a local sewage treatment plant of contaminated water (including leachate) generated by remedial activities.
- Pumping and treating, or otherwise disposing of, the off-Site plume of contaminated groundwater in the UHZ of the Potomac.
- Institutional controls to prevent the use of contaminated groundwater during pumping and treating activities.
- Implementation of a health and safety plan and air monitoring during remedy construction.
- Establishment and implementation of a groundwater, surface water, landfill cap and air monitoring program.

Table 2 shows cleanup goals established in the 1986 ROD for the Site's groundwater contaminants of concern (COCs).

Table 2: Groundwater COC Cleanup Goals

Groundwater COC	ROD Cleanup Goal (µg/L)[a]
Total VOCs	100
Vinyl chloride	1
Benzene	5
1,2-DCA	5

Notes:
a – Cleanup goals as defined in the 1986 ROD. Goals were established based on human health risk.
µ/L – micrograms per liter

In May 1992, EPA modified the ROD with an Explanation of Significant Differences (ESD) to replace the upgradient trench with a slurry wall and the downgradient trench with interceptor wells. Intercepted groundwater was pumped to a Publicly Owned Treatment Works (POTW).

In October 1996, methane gas was detected outside of the confines of the landfill, adjacent to Red Lion Road, during routine maintenance. To mitigate threats presented by the migration of the gas, the PRPs installed a temporary active gas extraction system along the northern perimeter of the landfill along Red Lion Road in November 1996. In July 2000, EPA issued a second ESD to enhance the remedy with a permanent active landfill gas migration control system (GMCS) along the northern, eastern and southern boundaries of the landfill.

Remedy modifications in the 2000 ESD included the following remedial components:

- Replacement of the temporary active gas venting system installed along the Red Lion Road Corridor with a permanent above-ground system that will, in conjunction with other system components, prevent subsurface migration of gas from the landfill.
- Landfill gas monitoring to ensure that landfill gas concentrations at all monitoring points located outside of the landfill are below the threshold limit of 20 percent of the lower explosive limit (LEL).
- Operation of the gas collection and monitoring systems until landfill gas is no longer detected at any of the off-Site monitoring points for four consecutive monitoring events.
- In the event monitoring data reflect an increase or buildup of landfill gas in any perimeter area, appropriate response measures will be undertaken to prevent the uncontrolled subsurface migration of gases from the landfill.
- Collection of air samples from all vents at least once following construction and operation of the active vent system. Within a year of construction, analytical data shall be incorporated into an atmospheric model designed to evaluate threats to human health and the environment from gases vented from the landfill. Installation of air emission controls if the model predicts an exposure risk greater than 1×10^{-6}.
- In the event that land to the east, south and/or west of the landfill is developed, additional off-Site monitoring points will be installed in accordance with an EPA-approved plan.

- Revision of the Operation and Maintenance Plan, as well as other plans as necessary, to incorporate these ESD changes.

4.2 Remedy Implementation

Remedial design began in April 1989. The PRPs completed the remedial design and initiated remedial action in November 1992. The PRPs implemented the remedial action under settlements with EPA.

PRP contractors consolidated the west fill material in the main fill area in July 1993. In May 1995, post-excavation sampling from the west fill area confirmed that the excavation removed source material that could contaminate groundwater. In accordance with EPA-approved specifications, the area underwent wetland mitigation. The west fill area is now a wetland.

The PRPs installed the slurry wall in October 1993 to prevent infiltration of clean groundwater into the landfill and to lower the water level within the landfill. The slurry wall was tied into the clay layer under the landfill to prevent clean water from entering the landfill and divert around the landfill. The PRPs completed the multi-layer RCRA cap over the main landfill in November 1994. Following landfill cap construction, the PRPs installed 51 passive landfill gas vents in the landfill surface and 15 landfill gas monitoring wells outside of and downgradient of the landfill. They completed construction of a network of eight interceptor wells in April 1995 to prevent off-Site migration of landfill leachate. The remedy was designed to prevent clean water from entering the landfill, and extract contaminated leachate. Remedy construction finished in September 1995.

As required by the 2000 ESD, in 2000 the PRPs constructed a permanent above-ground landfill GMCS to help prevent the subsurface migration of gas from the landfill. The 1986 ROD required institutional controls to prevent the use of groundwater during pumping operations. See Section 6.3 of this Five-Year Review for additional details regarding institutional controls.

4.3 Operation and Maintenance (O&M)

The PRPs perform Site O&M activities in accordance with the Site's Long-Term Phase Operations & Maintenance Plan (O&M Plan), revised in 2007 and 2012.

In June 2003, the PRP's completed a detailed assessment of groundwater conditions. Based on the assessment, the PRPs concluded that the combined effluent of the interceptor well system was in compliance with the groundwater cleanup goals established in the ROD and that the interceptor wells could be shut down. EPA approved shutdown of some interceptor wells in April 2004. In May 2007, EPA approved the shutdown of the remaining interceptor wells with the revision of the O&M Plan. The interceptor wells and associated piping have been decommissioned and will not be operated again unless deem necessary by EPA and DNREC. Major components of the May 2007 O&M Plan and March 2012 updates to the 2007 O&M Plan are listed in Appendix G.

The PRPs prepare and submit quarterly O&M reports to EPA and DNREC. The reports document O&M inspection and Site monitoring results. Table 3 highlights major O&M activities and findings documented in the quarterly O&M reports between 2010 and 2014. Appendix H highlights additional O&M activities and findings from between 2010 and 2014.

Table 3: O&M Summary of Important Findings, 2010 to 2014

O&M activity	Key Observations/Findings
Landfill cap inspection and maintenance	There is no erosion of the cap, however groundhogs burrow into the surface of the cap. The groundhogs are not being actively managed. However, the burrowing has not damaged the cap's top impervious layer. There is differential settlement of the cap near the blower building and along the landfill's southeastern side. The PRPs evaluated the settlement in February 2015 and determined that the rate of settlement is not uniform across the entire landfill surface. The PRPs concluded that the available tensile strength of the landfill's geomembrane (152 pounds per square inch) is greater than the required tensile strength (63.2 pounds per square inch). Therefore, the strain placed on the liner by differential settlement should not compromise the material at this time.
Site security	Trespassers routinely access the west fill area by foot. However, contamination is not present at the west fill area that could pose a risk to human health. Quarterly O&M reports identified the need for improved security in that area. O&M Plan Amendment #1 includes a provision for installing additional fencing to help improve security west of the main landfill if ownership changes. Site ownership changed in 2014. The additional fencing has not been constructed.
Interceptor wells	Interceptor well (IW) pumps are checked periodically to determine if they are still operable. On May 25, 2010, the IW pumps were activated. All wells indicated power to the pumps; however, no water discharged to the sumps when tested. The 2014 fourth-quarter O&M Report states that there is a strong possibility the wells have filled with silt.

The 1984 interim measures did not include an annual estimate of O&M costs for extension of public water lines to nearby residences. The 1986 ROD did not specify estimated annual O&M costs associated with the capped landfill area. The 2000 ESD specified an estimated annual O&M cost of $20,000 for the gas migration control component of the remedy. Table 4 shows actual O&M costs between 2010 and 2014. Two automobile accidents along U.S. Route 13, one in 2011 and one in 2012, impacted the Site fence and landfill GMCS. In both cases, automobiles crashed through the Site fence. Elevated O&M costs in 2011 and 2012 are attributed to costs associated with accident-related Site repairs.

Table 4: Annual O&M Costs

Year	Total Cost *(rounded to the nearest $1,000)*
2010	$81,000
2011	$144,000
2012	$104,000
2013	$96,000
2014	$105,000

5.0 Progress Since the Last Five-Year Review

The protectiveness statement from the 2010 FYR for the Site reads:

The remedy at the Tybouts Corner Superfund Site is protective of human health and the environment. Physical construction of the remedy is complete and institutional controls have been implemented.

The 2010 FYR included two issues and recommendations. This report summarizes each recommendation and its current status below.

Table 5: Progress on Recommendations from the 2010 FYR

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Amend O&M Plan to require stack data evaluation.	PRP	6/30/11	The PRPs revised the Site's O&M Plan to include evaluating stack data and gas vent monitoring. EPA approved the modification to the O&M Plan in an email in July 2011.	7/19/2011
Calibrate effluent flow meter.	PRP	11/30/10	A manufacturer's representative now performs annual effluent flow meter calibration. The meter is calibrated to stay in compliance with the Site's sewer discharge permit, even though no water has been discharged since May 2007.	11/01/2010

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 3 initiated the FYR in February 2015 and scheduled its completion for June 2015. EPA Remedial Project Manager (RPM) Kate Lose led the EPA Site review team, which also included EPA Community Involvement Coordinator (CIC) Vance Evans and contractor support provided to EPA by Skeo Solutions. The review schedule consisted of the following activities:

- Community notification.
- Document review.
- Data collection and review.
- Site inspection.
- Local interviews.
- FYR Report development and review.

6.2 Community Involvement

In April 2015, EPA published a public notice in the *News Journal* newspaper announcing the commencement of the FYR process for the Site, providing contact information for RPM Kate Lose and CIC Vance Evans and inviting community participation. The press notice is available in Appendix B. No one contacted EPA as a result of the advertisement.

EPA will make the final FYR Report available to the public. EPA will place copies of the document in the designated Site repository, the Delaware Department of Natural Resources & Environmental Control, Superfund Branch, located at 391 Lukens Drive in New Castle, Delaware.

6.3 Document Review

This FYR included a review of relevant, Site-related documents including the ROD, remedial action reports and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

ARARs Review

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate.

Groundwater

The 1986 ROD did not specifically identify ARARs, although cleanup goals based on maximum contaminant levels (MCLs) were established for vinyl chloride, 1,2-DCA and benzene. Table 6 compares the MCLs at the time of the ROD against the current MCLs.

In addition to the COCs (benzene, 1,2-dichloroethane, and vinyl chloride) identified in the 1986 ROD for this Site, tetrachloroethene (PCE) and trichloroethene (TCE) were observed during the Remedial Investigation in excess of their respective MCLs. Clean-up goals were not specifically proposed for these contaminants; rather, the ROD indicated that total VOC concentrations in groundwater would not exceed 100 µg/L subsequent to remediation. The concentration of total VOCs is below the groundwater cleanup goal of 100 µg/L established in the 1986 ROD. Recent monitoring at the Site revealed little to no PCE or TCE in groundwater; consequently, no current or future threat due to these compounds is expected.

Table 6: MCL Review for Groundwater COCs

Contaminant of Concern	1986 ROD MCL (µg/L)[a]	Current MCL (µg/L)[b]	MCL Change
Vinyl chloride	1	2	Less stringent
1,2-DCA	5	5	No change
Benzene	5	5	No change

Notes:
a - Based on MCL
b - Current MCLs were obtained from http://water.epa.gov/drink/contaminants/index.cfm (accessed August 8, 2014)

Landfill Gas
The 2000 ESD established ARARs for the active gas collection system. Delaware Regulations Governing Control of Air Pollution (§60.753(d)) require operation of the gas collection and control system in a manner conducive to limiting surface emissions of methane to less than 500 parts per million (ppm). The ESD also establishes 40 CFR Part 258 Subpart D (§258.23) as an ARAR applicable to the Site's active landfill gas migration system. The regulation requires that methane does not exceed 25 percent of the LEL in facility structures, and does not exceed the LEL at the facility property boundary.

Institutional Control Review
The 1986 ROD required institutional controls to prevent the use of contaminated groundwater during pumping and treatment activities. As groundwater pumping and treatment activities are no longer taking place at the Site, that specific requirement is no longer applicable.

While not selected in the 1986 ROD, land use restrictions were negotiated into settlements under which PRPs were required to implement the remedial action. These restrictions required the following:

- The PRPs shall not obstruct or interfere with the remedial action (including operation and maintenance) nor shall they interfere with or alter the constructed remedy.
- All conveyances of title, easement, or other interest in the Site shall contain (i) a provision requiring access as required under the Consent Decrees, and (ii) a provision ensuring that there shall be no obstruction of the remedial action (including operation and maintenance) or alteration of the remedy constructed.
- All conveyances of title, grants of easements, and all such other conveyances of any interest in the Site shall contain such covenants to permit remedial activities and to protect the remedy and shall comply with the deed notice requirements of New Castle County and the State of Delaware.
- New Castle County was required to file a copy of two of the three Consent Decrees with the Office of the Recorder of Deeds so as to ensure that the restrictions and obligations run with the land and are binding upon any and all parties who may at any time acquire any interest in the Site.
- Similar restrictions were required of properties contiguous to the Site.

On August 21, 2001, New Castle County filed a Notice of Consent Decree which attaches the 1988 Consent Decree between the Site owner and the United States of America.

In April 2014, Red Lion Open Space purchased the main landfill parcel (1004900062) and the parcel along the northwestern edge of the main landfill (Parcel 1004900128) (Figure 3). The landfill parcel is currently zoned for commercial use. Parcel 1004900128 is zoned for residential use. In April 2014, Red Lion Ventures LLC purchased the west fill area parcel (1005300030) and an adjoining parcel, located south of Red Lion Creek (1200200011). The west fill parcel is zoned for commercial use. Parcel 1200200011 is zoned for residential use. A property records search, performed as part of this FYR, determined that each of the four property parcels are subject to the land use restrictions established in the 1988 consent decree.

The 1986 ROD required institutional controls during pumping, to prevent the use of contaminated groundwater. Groundwater use restrictions are in place for the main landfill and west fill properties and for the surrounding properties. The Site and areas to the southeast (downgradient) of the Site are located within a DNREC Groundwater Management Zone (GMZ)[1]. The Site's location within the GMZ ensures that no new groundwater wells are installed at and near the Site. It is possible that nearby residences could still have operational groundwater wells installed prior to the establishment of the GMZ. In May 2003, the PRPs performed a survey of residents living near the Site to determine which residences were connected to public water. As part of this FYR, EPA verified that United Water Delaware connected public water lines to addresses surrounding the Site, along both Red Lion Road and South DuPont Parkway (Route 13), in the mid-1980s. The review also determined that with the exception of one address, all connected residences are currently billed for public water. This information indicates that residents surrounding the Site are using public water rather than water provided by private groundwater wells. The address associated with the Wagner property Parcel 1004900074 in Figure 3, which is immediately downgradient of the main landfill) has not been billed for public water since August 2012. An interview with the property owner revealed that the property is not currently inhabited so public water is not currently used.

