FOURTH FIVE-YEAR REVIEW REPORT FOR
EAST MOUNT ZION LANDFILL SUPERFUND SITE
YORK COUNTY, PENNSYLVANIA

Prepared by

U.S. Environmental Protection Agency
Region 3
PHILADELPHIA, PENNSYLVANIA

MAY 25 2017

Karen Melvin, Director
Hazardous Sites Cleanup Division

Date

Table of Contents

LIST OF ABBREVIATIONS & ACRONYMS 2
I. INTRODUCTION 3
FIVE-YEAR REVIEW SUMMARY FORM 4
II. RESPONSE ACTION SUMMARY 4
Basis for Taking Action 4
Response Actions 5
Status of Implementation 6
IC Summary Table 7
Systems Operations/Operation & Maintenance 7
III. PROGRESS SINCE THE LAST REVIEW 8
IV. FIVE-YEAR REVIEW PROCESS 8
Community Notification, Involvement & Site Interviews 8
Site Inspection 10
V. TECHNICAL ASSESSMENT 10
QUESTION A: Is the remedy functioning as intended by the decision documents? 10
QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid? 11
QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy? 11
VI. ISSUES / RECOMMENDATIONS 11
VII. PROTECTIVENESS STATEMENT 12
VIII. NEXT REVIEW 12

ATTACHMENTS

Attachment 1 Map depicting location of Site
Attachment 2 Map of the East Mount Zion Landfill Superfund Site (with ground water monitoring wells)
Attachment 3 Fact sheet regarding re-planting of landfill cap (2016)
Attachment 4 Map of the East Mount Zion Landfill Superfund Site (with landfill gas vents and landfill gas wells)
Attachment 5 Schematic of landfill cap
Attachment 6 Photographs taken during the Five Year Review inspection

LIST OF ABBREVIATIONS & ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
IC	Institutional Control
LEL	Lower explosive limit
LFG	landfill gas
NPL	National Priorities List
O&M	Operation and Maintenance
PADEP	Pennsylvania Department of Environmental Protection
ppb	part per billion
RAO	Remedial Action Objectives
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SSC	State Superfund Contract
SVOC	semi-volatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
USACE	United States Army Corps of Engineers
VOC	volatile organic compound

I. 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 is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121(c), consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fourth FYR for the East Mount Zion Landfill Superfund Site (Site). The triggering action for this **statutory** review is the signature date of the third Five Year Review which was June 21, 2012. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

The Five-Year Review was led by an EPA team including Remedial Project Manager Mitch Cron; hydrogeologist Mindi Snoparsky; toxicologist Dawn Ioven; toxicologist Martin Gehlhaus; Biological Technical Assistance Group biologist Bruce Pluta; community involvement coordinator Alex Mandell; and Pennsylvania Department of Environmental Protection (PADEP) project officer Elise Juers. The review began on November 23, 2016.

Site Background

The Site is located in Springettsbury Township, York County, Pennsylvania (see Attachment 1). The Site consists of the capped 10-acre East Mount Zion landfill, and a plume of contaminated ground water which underlies part of a wooded park to the south of the landfill (see Attachment 2). To the north and south of the landfill are wooded areas of the Rocky Ridge county park; the road immediately to the north of the landfill is Deininger Road. To the east of the landfill is a gravel parking area, a picnic pavilion, and an outdoor play area for children. To the west of the landfill area residential houses, along a road called “Doersam Court.”

Over the course of its active life, from approximately 1955 to 1972, the East Mount Zion landfill was a repository for domestic and industrial wastes. Areas for filling were excavated to bedrock, filled with waste materials, and covered with native materials. There was evidence that the Site was operated as an open burning dump at some period during its history. Early 1963 inspection reports of the landfill indicated improper disposal of residential and industrial wastes. Notes of interviews conducted by Pennsylvania state personnel indicated that paint thinner, paint filters, and metal sludge wastes were disposed of at the Site.

The Site is located in the Conestoga Valley section of the Piedmont Physiographic Province. It is approximately 860 feet above mean sea level. The bedrock underlying the Site consists of quartzite and quartz pebble conglomerate of the Hellam member of the Lower Cambrian Chickies Formation. Structurally, the Site is located on the northwest limb of the Mount Zion anticline. The structural and lithologic features govern the movement of groundwater and surface water in the vicinity of the Site.