On March 17, 2015, Skeo staff conducted online research at the New Castle County Recorder of Deeds Office website and found the deed information pertaining to the Site listed in Table 7.

Table 7: Site-related Documents from New Castle County Public Records Office

Date	Type of Document	Description	Instrument Number
4/30/2014	Deed	Property deed verifying ownership of the main landfill parcel (1004900062) and parcel located along the northwestern edge of the main landfill (1004900128) by Red Lion Open Space. The deed states that the parcels are subject to the consent decree.	201404300017692
4/30/2014	Deed	Property deed verifying ownership of the west fill parcel and the large parcel located south of Red Lion Creek (parcels 1005300030 and 1200200011) by Red Lion Ventures LLC. The deed states that the parcels are subject to the consent decree.	201404300017690
8/22/2001	Notice of Consent Decrees	The Notice of Consent Decrees attaches the 1988 consent decree between the Site owner and the United States of America to the property deed. The consent decree establishes land use restrictions.	200108220068764
3/30/1992	Superfund Site Agreement[a]	Agreement between the Site owner and New Castle County regarding construction of a sanitary sewer	199203301689305

409 Page Recorded 8/22/2001

[1] A GMZ is a delineated land area where DNREC has determined that new drinking water wells must be restricted in order to protect public health and safety. A Memorandum of Agreement (MOA) between DNREC's Division of Water and Division of Waste & Hazardous Substances (last updated in September 2011) establishes the specific groundwater use restrictions for the area. The 2011 MOA states that no public or domestic water supply wells will be allowed or permitted in the Columbia Aquifer or within the unconfined portions of the Potomac Aquifers(s). Both of those aquifers underlie the Site. The MOA also states that permits for any wells located in other areas of the GMZ may be issued, but will be subject to review and approval by both the Delaware Division of Water and the Delaware Division of Waste & Hazardous Substances.

Date	Type of Document	Description	Instrument Number
		system at the Site and referencing the 1988 consent decree.	

Note:
a – Appendix A of the Superfund Site Agreement is an excerpt from the 1988 consent decree that establishes land use restrictions for the main landfill, west fill area and contiguous properties .
Property records obtained from the New Castle County Recorder of Deeds website (http://www.nccde.org/144/Document-Search), accessed 3/17/2015.

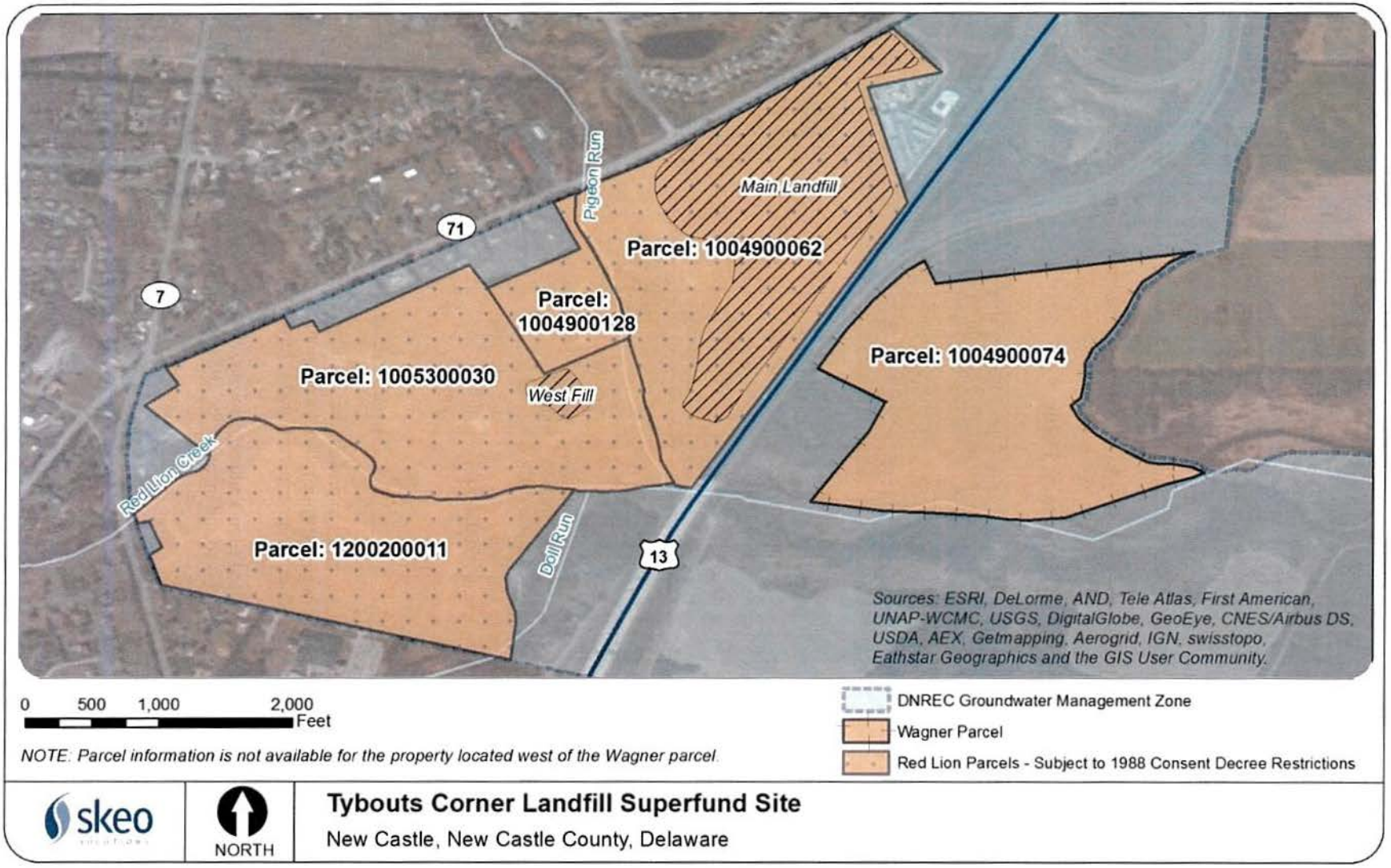
Table 8 lists the institutional controls associated with areas of interest at the Site.

Table 8: Institutional Control (IC) Summary Table

Areas of Interest – Main Landfill, West Fill and Surrounding Parcels (Parcels: 1004900062, 1005300030, 1004900128, 1200200011 and 1004900074)						
Media	**ICs Needed**	**ICs Called for in the Decision Documents**	**Impacted Parcel(s)**	**IC Objective**	**Instrument in Place**	**Notes**
Groundwater	Yes	No[a]	1004900062, 1005300030, 1004900128, 1200200011 and 1004900074[b]	Restrict installation of groundwater wells and groundwater use.	DNREC GMZ	The DNREC GMZ restricts the installation of new groundwater wells at and downgradient of the Site.
Soil	Yes	No	1004900062, 1005300030 1004900128 and 1200200011	Prohibit activities that could compromise the integrity of the remedy.	1988 consent decrees	The 1988 consent decrees prohibits activities that could obstruct or interfere with the remedy.[c]

Notes:
a –The 1986 ROD required institutional controls to prevent the use of contaminated groundwater during pumping and treating activities. That specific requirement applied during pumping activities only.
b – Parcel 1004900074 is referred to as the "Wagner parcel" and is located downgradient of the main landfill (Figure 3).
c – The deeds for the parcels owned by Red Lion Ventures LLC and Red Lion Open Space incorporate the 2001 Notice of Consent Decrees, which refers to and includes the 1988 consent decree.

Figure 3: Institutional Control Base Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

6.4 Data Review

Groundwater

This FYR compared groundwater monitoring results collected between 2010 and 2014 to groundwater cleanup goals established in the ROD. Currently, the PRPs perform annual groundwater monitoring at wells MW-05, MW-06, MW-08, MW-09, MW-12, MW-13, TY-104, TY-114 and TY-120B and semi-annual monitoring at wells MW-01, MW-02, MW-03, MW-04, MW-10, TY-204, TY-205 and TY-119B (Figure 4).

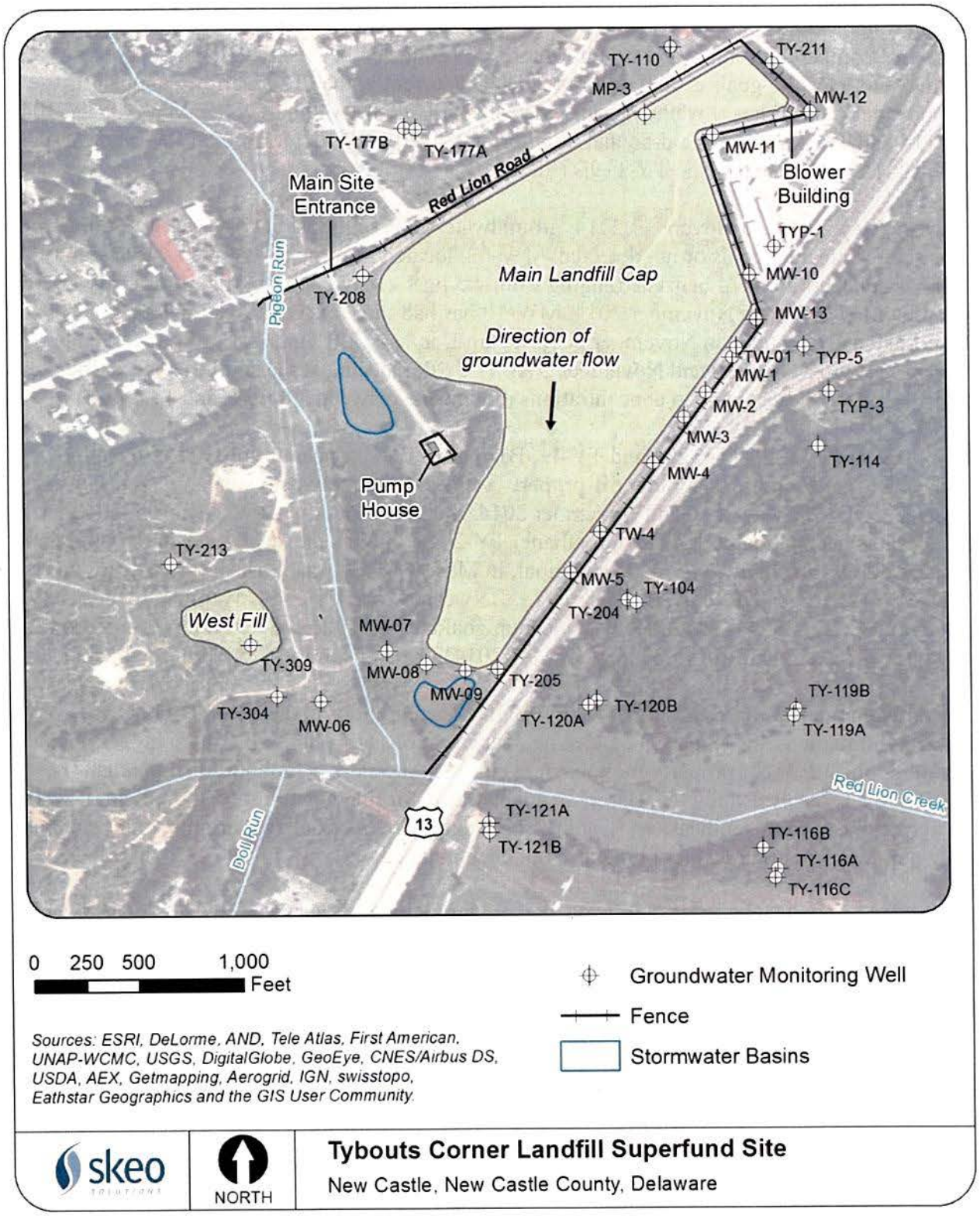
Between May 2010 and November 2014, groundwater COCs at most on-Site well locations were either below cleanup goals or not detected. MW-02, located near the end of the eastern slurry wall has concentrations of benzene ranging from 4.5 µg/L (May 2014) to 10.0 µg/L (May 2010). Between May 2010 and November 2014, MW-10 has had three exceedances for 1,2-dichloroethane (7.6 µg/L in November 2010, 11 µg/L in May 2013 and 7.8 µg/L in November 2014). Between May 2010 and November 2014, TY-205, located at the southeast toe of the landfill, consistently contained concentrations of benzene between 3.8 µg/L and 11.4 µg/L.

Two off-property wells (TY-204 and TY-119B) exhibit VOC concentrations above cleanup goals. COC concentrations at other off-property wells are routinely below cleanup goals or not detected. Between May 2010 and November 2014, the only groundwater COC in TY-204 that exceeds its cleanup goal is 1,2-dichloroethane. TY-204 exhibited elevated 1,2-dichloroethane concentrations, above the 5 µg/L cleanup goal, in May 2010 (14 µg/L), May 2011 (14 µg/L), May 2013 (25 µg/L) and May 2014 (28 µg/L). Between May 2010 and November 2014, benzene is the only COC that exceeds the 5 µg/L cleanup goal at TY-119B (concentrations range from 1.3 µg/L in November 2011 to 23 µg/L in May 2014). See Appendix F for additional details.

The downgradient wells that routinely show VOC concentrations above cleanup goals are located within the GMZ (Figure 3). Benzene concentrations at well TY-119B are higher than at any other on-Site or off-property monitoring well (See Appendix F for additional details, specifically Tables F-1 and F-2). Based on a lack of monitoring locations downgradient of well TY-119B, the current southeastern (leading edge) extent of the groundwater plume may not be fully defined. The groundwater plume has not been mapped.

Additional groundwater monitoring wells that are no longer routinely sampled are located south (wells TY-116A, B and C) and southwest (TY-121A and B) of well TY-119B (Figure 4). Per the approved changes to the long-term groundwater monitoring plan, the PRPs stopped sampling those wells regularly in 2007. The PRPs sampled wells TY-116A, B and C, and TY-121A and B in May 2011, and wells TY-121A and B in May 2012, at the request of EPA. Benzene concentrations at those off-property wells are typically either below the benzene cleanup goal or are not detected (Table F-1). Data from these wells suggest the location of the groundwater plume may be relatively stable at all locations along its leading edge, except for the area near well TY-119B. Additional sampling at locations southeast and east of well TY-119B may help better define the leading edge of the groundwater plume in that area.

Figure 4: Groundwater Monitoring Well Locations



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

The highest concentration of benzene observed at TY-119B between 2006 and 2014 was 28 µg/L in February 2006, well below the freshwater screening benchmark for benzene of 370 µg/L. The highest concentration of 1,2-DCA observed at TY-204 between 2010 and 2014 was 28 µg/L in May 2014, well below the 1,2-DCA freshwater screening benchmark level of 100 µg/L. While these levels of benzene in TY-119B and 1,2-DCA in TY-204 exceed the cleanup goals established in the 1986 ROD, the concentrations do not likely pose risks to ecological receptors in Red Lion Creek.

A slurry wall exists along the eastern perimeter of the landfill and parts of the northern and southern perimeters. Water level measurements collected between 2010 and 2014 indicate that the slurry wall is consistently and effectively controlling water levels within the landfill and helping to divert clean groundwater around the landfill.

Landfill Gas

The 2000 ESD established a threshold limit for methane gas of 20 percent of the Lower Explosive Limit (LEL) (20 percent LEL) for off-Site gas monitoring locations (or 1 percent volume in air). A system of 20 off-Site contingency landfill gas probes monitor methane concentrations outside of the landfill boundary (Figure 5). These probes are located outside of the northern, eastern and southern edges of the landfill and are sampled quarterly. There are no contingency probes located along the western (upgradient) edge of the landfill. Between 2010 and 2014, all contingency probe methane concentrations were 0 percent of the LEL for methane. These data show that the migration of unsafe levels of landfill gas is not occurring.

The perimeter wells, designated with the prefix PGMW- or GP-, are located around the entire perimeter of the landfill (Figure 5). Between 2010 and 2014, most wells never exceeded 0 percent LEL for methane. Wells PGMW-1, PGMW-2 and PGMW-6 showed sporadic low levels of methane, varying between 2 percent and 6 percent LEL for methane, well below the 20 percent LEL limit. Wells PGMW-5 and PGMW-7 showed more significant levels of methane, as discussed below.

PGMW-5 showed a value of 104 percent LEL for methane in the first quarter of 2013. The well is located along U.S. Route 13. Based on data collected between 2010 and 2014, the elevated methane reading appears to be an isolated detection. In addition, the methane readings from nearby contingency probes located outside of the PGMW system showed 0 percent LEL for methane during the same sampling event. This indicates that the elevated methane concentrations detected in PGMW-5 did not migrate past the outside of the landfill at that time.

PGMW-7 is located along the western edge of the landfill, adjacent to the wooded area between the landfill cap and the west fill property (Figure 5). The landfill GMCS does not control gas migration along the western edge of the landfill. The well routinely shows elevated concentrations of methane, ranging from a low of 330 percent LEL for methane in the third quarter of 2014, to a high of 480 percent LEL in the third quarter of 2011, well above the 20 percent LEL limit. The well is located at a relatively low elevation below the access road, in a marshy area. There are no contingency probes west of the landfill; however, two system response probes are located between the main landfill and the west fill area. Response probes GP91-98 and GP92-98 are located northwest of PGMW-7, on the west side of Pigeon Run (Figure 5).

Between 2010 and 2014, methane concentrations (percent by volume) have not been detected at either of those response probe locations. These data suggest limited westward migration of subsurface landfill gas in that area. The wet, marshy area immediately west of PGMW-7 may help to capture and degrade any escaped methane. The Site's August 2008 O&M Plan Amendment #1 includes a provision for the installation of additional gas monitoring probes between the landfill and the parcels west of the main landfill upon transfer of Site property ownership. Site ownership changed in 2014. Additional monitoring locations have not yet been installed.

The PRPs began performing annual air dispersion modeling in December 2011 to assess the impacts of the residual landfill gas releases on the neighboring environment as required by the long term monitoring plan. Prior to 2011, the last air dispersion modeling report was prepared in 2001. Air dispersion modeling reports from 2011 to 2014 conclude that the maximum annual off-Site concentration of landfill gas is significantly less than the EPA regional screening levels (RSLs) established for determination of risk. There is no RSL for methane. The threshold limit for methane gas, as established in the ESD, is 20 percent of the Lower Explosive Limit (LEL). The off-Site impact, at most, reaches a concentration of less than 0.6 percent of the screening level. Based on these findings, the expected risk posed by the off-Site migration of landfill gas can be considered insignificant. The study determined that off-Site landfill gas concentrations are primarily present to the east of the landfill on non-residential lands. The winds modeled blow predominantly toward the southeast.

6.5 Site Inspection

A Site inspection took place on February 18, 2015. The inspection team included Kate Lose (EPA Region 3 RPM); Dawn Ioven, Patricia Flores-Brown, Herminio Concepcion and Vance Evans (EPA Region 3); Morgan Price (DNREC); Beth Klotzbach and Suzanna Mays (Tybout Corner Trust); and Ryan Burdge and Melissa Oakley (Skeo Solutions).

The Site inspection began at the pump house. The pump house is surrounded by a tall fence with a locking gate. It has not been operational since 2007 when the last of the interceptor wells were shut down. A programmable logic controller located inside of the pump house monitors the Site's landfill GMCS was operational at the time of the inspection.

The inspection team toured the main landfill area by car and inspected various features. All passive and active landfill gas wells and inactive interceptor wells inspected appeared to be in good condition. All on-Site groundwater monitoring wells observed appeared to be in good condition and were closed and secured with locks. The inspection team observed areas of subsidence in the northeastern corner of the landfill, west of the blower building and along the landfill's southeastern border. This area is being assessed by the PRPs. The inspection team did not see any evidence of burrowing in the landfill cap; Ms. Klotzbach indicated that groundhogs do burrow in the landfill cap but do not reach the landfill cap liner. The Site inspection team also toured the blower building and inspected the landfill GMCS piping system.

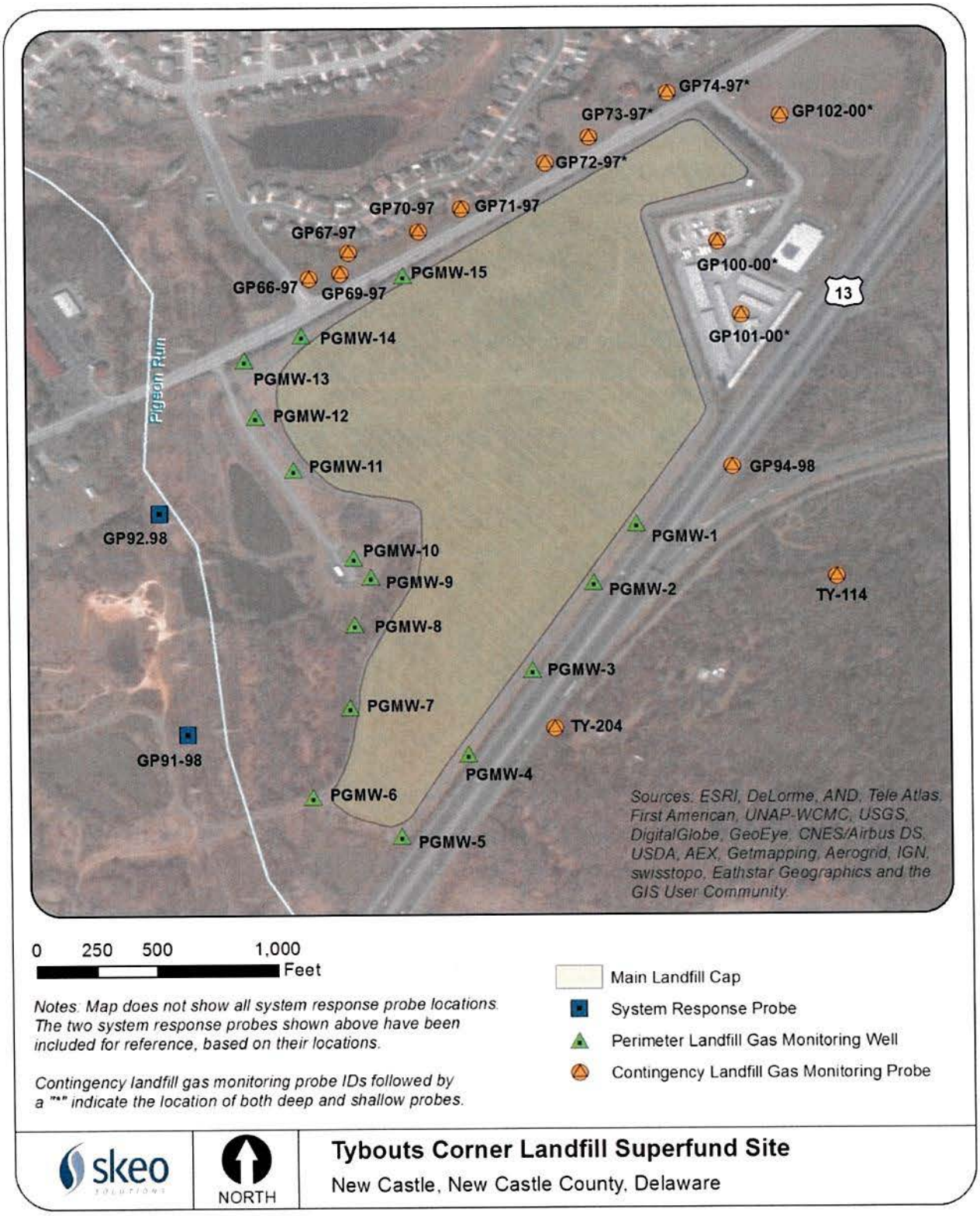
A locked gate restricts vehicular access to the west fill area. At time, trespassers have entered the area on foot and once broke into the chemical feed shed, located near IW-7. After the incident,

the PRPs emptied the building by removing all chemical feed materials. A fence partially encloses the west fill wetland. The wetland area is surrounded by brush and was covered with snow at the time of the inspection.

The inspection team toured the downgradient Wagner property, located south of U.S. Route 13 and the landfill's southeastern boundary. The Wagner property is the location of the Wagner residential well where groundwater contamination was initially discovered in 1976. Two houses and a large, newly-constructed structure are located on the Wagner property. The property owner indicated that none of the structures are occupied and that neither public water nor well water is used at the property. The monitoring wells on the Wagner property appeared to be in good condition and were secured with locks. EPA interviewed the property owner during the Site inspection.

Appendix D includes a completed Site Inspection Checklist. Appendix E includes photographs taken during the Site inspection.

Figure 5: Landfill Gas Monitoring Locations



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

6.6 Interviews

Interviews with parties affected by the Site, including the current landowners and regulatory agencies typically are conducted during a FYR. The purpose is to document the perceived status of the Site and any apparent problems or successes with the phases of the remedy implemented to date. The interviews are summarized below. Appendix C provides the complete interviews.

EPA's CIC interviewed a nearby property owner (Resident #1) during the Site inspection on February 18, 2015. The owner of the property southeast of and downgradient of the main landfill, is aware of the Site's history and has an overall positive impression of the cleanup. He feels that EPA has kept him well-informed about the Site. He is not aware of any effects of the Site on the surrounding community. The property owner would like to know if the old groundwater well on his property (the original "Wagner well") has been properly closed or abandoned by the state. DNREC staff indicated that they would look into this issue. The property owner indicated that none of the structures on his property are currently occupied or using well or public water. He inquired as to how he might be able to get his connection to the public water supply turned on in the future. EPA suggested that he contact the water company for information.

EPA's CIC interviewed a nearby resident (Resident #2) by phone on April 14, 2015. Resident #2 is aware of the Site's history and familiar with most of the cleanup activities that have taken place. Overall, he has a positive impression of the Site and its cleanup. He stated that the Site appears to be well maintained. Resident #2 does not think that EPA has kept residents near the Site well-informed about Site activities. He suggested posting Site-related information in the Wilmington News Journal. He also indicated that email would be a good way to communicate Site information. Resident #2 stated that he has a groundwater well, but only uses the water for irrigation. He has not used the well for the last three years.

EPA's CIC interviewed a nearby resident (Resident #3) by phone on April 14, 2015. Resident #3 is aware of the Site's history and familiar with most of the cleanup activities that have taken place. Overall, she has a positive impression of the Site and its cleanup. Resident #3 does not think that EPA has kept residents near the Site well-informed about Site activities. She indicated that phone calls would be a good way to communicate Site information to nearby residents. Resident #3 has a groundwater well, but no longer uses it. She expressed concern that reuse of the landfill area may damage the cap, and possibly pose a threat to the residents living near the Site.

EPA's CIC interviewed a nearby resident (Resident #4) by phone on April 20, 2015. Resident #4 is aware of the Site's history and familiar with most of the cleanup activities that have taken place. The resident stated that she thought Site-related contamination may have made her neighbors sick, before they were connected to the public water supply. Resident #4 indicated that people routinely trespass and ride dirt bikes on part of the Site. She does not think that EPA has kept residents near the Site well-informed about Site activities. Resident #4 stated that she has a groundwater well, but no longer uses it. She is not sure if her well was ever properly closed or abandoned and expressed concern regarding whether it should have been, or may still need to be closed.

DNREC Site Manager Morgan Price submitted interview question responses by email on April 20, 2015. Ms. Price has a positive impression of the Site and indicated that the selected remedy is appropriate. She stated that she is comfortable with the institutional controls in place at the Site and is not aware of any changes to state law that might affect the protectiveness of the remedy. Ms. Price indicated that DNREC, EPA and the Trust maintain excellent communication and have a good working relationship.

Tybouts Corner Landfill Trust Project Engineer Beth Klotzbach submitted interview question responses by email on April 23, 2015. Ms. Klotzbach indicated that the remedy has performed as designed consistently over the last five years and that the Site is well-maintained. She stated that while the groundwater COC concentrations fluctuate, there hasn't been a significant change over the past 5 years in the overall groundwater quality. Methane monitoring confirms that the GMCS is successfully preventing off-Site migration of methane. Ms. Klotzbach stated that the shut-down of the interceptor well system and modifications to the groundwater sampling scheduled has resulted in a reduction of Site-related O&M costs.

Tybouts Corner Landfill Trust Representative Susanna Mays submitted interview question responses by email on April 23, 2015. She has a positive impression of the Site and its cleanup, and feels that the remedy is performing as designed. She indicated that O&M activities have continued routinely as required by the Site's O&M plan during the last five years. The Trust responds to Site-related inquiries from residents living near the Site in a timely and responsive manner. Ms. Mays stated that the Trust, EPA and DNREC have an excellent working relationship.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes, the remedy is functioning as intended by the decision documents. Excavation removed source contamination from the west fill area. The main landfill is secured by a fence, and the cover protects potential receptors from unacceptable exposures and prevents groundwater infiltration. The slurry wall installed along the upgradient side of the landfill prevents infiltration of clean groundwater into the landfill and helps prevent elevated water levels within the landfill.

Monitoring results from contingency landfill gas monitoring locations and most perimeter gas monitoring locations indicate that the active landfill GMCS effectively prevents off-Site migration of unacceptable levels of landfill gas. Landfill gas monitoring inside Site structures verifies that gas concentrations are safe. Although not required by the ROD, groundwater and land use restrictions needed to ensure the protectiveness of the remedy are in place for the Site properties. The DNREC GMZ prohibits the installation of new groundwater wells at and surrounding the Site. Institutional controls prevent activities that could compromise the remedy at the main landfill and site parcels to the west of the landfill.

Groundwater monitoring data indicate that groundwater cleanup goals have largely been achieved. While groundwater COC concentrations at four monitoring locations exceed cleanup

goals, COC concentrations at those locations have remained relatively stable over time. Since 2009, two wells located on the Site property contain fluctuating concentrations of benzene. MW-2 benzene concentrations have ranged between 4.5 µg/L and 10 µg/L. TY-205 benzene concentrations have ranged between 3.8 µg/L and 11.4 µg/L. Downgradient well TY-119B contains elevated benzene concentrations, above the 5 µg/L cleanup goal. In 2014 well TY-119B showed benzene concentrations of 23 µg/L (in May 2014) and 21 µg/L (in November 2014). Given the well's location, additional groundwater sampling may be needed downgradient of TY-119B to fully define the southeastern (leading edge) extent of the groundwater plume and to determine if additional actions are necessary.

The freshwater screening benchmark for benzene is 370 µg/L. The highest concentration of benzene observed at TY-119B between 2006 and 2014 was 28 µg/L in February 2006, well below the screening benchmark level. These data suggest that benzene concentrations in groundwater at TY-119B do not likely pose risks to ecological receptors in Red Lion Creek.

On three occasions an on-Site well, MW-10, contained concentrations of 1,2-dichloroethane above the cleanup goal of 5 µg/L (7.6 µg/L in November 2010, 11 µg/L in May 2013 and 7.8 µg/L in November 2014). The only contaminant in the downgradient well TY-204 that exceeds the cleanup goal of 5 µg/L is 1,2-dichloroethane. From 2010 through 2014 the concentrations of 1,2-dichloroethane in TY-204 have ranged from 0.8 µg/L (November 2014) to 28 µg/L (May 2014).

An evaluation of the vertical gradient between the P1 and P2 Sands should be conducted if increasing contaminant concentrations are observed in a P1 well. Since 2006, benzene concentrations have increased slightly at TY-119B (screened in the P1 Sand). In 2012 and 2013, data verified a downward gradient at TY-119B. Based on this information, sampling of well TY-119A (screened in the P2 Sand) may be warranted to determine if contamination has migrated to the P2 Sand at the TY-119 well pair.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of remedy selection still valid?

The groundwater cleanup goals remain valid. Groundwater use in the affected area has been eliminated through the extension of the public water supply and the enforcement of the DNREC GMZ. The MCLs identified in the ROD for 1,2-DCA and benzene have not changed, and the current MCL for vinyl chloride is less stringent. Contaminated soils have been excavated and capped, eliminating direct exposures and infiltration to groundwater.

The vapor intrusion pathway has not been evaluated, but the Long Term O&M Plan Amendment #2 (January 2009) includes a provision for the Trust to perform a vapor intrusion investigation if the property is developed. At this time, there are no completed exposure pathways for vapor intrusion. The downgradient Wagner property does not include inhabited structures, although benzene concentrations and future sampling may indicate a need for a full vapor intrusion assessment.

Air dispersion modeling evaluates air emissions from the gas mitigation system stack to determine if the emissions present a human health risk. Modeling performed from 2011 to 2014 concluded that the maximum annual off-Site concentration of landfill gas is significantly less than the EPA RSLs established for determination of risk. There is no RSL for methane.

Monitoring of subsurface landfill gas is also conducted. The threshold limit for methane gas, as established in the ESD, is 20 percent of the Lower Explosive Limit (LEL). Higher levels have been detected in PGMW-7, along the western edge of the landfill, adjacent to the wooded area between the landfill cap and the west fill property. With the recent purchase but unknown development plans, this area may need additional monitoring to ensure no unacceptable risks occur. The Site's EPA-approved August 2008 O&M Plan Amendment #1 includes a provision for the installation of additional gas monitoring probes between the landfill and the parcels west of the main landfill upon transfer of Site property ownership. Additional monitoring locations have not yet been installed. Monitoring points will be installed when future plans for development are finalized to ensure they are properly located. A power line right of way is present in this location, which will likely deter development in the immediate area.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. No other information has come to light that could call into question the protectiveness of the remedy.

7.4 Technical Assessment Summary

EPA's review of documents, ARARs, risk assumptions and the Site inspection indicate that the remedy is functioning as intended by the Site's decision documents. Remedial actions at the Site eliminated direct contaminant exposure pathways. Institutional controls further prevent exposures by restricting groundwater use and prohibiting activities that could compromise the integrity of the remedy. The active landfill GMCS effectively prevents off-Site migration of unacceptable levels of landfill gas.

Groundwater data indicate that the leading edge of the groundwater plume may not be fully defined. Elevated benzene concentrations and a downward groundwater gradient at TY-119B may indicate migration of contamination into the P2 Sand. Based on the recent Site property transfer and expected land use change at parcels adjacent to the landfill, additional gas monitoring probes may be needed along the western edge of the landfill. The downgradient Wagner property does not include inhabited structures, although 1,2-dichloroethane concentrations and future sampling may indicate a need for a full vapor intrusion assessment. While groundwater and land use restrictions are in place for Site properties, the need for those restrictions has not been documented in a decision document. No other information has come to light that could call into question the protectiveness of the remedy.

8.0 Issues

Table 9 summarizes the current Site issues.

Table 9: Current Site Issues

Issue	Affects Current Protectiveness?	Affects Future Protectiveness?
Benzene concentrations remain elevated in the furthest downgradient well that is sampled, TY-119B.	No	Yes
A downward vertical groundwater gradient at well TY-119B may indicate vertical migration of contamination into the P2 Sand.	No	Yes
1,2-dichloroethane concentrations have gradually increased in TY-204.	No	Yes
Based on the recent property transfer and expected land use change at parcels adjacent to the landfill, additional gas monitoring probes are required.	No	Yes
The requirement of land and groundwater institutional controls needed to ensure protectiveness is not documented in a decision document.	No	Yes

9.0 Recommendations and Follow-up Actions

Table 10 provides recommendations to address the current Site issues.

Table 10: Recommendations to Address Current Site Issues

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
Benzene concentrations remain elevated in the furthest downgradient well that is sampled, TY-119B.	Conduct an evaluation of groundwater further downgradient of TY-119B to better define and map the leading edge of the groundwater plume.	PRPs	EPA	9/29/2017	No	Yes
A downward vertical groundwater gradient at well TY-119B may indicate vertical migration of contamination into the P2 Sand.	Monitor well TY-119A to determine if contamination is migrating vertically into the P2 Sand at that location.	PRPs	EPA	9/29/2017	No	Yes
Concentrations of 1,2-dichloroethane have gradually increased in well TY-2014.	Determine if the concentrations of 1,2-dichloroethane in TY-204 are attributable to the landfill.	PRPs	EPA	9/29/17	No	Yes
Based on the recent property transfer and expected land use change at parcels adjacent to the landfill, additional gas monitoring probes may be needed.	Determine the anticipated land use changes and install additional gas monitoring probes along the western edge of the landfill, if needed.	PRPs/EPA	EPA	9/29/2017	No	Yes
The requirement of land and groundwater institutional controls needed to ensure protectiveness is not documented in a decision document.	Document the selection of land and groundwater use restrictions for properties affected by Site-related contamination.	EPA	EPA	12/29/2015	No	Yes

The following additional items, though not expected to affect protectiveness, warrant additional follow up:

- While the interceptor well system is not currently in operation, the system should be maintained in case the need arises to put it back into operation. A system inspection in 2010 indicated that there is a strong possibility that the interceptor wells may have filled in with silt. Further investigate the condition of the interceptor well system and perform any maintenance or repairs needed to ensure the system can be made operational if necessary.
- Update the monitoring schedule to include quarterly monitoring of PGMW-7.
- Groundhogs burrow into the surface of the landfill cap. Inspections have determined that the burrowing has not damaged the cap's top impervious layer. However, the groundhogs are not actively managed. Implement a management plan to help actively prevent burrowing animals from damaging the landfill cap. Incorporate the management plan into the Site's O&M Plan.
- Continue to monitor development activities at parcels adjacent to the landfill.

10.0 Protectiveness Statement

The remedy currently protects human health and the environment in the short term because the cap and institutional controls (which were not selected by EPA in a decision document) prevent exposure to contaminated soil and groundwater. The active landfill GMCS effectively prevents off-Site migration of unacceptable levels of subsurface landfill gas. For the remedy to be protective over the long term, the following actions need to be taken:

- Perform additional groundwater sampling to better define and map the leading edge of the groundwater plume.
- Begin monitoring well TY-119A to determine if contamination is migrating vertically into the P2 Sand at that location.
- Determine if the concentration of 1,2-dichloroethane in TY-204 is attributable to the main landfill.
- Determine the anticipated land use changes and install additional gas monitoring probes along the western edge of the landfill when redevelopment plans on the adjacent property are finalized.
- Record the need for land and groundwater use restrictions for properties affected by Site-related contamination.

11.0 Next Review

The next FYR will be due within five years of the signature/approval date of this FYR.

Appendix A: List of Documents Reviewed

Air Dispersion Modeling Report, Tybouts Corner Landfill, New Castle County, Delaware. Prepared for The Tybouts Corner Landfill Steering Committee by Conestoga-Rovers & Associates. January 2012.

Amended Memorandum of Agreement between the Division of Waste and Hazardous Substances and Division of Water for the City of Wilmington Groundwater Management Zone. Department of Natural Resources and Environmental Control. September 2011.

Differential Settlement of Tybouts Corner Landfill Site Memorandum. Conestoga-Rovers & Associates. February 2015.

Explanation of Significant Differences, Tybouts Corner Landfill OU1, New Castle, Delaware. United States Environmental Protection Agency Region 3. July 26, 2000.

Five-Year Review Report for Tybouts Corner Landfill, Bear, Delaware. United States Environmental Protection Agency Region 3. September 29, 2000.

Negotiating Decision Document, Tybouts Corner Landfill, New Castle, Delaware. United States Environmental Protection Agency Region 3. September 13, 1984.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, First Quarter – 2010. Tybouts Corner Landfill Site Trust Fund. April 2010.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, Second Quarter – 2010. Tybouts Corner Landfill Site Trust Fund. August 2010.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, Third Quarter – 2010. Tybouts Corner Landfill Site Trust Fund. October 2010.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, First Quarter – 2011. Tybouts Corner Landfill Site Trust Fund. April 2011.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, Second Quarter – 2011. Tybouts Corner Landfill Site Trust Fund. August 2011.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, Third Quarter – 2011. Tybouts Corner Landfill Site Trust Fund. November 2011.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, Fourth Quarter – 2011. Tybouts Corner Landfill Site Trust Fund. February 2012.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, First Quarter – 2012. Tybouts Corner Landfill Site Trust Fund. April 2012.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, Second Quarter – 2012. Tybouts Corner Landfill Site Trust Fund. August 2012.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, Third Quarter – 2012. Tybouts Corner Landfill Site Trust Fund. October 2012.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, Fourth Quarter – 2012. Tybouts Corner Landfill Site Trust Fund. February 2013.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, First Quarter – 2013. Tybouts Corner Landfill Site Trust Fund. April 2013.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, Second Quarter – 2013. Tybouts Corner Landfill Site Trust Fund. August 2013.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, Third Quarter – 2013. Tybouts Corner Landfill Site Trust Fund. October 2013.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, Fourth Quarter – 2013. Tybouts Corner Landfill Site Trust Fund. February 2014.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, First Quarter – 2014. Tybouts Corner Landfill Site Trust Fund. April 2014.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, Third Quarter – 2014. Tybouts Corner Landfill Site Trust Fund. October 2014.

Operations and Maintenance Quarterly Report for the Tybouts Corner Superfund Site, Fourth Quarter – 2014. Tybouts Corner Landfill Site Trust Fund. February 2015

Record of Decision, Tybouts Corner Landfill OU1, New Castle, Delaware. United States Environmental Protection Agency Region 3. March 6, 1986.

Remedial Action Completion Report, Tybouts Corner, Delaware. Tybouts Corner Landfill Site Trust Fund. May 1995.

Remedial Investigation/Feasibility Study Report, Tybouts Corner Landfill, New Castle County, Delaware. June 1985. Prepared for EPA Region 3 by NUS Corporation.

Second Five-Year Review Report for Tybouts Corner Landfill Site, New Castle, New Castle County, Delaware. United States Environmental Protection Agency Region 3. September 29, 2005.

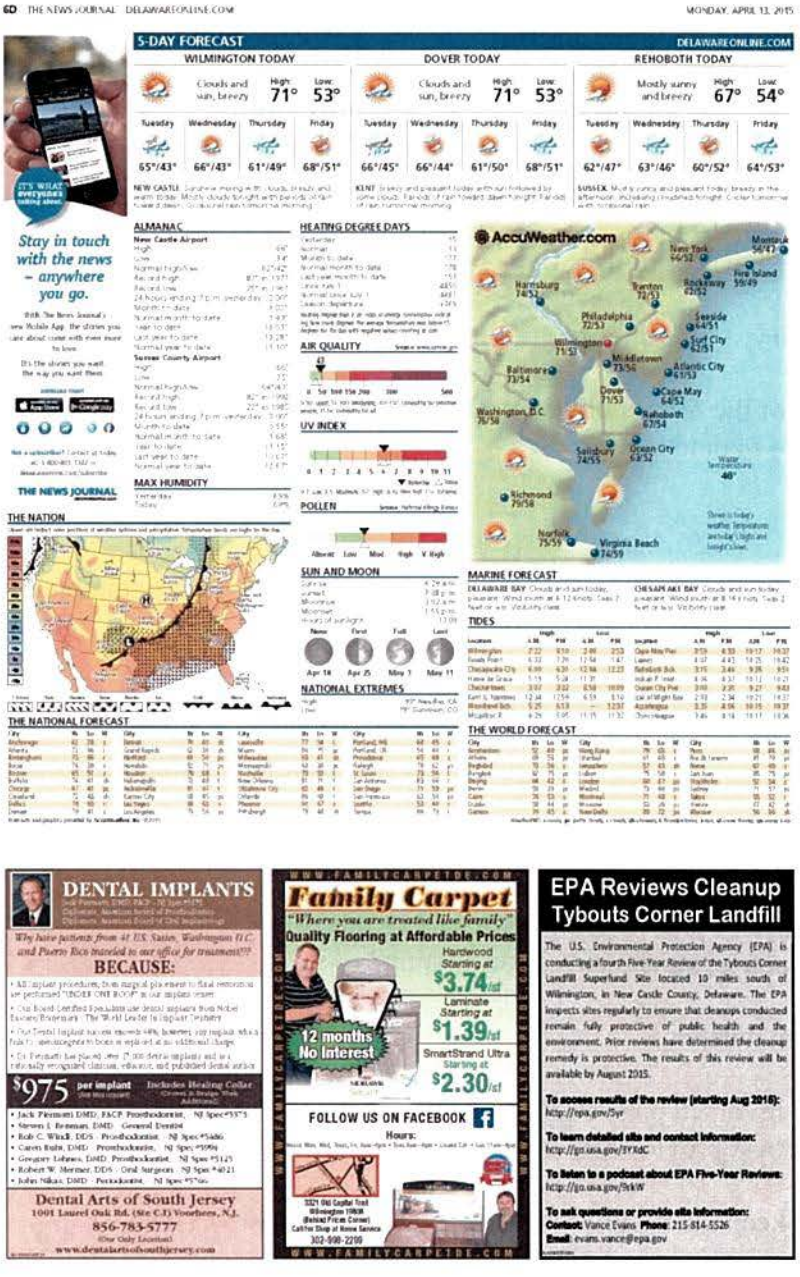
Superfund Site Agreement for Tybouts Corner Landfill Site between William C. Ward and New Castle County. March 4, 1992.

Third Five-Year Review Report for Tybouts Corner Landfill Site, New Castle, New Castle County, Delaware. United States Environmental Protection Agency Region 3. September 29, 2010.

Tybouts Corner Landfill Design Report, West Landfill/Wetland Mitigation Sampling and Analysis Report. Prepared for Tybouts Corner Landfill Trust Fund Management Steering Committee by DPL Consultants. October 1995.

Tybouts Corner Landfill Long-Term Phase Operation & Maintenance Manual Addendum 1. Tybouts Corner Landfill Trust Fund Management Steering Committee. August 2008.

Appendix B: Press Notice



Appendix C: Interview Forms

Tybouts Corner Landfill Superfund Site		**Five-Year Review Interview Form**	
Site Name:	**Tybouts Corner Landfill**	**EPA ID No.:**	**DED000606079**
Interviewer Name:	**Vance Evans**	**Affiliation:**	**EPA CIC**
Subject Name:	**Resident #1**	**Affiliation:**	**Not applicable**
Time:	**2:00 p.m.**	**Date:**	**2/18/2015**
Interview Location:	**Resident's property**		

Interview Format (circle one): **In Person** **Phone** **Mail** **Other:**

Interview Category: **Residents**

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   Yes.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   From what I know, the cleanup and the project in general seems okay.

3. What have been the effects of the Site on the surrounding community, if any?

   There have been no effects on the surrounding community that I'm aware of.

4. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   No, not that I'm aware of.

5. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide Site-related information in the future?

   Yes. EPA can keep me best informed by phone, mail and/or email.

6. Do you own a private well in addition to or instead of accessing city/municipal water supplies? If so, for what purpose(s) is your private well used?

   There's an inactive well on the property. There's currently no water of any sort connected to any of the structures on my property. I'd like to know if the well has been properly closed.

7. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

If I want to drill a private well on my property, may I? (EPA responded that the property is located within a GMZ that prohibits the installation of new groundwater wells). My property is not currently connected to the public water line. Will the water company turn on my connection if I ask? (EPA explained that that would be a question best answered by the water company).

Tybouts Corner Landfill Superfund Site	Five-Year Review Interview Form
Site Name: Tybouts Corner Landfill	**EPA ID No.:** DED000606079
Interviewer Name: Vance Evans	**Affiliation:** EPA CIC
Subject Name: Resident #2	**Affiliation:** Not applicable
Time: 10:30 a.m.	**Date:** 4/14/2015
Interview Location: Not applicable	

Interview Format (circle one): In Person **Phone** Mail Other:

Interview Category: Residents

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   I'm aware of the Site's history and know about most of the cleanup that has taken place there, including the installation of the system that controls landfill gas. I'm not aware of all of the Site cleanup activities.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   Overall, I have a positive impression of the Site. It always appears to be well-maintained and mowed.

3. What have been the effects of this Site on the surrounding community, if any?

   None that I know of.

4. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   No.

5. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide Site-related information in the future?

   No, as far as I know, EPA has not had direct contact with the nearby residents regarding the Site. Most people in the area read the Wilmington News Journal newspaper; that might be a good place in which to publish Site-related information. Letting people know about the Site through emails would also be helpful.

6. Do you own a private well in addition to or instead of accessing city/municipal water supplies? If so, for what purpose(s) is your private well used?

   Yes. We used to use the well for irrigation purposes. We haven't used the well at all for the last three years.

7. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

   The Tybouts Site led me to become interested in local conservation. I founded a local civic organization during the Site cleanup. I'd be happy to help communicate Site-related information to the local community.

Tybouts Corner Landfill Superfund Site		Five-Year Review Interview Form	
Site Name:	**Tybouts Corner Landfill**	**EPA ID No.:**	**DED000606079**
Interviewer Name:	**Vance Evans**	**Affiliation:**	**EPA CIC**
Subject Name:	**Resident #3**	**Affiliation:**	**Not applicable**
Time:	**12:00 p.m.**	**Date:**	**4/14/2015**
Interview Location:	**Not applicable**		
Interview Format (circle one):	**In Person**	**Phone**	**Mail** **Other:**

Interview Category: Residents

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   Yes.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   I have a good impression of the Site. I was not aware that the Site can be reused.

3. What have been the effects of this Site on the surrounding community, if any?

   The Site contaminated the groundwater and resulted in nearby residents having to pay for public water.

4. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   Other than the problem years ago with landfill gas affecting nearby homes, I'm not aware of any other unusual activities or trespassing at the Site.

5. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide Site-related information in the future?

   No. Phone calls would be a good way to inform people of Site activities.

6. Do you own a private well in addition to or instead of accessing city/municipal water supplies? If so, for what purpose(s) is your private well used?

   Yes. We don't use the well.

7. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

   I was not aware that the Site can be reused. I would be concerned that the landfill cap could be damaged if someone tried to reuse the area.

Tybouts Corner Landfill Superfund Site		Five-Year Review Interview Form	
Site Name:	**Tybouts Corner Landfill**	**EPA ID No.:**	**DED000606079**
Interviewer Name:	**Vance Evans**	**Affiliation:**	**EPA CIC**
Subject Name:	**Resident #4**	**Affiliation:**	**Not applicable**
Time:	**6:00 p.m.**	**Date:**	**4/20/2015**
Interview Location:	**Not applicable**		

Interview Format (circle one): **In Person** **Phone** **Mail** **Other:**

Interview Category: **Residents**

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   Yes. I know about the cap over the landfill and the system that controls landfill gas.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   I am not sure if there are any reuse activities at the Site.

3. What have been the effects of this Site on the surrounding community, if any?

   The Site contaminated the groundwater. A neighbor was involved with a lawsuit related to the Site because a few of the family members, including children, became sick. The family drank well water and swam in the on-Site pond before the cleanup. They believe it was the Site that made them sick.

4. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   People regularly trespass at the Site to ride dirt bikes.

5. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide Site-related information in the future?

   I used to receive updates about the Site from time to time, but haven't heard anything in a long time.

6. Do you own a private well in addition to or instead of accessing city/municipal water supplies? If so, for what purpose(s) is your private well used?

   Yes. We don't use the well.

7. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

We moved into our house right after the local homes were connected to the public water supply. I think our groundwater well was supposed to be closed. I don't know if the well was ever properly capped and/or closed, or if it needs to be. We might try to sell our house in the future, and I'd like to know the situation with the well before then. I also heard that the wells that used to pump the groundwater at the Site aren't being used anymore. I'd like to know why they aren't pumping anymore. People sometimes dump their garbage/trash near the Site. I'm concerned that may affect groundwater quality in the area.

Tybouts Corner Landfill Superfund Site		Five-Year Review Interview Form	
Site Name: Tybouts Corner Landfill		EPA ID No.: DED000606079	
Interviewer Name: _____		Affiliation: _____	
Subject Name: Morgan Price		Affiliation: DNREC-SIRS	
Subject Contact Information: Morgan.Price@state.de.us			
Time: _____		Date: 4-20-2015	
Interview Format (circle one):	In Person	Phone	Mail	Other: Email

Interview Category: State Agency

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   I have only been the project officer for the last few years, and as a result was not the project manager during the initial cleanup. However, based on my review of the project file and previous actions I feel that the cleanup actions were appropriate.

2. What is your assessment of the current performance of the remedy in place at the Site?

   The remedy that is in place is appropriate.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

   To my knowledge, no.

4. Has your office conducted any Site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

   My office, in conjunction with EPA, reviews the Operations and Maintenance reports from the contractor. Since the FYR interview (performed during the FYR Site inspection), there has been a minor amount of communication with a property owner near the Site regarding his well. In addition, there was a minor amount of communication with a local property owner regarding the potential testing of his well.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

   To my knowledge, there have not been any changes in state laws that would affect the Site.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

   I am comfortable with the status of the institutional controls.

7. Are you aware of any changes in projected land use(s) at the Site?

I am not aware of any changes in the projected land use.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   No, EPA and representatives from the Trust have been readily available and have maintained excellent communication. They are quick to respond to questions or when assistance is needed.

Tybouts Corner Landfill Superfund Site		Five-Year Review Interview Form	
Site Name:	**Tybouts Corner Landfill**	**EPA ID No.:**	**DED000606079**
Interviewer Name:		**Affiliation:**	
Subject Name:	**Beth Klotzbach**	**Affiliation:**	**Tybouts Corner Landfill Site Trust**
Subject Contact Information:	**BethK@TrustSC.com**		
Time:		**Date:**	**4/23/2015**
Interview Format (circle one):	**In Person**	**Phone**	**Mail** **Other: Email**

Interview Category: Operations and Maintenance (O&M)

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   The landfill currently has no reuse activities but as open space adjacent to major roads; it is well maintained. Maintenance at this stage is routine and the remedy is effective.

2. What is your assessment of the current performance of the remedy in place at the Site?

   The performance of the remedy has remained consistent since the last 5-year review.

3. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site?

   The groundwater sampling events are conducted the second and fourth quarters. The landfill GMCS monitoring is done quarterly. The GMCS data is presented in tables each quarter and the PID/FID and methane readings are presented. Annual stack sample and analysis are included in the fourth quarter report with an updated model run. The groundwater results and trend analysis are reported in Section 5 of the second and fourth quarter reports. Graphs plotting the total VOCs and the three contaminants of concern (benzene, 1,2-DCA and vinyl chloride) are included for the key wells. While the concentrations fluctuate, there hasn't been a significant change over the past 5 years in the overall groundwater quality. The levels of VOCs and COCs in the groundwater wells have been decreasing or static since the interceptor wells were shut down. The methane monitoring has confirmed that the GMCS has prevented off-Site migration of methane.

4. Is there a continuous on-Site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of Site inspections and activities if there is not a continuous on-Site O&M presence.

   There is not a continuous on-Site O&M presence at this time. As the technical representative for the Trust, I visit the Site weekly to record readings for the GMCS and inspect the Site for signs of trespassing or vandalism. The Site programmable logic controller confirms the GMCS is operating, records the flow and sends a fax to the office

at 0030 every day. If the report indicates the system has shut down, I go to the Site and restart the system or troubleshoot why it was shut down. There are quarterly monitoring requirements that are completed by our consultant, CRA, for both the GMCS and groundwater. Have there been any significant changes in Site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

The original O&M manual was updated in December 2006. Three addenda have been added with the most recent one dated March 2012. Addenda 1 and 2 addressed adjacent properties and proposed access controls and monitoring should these parcels be developed. Addendum 3 reduced the frequency for the sampling of 8 wells from semi-annual to annual. These changes do not affect the protectiveness or effectiveness of the remedy.

5. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details.

   There have not been any unexpected O&M difficulties or costs in the last 5 years.

6. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.

   All of the groundwater extraction wells have been shut off since May 2007. This resulted in cost savings from no longer having to discharge the water to the New Castle County sewer. The changes to the O&M manual described in my response to question 5 reduced groundwater sampling costs.

7. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

   Groundwater sampling and methane sampling results should continue to be monitored to confirm decreasing or static trends. So long as such trends continue, the potential to reduce monitoring frequency and associated costs should be assessed and, if possible, implemented.

Tybouts Corner Landfill Superfund Site		Five-Year Review Interview Form	
Site Name:	**Tybouts Corner Landfill**	**EPA ID No.:**	**DED000606079**
Interviewer Name:		**Affiliation:**	
Subject Name:	**Susanna Mays**	**Affiliation:**	**Tybouts Corner Landfill Site Trust**
Subject Contact Information:	**Susanna@TrustSC.com**		
Time:		**Date:**	**4/23/2015**

Interview Format (circle one): **In Person** **Phone** **Mail** **Other: Email**

Interview Category: **Potentially Responsible Parties (PRPs)**

1. What is your overall impression of the remedial activities at the Site?

   Operation & Maintenance activities at the Site have continued routinely as set within the Long Term O&M Plan, approved by EPA.

2. What have been the effects of this Site on the surrounding community, if any?

   The Trust completed the initial remediation of the Site in 1995 and the GMCS in 2000, all of which has ensured no adverse effects on the surrounding community.

3. What is your assessment of the current performance of the remedy in place at the Site?

   The remedy continues to be protective of human health and the environment as designed. EPA approved the shutdown of five of the eight interceptor wells in April 2004 and the shutdown of the last three interceptor wells in May of 2007. The operation of the GMCS continues today to ensure that there is no off-Site migration of methane. The remedy remains effective and protective.

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

   The Trust has responded to any inquiries from adjacent landowners in a timely, responsive and satisfactory manner. For example, the Trust responded to an inquiry from an adjacent, upgradient landowner by providing sampling data for locations on the Site most directly downgradient from the owner's property.

5. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey Site-related information in the future?

   EPA's Remedial Project Manager, DNREC's Environmental Scientist and members of the Tybouts Corner Trust have a very good working relationship. Any questions or issues that may arise with regard to Site activities are addressed in an appropriate and timely manner.

6. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   I am confident that EPA, DNREC and the Trust will continue to work together as we are currently doing until the remedy is complete.

Appendix D: Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Tybouts Corner Landfill	**Date of Inspection: 2/18/2015**
Location and Region: New Castle, DE – EPA R3	**EPA ID: DED000606079**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature: Sunny – 40 degrees F.**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Ground water pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☒ Ground water containment
- ☒ Vertical barrier walls
- ☒ Other: EPA approved the shutdown of the groundwater interceptor well system in 2007.

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** — Beth Klotzbach (Name) | Remedial Trust Steering Committee Project Engineer (Title) | 4/23/2015 (Date)

   Interviewed ☐ at site ☐ at office ☒ by email Phone: _____

   Problems, suggestions ☐ Report attached: Interview responses are summarized in Section 6.6.

2. **O&M Staff** — _____ (Name) | _____ (Title) | mm/dd/yyyy (Date)

   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____

   Problems/suggestions ☐ Report attached: _____

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). Fill in all that apply.

Agency DNREC
Contact Morgan Price (Name) | Site Manager (Title) | 4/20/2015 (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached: Intrerview responses are summarized in Section 6.6.

Agency _____
Contact _____Name | _____ (Title) | _____ (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached:_____

Agency _____
Contact _____ (Name) | _____ (Title) | _____ (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached:_____

Agency _____
Contact _____ (Name) | _____ (Title) | _____ (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ (Name) | _____ (Title) | _____ (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached:_____

4. **Other Interviews** (optional) ☒ Report attached: _____

Susanna Mays, Tybouts Corner Landfill Site Trust — Interview question responses are summarized in Section 6.6

Residents — Resident interviews were conducted during the Site Inspection and over the phone following the Site Inspection. Responses are summarized in section 6.6.

III. ON-SITE DOCUMENTS AND 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: The PRP maintains a blower building inspection log in the blower building. All other O&M documents are stored digitally.

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: The PRP maintains an emergency/contingency plan for the gas migration control system. If the system is out of operation for seven days, they will perform air monitoring to ensure that the shutdown did not impact air quality. The PRP maintains a Site-specific health and safety plan for the on-Site pump house. Plans are stored digitally.

3.	**O&M and OSHA Training Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: All training and OSHA records for field personnel are maintained digitally.			
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: The PRP maintains an active sewer discharge permit in the event that groundwater pumping and discharge operations resume in the future.			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: The PRP performed a landfill survey in fall 2014 to evaluate differential settlement of the cap.			
7.	**Ground Water 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: The PRP maintains a Site access log book on Site.			

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
	☒ CRA performs O&M activities related to the landfill GMCS. The PRP performs other Site O&M activities.	

2. **O&M Cost Records**

☒ Readily available ☒ Up to date

☐ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate: The 1986 ROD did not specify estimated annual O&M costs associated with the capped landfill area. The 2000 ESD specified an estimated annual O&M cost, associated with the gas migration control component of the remedy, of $20,000. ☐ Breakdown attached

Total annual cost by year for review period if available

Year: 2010	$81,382.32	Total cost
Year: 2011	$143,501.89	Total cost
Year: 2012	$103,652.19	Total cost
Year: 2013	$95,762.81	Total cost
Year: 2014	$104,528.10	Total cost

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

Describe costs and reasons: Two automobile accidents along U.S. Route 13, one in 2011 and one in 2012, impacted the Site fence and landfill gas migration system. In both cases, the automobiles crashed through the Site fence. In 2011 the PRPs incurred $39,930.09 in costs associated with the April 10, 2011 automobile accident, which is the reason for the significant increase in O&M costs in 2011. The PRPs also paid $1,315 in 2012 in costs associated with the September 8, 2012 accident.

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

A. Fencing

1. **Fencing Damaged** ☒ Location shown on Site map ☒ Gates secured ☐ N/A

Remarks: Site fencing appeared to be in good condition.

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on Site map ☐ N/A

Remarks: Warning signs are posted on Site fencing.

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): _____

Frequency: _____

Responsible party/agency: _____

Contact _____ _____ mm/dd/yyyy _____

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

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

Remarks: While not required by the ROD, land and groundwater use restrictions are in place for properties affected by Site related contamination. The need for these institutional controls should be documented.

D. General

1. **Vandalism/Trespassing** ☐ Location shown on Site map ☐ No vandalism evident

Remarks: Since the last FYR, trespassers have broken into the chemical feed shed, located near IW-7 in the west fill area. While the locked gate at the entrance to the west fill area restricts vehicular access to the area, tresspassers can access the area by foot.

2. **Land Use Changes On Site** ☐ N/A

Remarks: A new owner purchased the Site property in 2014. Redevelopment plans have not yet been finalized.

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

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on Site map ☐ Settlement not evident
   Arial extent: _____ Depth: _____
   Remarks: Areas of landfill cap settlement have been identified at different areas on the landfill surface. The PRP is aware of the issue and is in the process of evaluating alternatives to address the problem.

2. **Cracks** ☐ Location shown on Site map ☒ Cracking not evident
   Lengths: _____ Widths: _____ Depths: _____
   Remarks: _____

3. **Erosion** ☐ Location shown on Site map ☒ Erosion not evident
   Arial extent: _____ Depth: _____
   Remarks: _____

4. **Holes** ☐ Location shown on Site map ☒ Holes not evident
   Arial extent: _____ Depth: _____
   Remarks: No evidence of burrowing was observed. The PRP indicated that groundhogs routinely burrow in the landfill cap but do not reach the landfill cap liner.

5. **Vegetative Cover** ☐ Grass ☒ Cover properly established
   ☐ No signs of stress ☐ Trees/shrubs (indicate size and locations on a diagram)
   Remarks: _____

6. **Alternative Cover** (e.g., armored rock, concrete) ☒ N/A
   Remarks: _____

7. **Bulges** ☐ Location shown on Site map ☒ Bulges not evident
   Arial extent: _____ Height: _____
   Remarks: _____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Arial extent: _____
   ☐ Ponding ☐ Location shown on Site map Arial extent: _____
   ☐ Seeps ☐ Location shown on Site map Arial extent: _____
   ☐ Soft subgrade ☐ Location shown on Site map Arial extent: _____
   Remarks: _____

9. **Slope Instability** ☐ Slides ☐ Location shown on Site map
   ☒ No evidence of slope instability
   Arial extent: _____
   Remarks: _____

B. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on Site map ☐ N/A or okay
   Remarks: _____

2. **Bench Breached** ☐ Location shown on Site map ☐ N/A or okay
   Remarks: _____

3. **Bench Overtopped** ☐ Location shown on Site map ☐ N/A or okay
   Remarks: _____

C. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** (Low spots) ☐ Location shown on Site map ☐ No evidence of settlement
   Arial extent: _____ Depth: _____
   Remarks: _____

2. **Material Degradation** ☐ Location shown on Site map ☐ No evidence of degradation
   Material type:_____ Arial extent: _____
   Remarks: _____

3. **Erosion** ☐ Location shown on Site map ☐ No evidence of erosion
   Arial extent: _____ Depth: _____
   Remarks: _____

4. **Undercutting** ☐ Location shown on Site map ☐ No evidence of undercutting
   Arial extent: _____ Depth: _____
   Remarks: _____

5. **Obstructions** Type: _____ ☐ No obstructions
   ☐ Location shown on Site map Arial extent: _____
   Size: _____
   Remarks: _____

6. **Excessive Vegetative Growth** Type: _____
   ☐ No evidence of excessive growth
   ☐ Vegetation in channels does not obstruct flow
   ☐ Location shown on Site map Arial extent: _____
   Remarks: _____

D. Cover Penetrations ☒ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☒ Passive
☐ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
Remarks: All passive and active landfill gas vents/wells appeared to be in good condition.

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
Remarks: All wells appeared to be in good condition, well maintained and secured with locks. Most monitoring wells are located outside the perimter of the landfill cap.

4. **Extraction Wells Leachate**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A
Remarks: _____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A
Remarks: _____

E. Gas Collection and Treatment ☒ Applicable ☐ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs maintenance
Remarks: Landfill gas is not treated. It is collected and vented through a central stack.

2. **Gas Collection Wells, Manifolds and Piping**
☒ Good condition ☐ Needs maintenance
Remarks: Landfill gas piping appeared to be in good condition.

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)
☒ Good condition ☐ Needs maintenance ☐ N/A
Remarks: Gases inside of the blower building are routinely monitored to ensure the safety of O&M staff.

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks: _____

2.	**Outlet Rock Inspected**	☐ Functioning	☐ N/A
	Remarks: _____		
G. Detention/Sedimentation Ponds		☐ Applicable	☒ N/A
1.	**Siltation**	Area extent: _____ Depth: _____	☐ N/A
	☐ Siltation not evident		
	Remarks: _____		
2.	**Erosion**	Area extent: _____ Depth: _____	
	☐ Erosion not evident		
	Remarks: _____		
3.	**Outlet Works**	☐ Functioning	☐ N/A
	Remarks: _____		
4.	**Dam**	☐ Functioning	☐ N/A
	Remarks: _____		
H. Retaining Walls		☐ Applicable	☒ N/A
1.	**Deformations**	☐ Location shown on Site map	☐ Deformation not evident
	Horizontal displacement: _____		Vertical displacement: _____
	Rotational displacement: _____		
	Remarks: _____		
2.	**Degradation**	☐ Location shown on Site map	☐ Degradation not evident
	Remarks: _____		
I. Perimeter Ditches/Off-Site Discharge		☒ Applicable	☐ N/A
1.	**Siltation**	☐ Location shown on site map	☒ Siltation not evident
	Area extent: _____		Depth: _____
	Remarks: _____		

2.	**Vegetative Growth**	☐ Location shown on Site map	☐ N/A
	☒ Vegetation does not impede flow		
	Area extent: _____		Type: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on Site map	☒ Erosion not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
4.	**Discharge Structure**	☒ Functioning	☐ N/A
	Remarks: All surface water runoff discharge pipes and rock drainage ditches appeared to be in good condition and were free of debris and vegetation.		

VIII. VERTICAL BARRIER WALLS ☒ Applicable ☐ N/A

1. **Settlement** ☐ Location shown on site map ☒ Settlement not evident

   Area extent: _____ Depth: _____

   Remarks: _____

2. **Performance Monitoring** Type of monitoring: Water level measurements are routinely collected to assess the performance of the slurry wall.

   ☐ Performance not monitored

   Frequency: Annually ☐ Evidence of breaching

   Head differential: _____

   Remarks: Water level measurement data collected annually from the monitoring wells outside of the slurry wall at the bottom of the Columbia Formation water table indicate that the slurry wall is performing as designed.

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

A. Ground Water 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: The groundwater extraction system is no longer operational. IW pumps are checked periodically to determine if they are still operable. On May 25, 2010, the IW pumps were activated. All wells indicated power to the pumps; however, no water discharged to the sumps when tested. The 2014 fourth-quarter O&M Report states that there is a strong possibility the wells have silted in.

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

   ☒ Good condition ☐ Needs maintenance

   Remarks: _____

3. **Spare Parts and Equipment**

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

   Remarks: Not applicable.

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**

☐ 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: _____

☐ Additive (e.g., chelation agent, flocculent): _____

☐ Others: _____

☐ Good condition ☐ Needs maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of ground water treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: _____

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: _____

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:**

☐ Ground water plume is effectively contained ☐ Contaminant concentrations are declining

E. 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: All observed monitoring wells were closed and locked and appeared to be in good condition.

X. OTHER REMEDIES

If there are remedies applied at the site and 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 designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).

The selected remedy has been implemented as designed. Excavation effectively removed source contamination from the west fill area, leaving no soil remaining in place that could cause groundwater to exceed groundwater cleanup goals. The main landfill is secured by a fence and the landfill cover protects and prevents infiltration of precipitation of groundwater into the landfill. The slurry wall prevents the infiltration of clean groundwater into the landfill and helps prevent elevated water levels within the landfill. The Site's location within a GMZ prohibits the installation of new groundwater wells and institutional controls prevent activities that could compromise the integrity of the remedy. The institutional controls in place were not required by the ROD. The need for these institutional controls should be documented. Groundwater monitoring data indicate that groundwater cleanup goals have largely been achieved throughout most of the monitoring well network. In general, landfill gas monitoring results indicate that the active landfill GMCS effectively prevents off-Site migration of unacceptable levels of landfill gas.

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. The PRP prepares and submits quarterly O&M reports to EPA and DNREC. Reports indicate that O&M activities are adequate. However, areas of landfill cap settlement have been identified in different areas of the landfill surface. Annual gas vent inspections have noted that nine of the 51 passive landfill gas vents appear to be tilting. The PRPs completed an evaluation of the settlement in February 2015. The evaluation determined that the rate of settlement is not uniform across the entire landfill surface and that the strain placed on the liner by differential settlement should not result in a compromise of the material at this time. The presence of burrowing groundhogs at the landfill warrants implementation of an active management plan to ensure that burrowing activities do not compromise the integrity of the landfill cap.
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. Monitoring data indicate that the leading edge of the groundwater plume may not be fully defined and that additional sampling may be needed to determine if vertical migration of groundwater contamination is occurring near TY-119B.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. No opportunities for O&M optimization have been identified.

Appendix E: Photographs from Site Inspection Visit

Superfund Site sign posted at the site entrance.

This locking gate secures the Site entrance.

This locking gate on Site restricts access to the pump house.

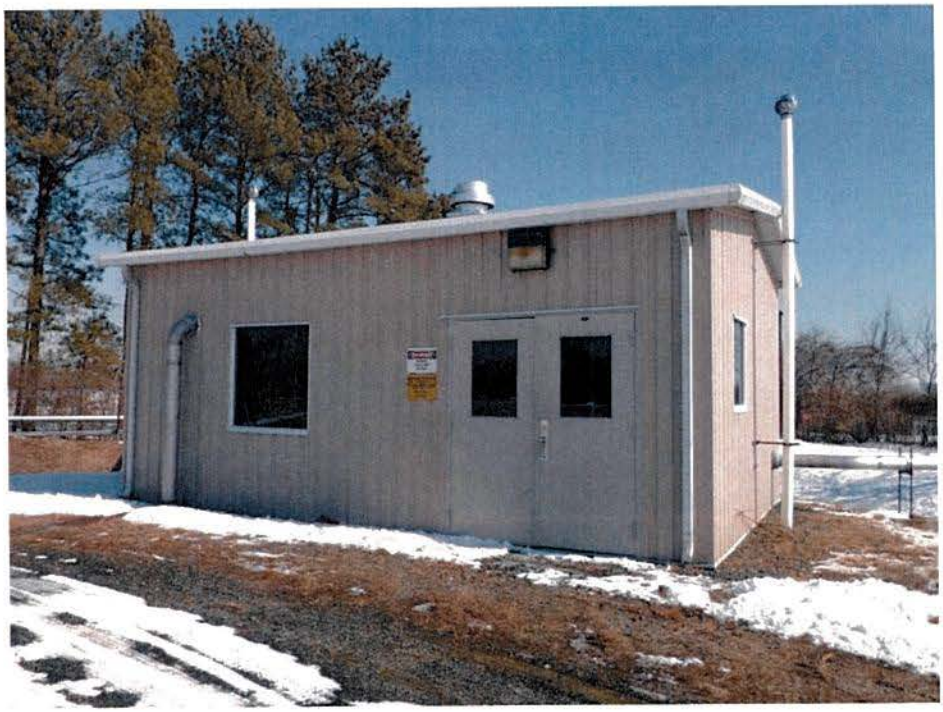
Equalization tank inside of the inactive pump house.

This programmable logic controller monitors the landfill GMCS and sends system status reports to the PRP office daily.

This map inside the inactive pump house shows the Site during remedial action activities.

On-site groundwater monitoring well TY-208 was locked at the time of the Site inspection.

This perimeter drainage ditch surrounds the main landfill.



The blower building is located at the far northeast corner of the main landfill.

Interior of the blower building.

This main line transports landfill gas from the perimeter of the landfill to the landfill gas stack at the center of the landfill.

IW-8, located near the blower building, is one of the several interceptor wells around the Site that are no longer in operation.

Landfill gas pulled in from the perimeter of the landfill is pumped through piping to this central stack.

An area of subsidence is located immediately west of the blower building, at the far northern end of the landfill.

Another area of cap settlement was observed along the landfill's southeastern edge.

View of the landfill cap, looking north.

This locked gate restricts vehicular access to the West Fill area.

Sign posted on the gate to the West Fill area.

Pigeon Run Creek.

This shed (previously used as a chemical feed building for IW-7) and IW-7 are located on the West Fill area property behind the gate. Trespassers have accessed the area by foot and broken into the shed. The PRP has removed all materials from the shed.

View of the west fill area. The fill area is full of water and is a wetland.

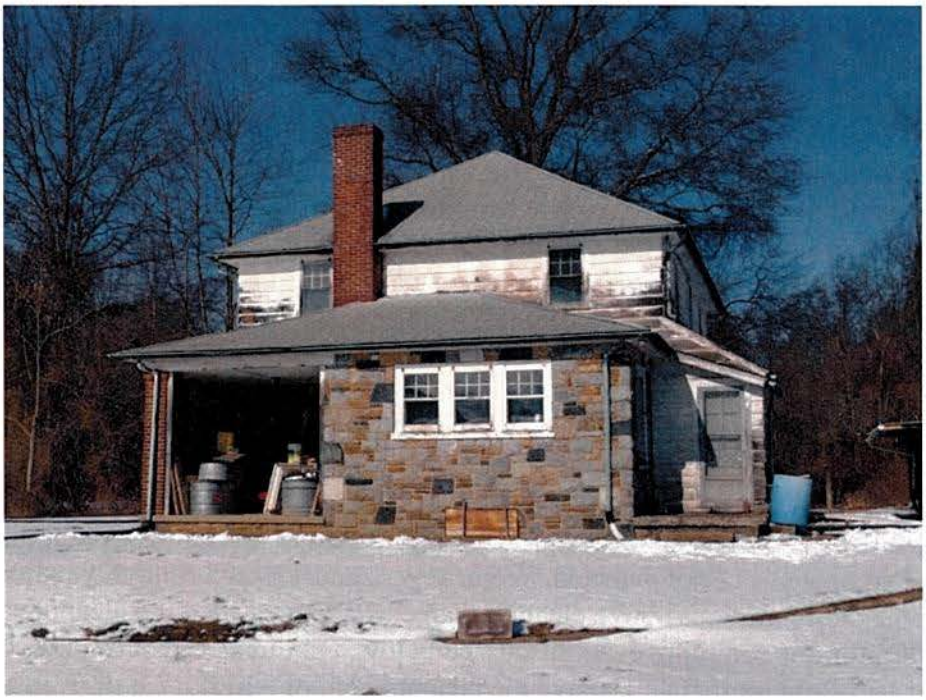
The Delmarva Power & Light Co. has a right-of-way across the southwestern part of the Site. The power lines run between the main landfill and west fill areas.

Perimeter landfill gas monitoring well PGMW-7 is located outside of the southwest edge of the main landfill. The well shows the highest methane concentrations of any of the perimeter landfill gas wells. The well's low elevation and location in a marshy area may attribute to the elevated gas concentrations.

This gate restricts access to the Wagner property located southeast and downgradient of the Site.

In 1976, groundwater contamination was first discovered at the Wagner well, located next to this abandoned house. This house is located on the Wagner property, east of the Site.

The property owner recently built this structure on the Wagner property.



According to the property owner, no one currently lives in this house, which is located on the Wagner property.

Off-Site groundwater monitoring well TY-104 is located immediately southwest of the Wagner property.

Appendix F: Detailed Groundwater Data Review

Groundwater

This FYR compared groundwater monitoring results collected between 2010 and 2014 to groundwater cleanup goals established in the ROD. The Site PRPs collect and analyze groundwater samples for VOCs per the most recent version of the O&M Plan. Currently, annual groundwater monitoring is performed at wells MW-05, MW-06, MW-08, MW-09, MW-12, MW-13, TY-104, TY-114 and TY-120B. Semi-annual monitoring is performed at wells MW-01, MW-02, MW-03, MW-04, MW-10, TY-204, TY-205 and TY-119B.

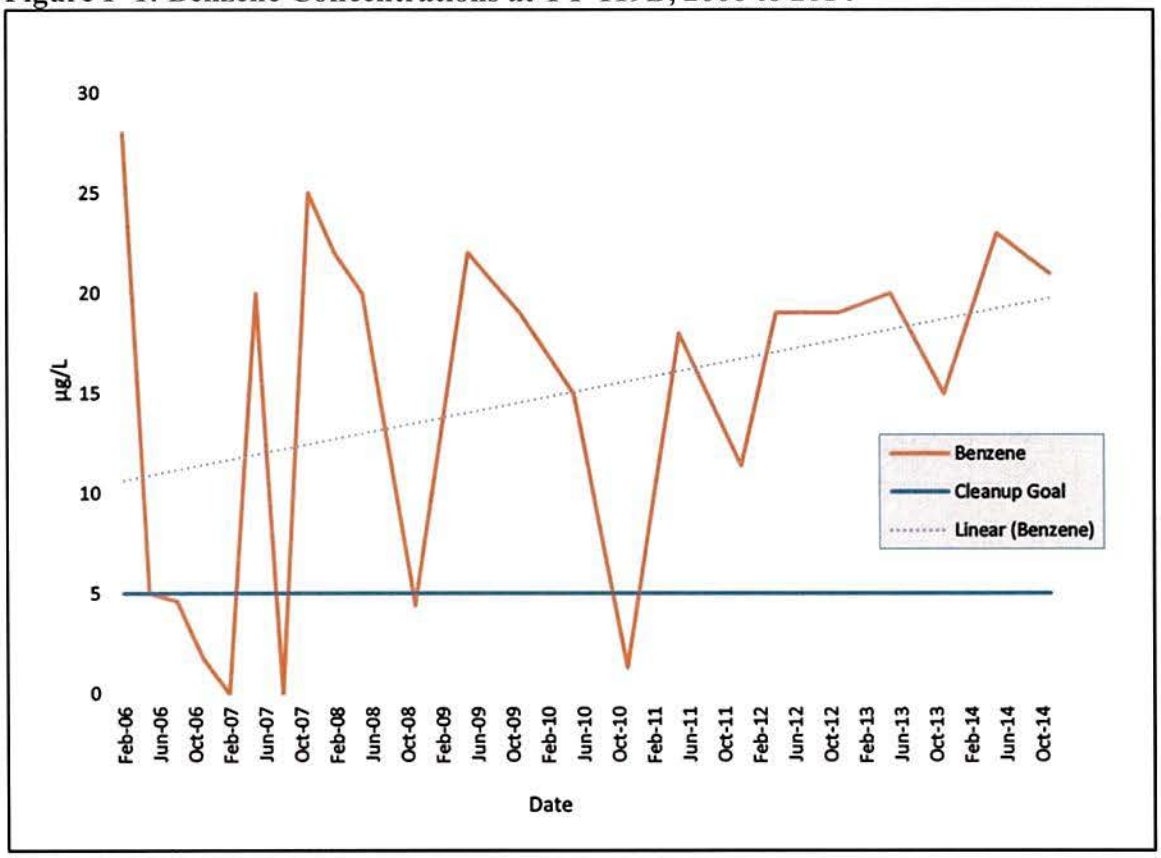
Wells TY-104, TY-114, TY-119B, TY-204 and TY-120B are located outside of the main landfill property (off-property). The rest of the wells are located around the perimeter of the main landfill.

Between May 2010 and November 2014, groundwater COCs at most on-Site well locations were either below cleanup goals or not detected. Wells MW-2 and TY-205 routinely exhibited elevated benzene concentrations above cleanup goals. MW-3 exceeded the cleanup goal of 100 µg/L total VOCs for one sampling event discussed below. On three occasions MW-10 contained concentrations of 1,2-dichloroethane above the cleanup goal of 5 µg/L (7.6 µg/L in November 2010, 11 µg/L in May 2013 and 7.8 µg/L in November 2014). Benzene concentrations at MW-2 were consistently above the 5 µg/L cleanup goal with the exception of the May 2014 sampling event. Benzene concentrations at MW-2 ranged from a low of 4.5 µg/L in May 2014 to a high of 10 µg/L in May 2010. Benzene concentrations at that location have remained stable during the period reviewed, with no concentration trends observed. In April 2012, MW-3 contained a total VOC concentration of 124.5 µg/L, above the 100 µg/L cleanup goal for total VOCs, primarily due to a detection of acetone at 120 µg/L. Acetone is not a Site-related COC and can often result from laboratory contamination during sampling analysis. Total VOC concentrations at MW-3 are typically significantly below the cleanup goal. The single cleanup goal exceedance is not representative of typical total VOC concentrations at that location and appears to be an anomaly. A single exceedance of the 1,2-DCA cleanup goal occurred in November 2014 at MW-3. Concentrations of 1,2-DCA at that location are typically below the cleanup goal. Concentrations of 1,2-DCA at MW-10 exceeded the cleanup goal slightly in November 2010, May 2013 and November 2014, with no concentration trends observed during the period reviewed.

Two off-property wells (TY-204 and TY-119B) and one well just outside of the main landfill (TY-205) routinely exhibit VOC concentrations above cleanup goals. COC concentrations at other off-property wells are routinely below cleanup goals or not detected. Benzene is the only COC that exceeds the 5 µg/L cleanup goal at TY-205 and TY-119B. TY-119B is the furthest downgradient well currently monitored. Benzene concentrations at well TY-119B are higher than at any other on-Site or off-Site monitoring well. Based on this information, this data review examined benzene concentrations at TY-119B from 2006 through 2014 (Figure F-1 and Table F-2). Based on the location of TY-119B, and the elevated benzene concentrations at that location, the current southeastern (leading edge) extent of the groundwater plume may not be fully defined. While these conditions suggest that the leading edge of the groundwater plume may not be fully defined, there is no complete exposure pathway because the downgradient wells that

routinely show VOC concentrations above cleanup goals are located within the GMZ. Figure F-3 provides a cross-section of wells TY-204 and TY-119B.

Figure F-1: Benzene Concentrations at TY-119B, 2006 to 2014



Additional groundwater monitoring wells that are no longer routinely sampled are located south (wells TY-116A, B and C) and southwest (TY-121A and B) of well TY-119B. Per the approved changes to the long-term groundwater monitoring plan, the PRPs stopped regularly sampling wells TY-116A, B and C and wells TY-121A and B in 2007. Per an EPA request, the PRPs sampled wells TY-116A, B and C, and TY-121A and B in May 2011, and TY-121A and B in May 2012. With the exception of a 1 µg/L result in February 2006 and an estimated result of 0.15 µg/L in May 2011 at well TY-121A, benzene was not detected in any of these wells in February 2006, May 2011 or May 2012. Those data suggest that the groundwater plume, up until May 2012, was not moving toward the south near those specific wells. Well TY-114 is located north of TY-119B (Figure 4). Between 2010 and 2014, benzene concentrations at TY-114 have not exceeded the 5 µg/L cleanup goal (Table F-1).

Data from these wells suggest the location of the groundwater plume may be relatively stable at all locations along its leading edge, except for the area near well TY-119B. Additional groundwater data from wells TY-116A, B and C and TY-121A and B, and from areas directly east and southeast of TY-119B, may help better define the leading edge of the groundwater plume in that area.

Table F-1: Benzene Concentrations at Downgradient, Off-Property Monitoring Wells, 2010-2014

Well ID	Benzene cleanup goal (µg/L)	Sampling Date									
		5/2010	11/2010	5/2011	12/2011	5/2012	11/2012	5/2013	11/2013	5/2014	11/2014
TY-114	5	1.7	3.6	1.8	NS	2.2	NS	1.8	NS	1.5	NS
TY-104	5	ND	1.3	ND	NS	ND	NS	ND	NS	ND	NS
TY-204	5	3.3	ND	0.84	2.22	3.8	2.8	3.4	3.2	2.6	2.5
TY-120A	5	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
TY-120B	5	ND	ND	ND	NS	ND	NS	ND	NS	ND	NS
TY-119A	5	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
TY-119B	5	**15**	1.3	**18**	**11.4**	**19**	**19**	**20**	**15**	**23**	**21**
TY-121A	5	NS	NS	0.15[a]	NS	ND	NS	NS	NS	NS	NS
TY-121B	5	NS	NS	ND	NS	ND	NS	NS	NS	NS	NS
TY-116A	5	NS	NS	ND	NS	NS	NS	NS	NS	NS	NS
TY-116B	5	NS	NS	ND	NS	NS	NS	NS	NS	NS	NS
TY-116C	5	NS	NS	ND	NS	NS	NS	NS	NS	NS	NS

Notes:
a – Estimated result.
Bold results indicate an exceedance of the benzene cleanup goal.
NS – Not sampled
ND – Not detected

Table F-2: Benzene Concentrations at TY-119B, 2006-2014

Well ID	Benzene cleanup goal (µg/L)	Sampling Date												
		2/2006	5/2006	8/2006	11/2006	2/2007	5/2007	8/2007	11/2007	2/2008	5/2008	11/2008	5/2009	11/2009
TY-119B	5	**28**	5	4.6	1.7	ND	**20**	ND	**25**	**22**	**20**	4.4	**22**	**19**

Well ID	Benzene cleanup goal (µg/L)	Sampling Date									
		5/2010	11/2010	5/2011	12/2011	5/2012	11/2012	5/2013	11/2013	5/2014	11/2014
TY-119B	5	**15**	1.3	**18**	**11.4**	**19**	**19**	**20**	**15**	**23**	**21**

Notes:
Bold results indicate an exceedance of the benzene cleanup goal.
ND – Not detected

Monitoring well TY-204 is located just outside of the southeastern edge of the main landfill, between the landfill and well TY-119B (Figure 4). In the month of May in 2010, 2011, 2013 and 2014, 1,2-DCA exceeded its cleanup goal of 5 µg/L at TY-204. Between 2010 and 2014, 1,2-DCA concentrations have gradually increased at TY-204 (Figure F-2). Concentrations of 1,2-DCA at TY-204 between 2010 and 2014 ranged from non-detectable concentrations in November 2010 to a high of 28 µg/L in November 2014.

EPA Region 3's Biological Technical Assistance Group (BTAG) has established screening benchmark levels to help evaluate sampling data at Superfund Sites. BTAG has established a freshwater screening benchmark for benzene of 370 µg/L. The highest concentration of benzene observed at TY-119B between 2006 and 2014 was 28 µg/L in February 2006, well below the screening benchmark level. The freshwater screening benchmark for 1,2-DCA is 100 µg/L. The highest concentration of 1,2-DCA observed at TY-204 between 2010 and 2014 was 28 µg/L in May 2014, also well below the screening benchmark level. These data suggest that benzene concentrations in groundwater at TY-119B and 1,2-DCA concentrations at TY-204 do not likely pose risks to ecological receptors in Red Lion Creek.

Figure F-2: 1,2-DCA Concentrations at TY-204, 2010 to 2014

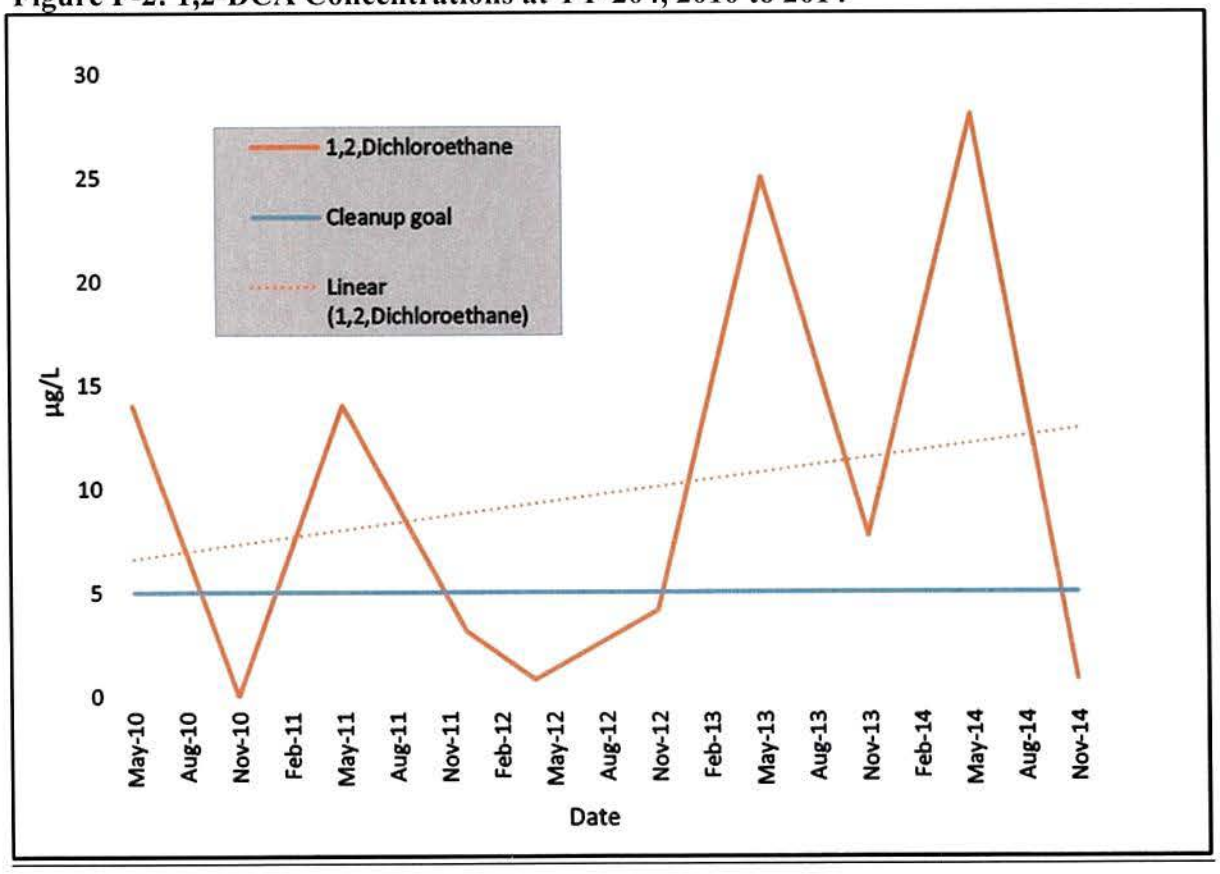
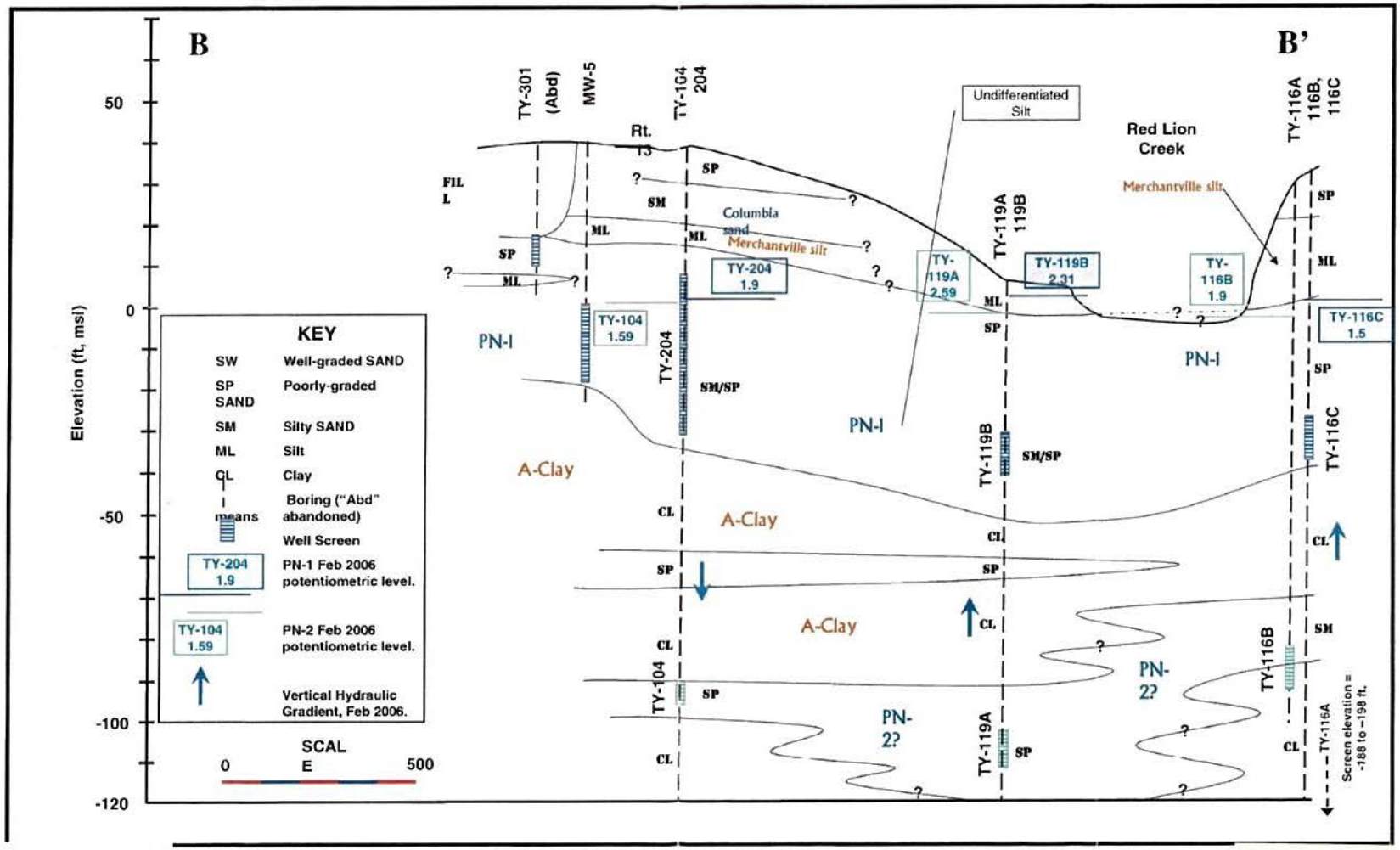


Figure F-3: Geological Cross-Section, TY-301 – TY-116



TYBOUTS CORNER LANDFILL
TYBOUTS CORNER , DELAWARE

Sketch Geological Cross-Section, TY-301 – TY-116.

Appendix G: Operations and Maintenance Plan Components

Major components of the May 2007 O&M Plan and March 2012 updates to the O&M Plan include:

- Annual groundwater monitoring at wells MW-05, MW-06, MW-08, MW-09, MW-12, MW-13, TY-104, TY-114 and TY-120B.
- Semi-annual groundwater monitoring at wells MW-01, MW-02, MW-03, MW-04, MW-10, TY-204, TY-205 and TY-119B.
- Semi-annual groundwater level monitoring, inspection, depth-to-water and headspace measurement.
- Annual landfill gas monitoring.
- Annual monitoring of 51 landfill gas vents.
- Annual collection of water level measurements from the slurry wall performance wells, installed outside of the slurry wall at the bottom of the Columbia Formation water table.
- Quarterly monitoring and inspection of one-fourth of the 15 landfill gas monitoring wells surrounding the landfill.
- Monthly inspection of the pump house.
- Quarterly inspections of the perimeter fence, gates and signs.
- Annual inspection and maintenance of the landfill cap.
- Quarterly inspection of stormwater management basins.
- Quarterly monitoring of the gas migration control system (including 20 contingency probes, 39 system response probes and 25 extraction wells).
- Quarterly monitoring of blower building data.
- Annual stack sampling.

Appendix H: O&M Review

Table H-1: O&M Activities and Findings, 2010 to 2014

O&M activity	Key Observations/Findings
Landfill cap inspection and maintenance	Inspections have not identified erosion of the cap, but have determined that groundhogs burrow into the surface of the cap. The groundhogs are not being actively managed. However, inspections have determined that the burrowing has not damaged the cap's top impervious layer. Differential settlement of the cap near the blower building and along the landfill's southeastern side has been observed. The PRPs completed an evaluation of the settlement in February 2015. The evaluation determined that the rate of settlement is not uniform across the entire landfill surface. The evaluation concluded that the available tensile strength of the landfill's geomembrane (152 pounds per inch) is greater than the required tensile strength (63.2 pounds per inch). Therefore, the strain placed on the liner by differential settlement should not result in a compromise of the material at this time.
Stormwater management	Vegetation is cleared from the perimeter drainage ditch during annual mowing of the landfill cap. Inspections have not identified areas of erosion within the drainage ditch. Phragmites are typically limited to a small area of the south pond.
Site security	The Site is inspected for unauthorized access on a routine basis. Trespassers routinely access the west fill area property by foot. A fence restricts trespassers form accessing the area by vehicle. O&M reports note that security for that area may need to be improved.
Interceptor wells	IW pumps are checked periodically to determine if they are still operable. On May 25, 2010, the IW pumps were activated. All wells indicated power to the pumps; however, no water discharged to the sumps when tested. The 2014 fourth-quarter O&M Report states that there is a strong possibility the wells have silted in.
Landfill GMCS and passive landfill gas vents	Annual gas vent inspections have noted that nine of the 51 passive landfill gas vents appear to be tilting. The PRP conducts weekly inspections of the blower building, system piping and landfill gas wells.
Groundwater monitoring	The PRP inspects groundwater monitoring wells quarterly. Wells are kept closed and secured with locks. O&M reports state that wells are operational and in good condition. Beginning in 2012, some of the Site's groundwater monitoring wells are sampled on an annual basis (MW-05, MW-06, MW-08, MW-09, MW-12, MW-13, TY-104, TY-114 and TY-120B), and some wells are monitored on a semi-annual basis (MW-01, MW-02, MW-03, MW-04, MW-10, TY-204, TY-205 and TY-119B).
Pump house	The PRP inspects the pump house on a monthly basis. A manufacturer's representative performs annual effluent flow meter calibrations.