Water bearing zones in the Hellam member of the Chickies, occur within the fractures and joints of the Chickies. Water bearing fractures decrease below 250 to 300 feet. Ground water monitoring wells surrounding the Site monitor the Chickies drinking water aquifer water as well as the weathered bedrock zone above.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: East Mount Zion Landfill Superfund Site		
EPA ID: PAD 980690549		
Region: 3	**State:** PA	**City/County:** Springettsbury Township, York 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", enter Agency name]*:**
Author name (Federal or State Project Manager): Mitch Cron
Author affiliation: EPA Region 3
Review period: 11/23/2016 - 4/30/2017
Date of site inspection: 3/22/2017
Type of review: Statutory
Review number: 4
Triggering action date: 6/21/2012
Due date *(five years after triggering action date)*: 6/21/2017

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The Site was included on the National Priorities List (NPL) in September 1984. The Pennsylvania Department of Environmental Resources (now the Pennsylvania Department of Environmental Protection (PADEP)), under a Cooperative Agreement with EPA, conducted the remedial investigation and feasibility study (RI/FS) at the Site beginning in 1988.

The contaminants of concern at the Site in ground water were manganese, arsenic, vinyl chloride, benzene, 1,1-dichloroethane, and bis(2-ethylhexyl)phthalate. Federal maximum contaminant levels (MCLs) for drinking water established pursuant to the Safe Drinking Water Act, 42 U.S.C. §§300f et seq.,were exceeded for vinyl chloride and benzene in ground water.

EPA identified metals, volatile organic compounds, and benzene during the investigation of the Site. A summary of the media sampled and associated hazardous substances include:

Ground Water: benzene; vinyl chloride; 1,1-dichloroethane; chlorobenzene; ethylbenzene; 1,4-dichlorobenzene; bis(2-ethylhexyl)phthalate; manganese; iron; lead.

Surface water/leachate: benzene; 1,1-dichloroethene; trichloroethene; toluene; bis(2-ethylhexyl)phthalate; barium; copper; lead; mercury; zinc; cyanide.

Landfill waste: acetone, 2-butanone; toluene; chlorobenzene; ethylbenzene; xylenes; dieldrin; PCBs; cadmium; chromium; lead; zinc; copper; iron; mercury.

EPA evaluated the risk from the Site for the theoretical ingestion of ground water. Based on ground water data from the monitoring wells there would be a potential risk associated with the ingestion of ground water from wells on the Site. While wells on Site showed a potential risk, residential wells in the area of the Site did not show a risk as described in the Record of Decision, which states, "*Evaluation of the residential and nonresidential wells in the neighboring area indicates that there is not significant risk being posed to the population ingesting ground water based on the samples, chemicals, and exposure pathways evaluated.*"

Response Actions

The Record of Decision (ROD) for the East Mount Zion Landfill Site was signed on June 29, 1990. The Remedial Action Objectives (RAOs) were to prevent ingestion of ground water which had concentrations that are greater than the MCLs and to protect downstream water quality to assure concentrations of parameters associated with the East Mount Zion Site met federal and state water quality criteria.

The major components of the selected remedy in the ROD included the following:

1. Installation and maintenance of an impermeable cap over the 10-acre landfill;

2. Installation and maintenance of surface water control systems for the cap;

3. Installation and maintenance of a fence around the landfill;

4. Monitoring ground water contaminant attenuation after installation of the cap; and

5. Initiation of a deed restriction regarding future activities at the Site.

On July 3, 1996, EPA issued an Explanation of Significant Differences (ESD) that delineated two significant differences from the original remedy selected in the ROD. Specifically, these were as follows:

1. EPA determined that it would be necessary to provide for the temporary relocation of some of the residents in the Doersam Woods subdivision located on the Site's western boundary. During remedial action, a significant amount of refuse relocation would occur. Open excavations and exposed refuse could be a potential source of hazardous and odorous emissions from the Site. Although air dispersion modeling revealed that concentrations of hazardous substances at the nearest residence would not significantly impact the nearest residences, as a precautionary measure, due to the proximity of some of the residents to the construction area, EPA determined to temporarily relocate some of the residents during construction. Two families in the Doersam Court subdivision were offered temporary relocation during construction. One family accepted the temporary relocation and was placed in a comparable rental home for approximately 14 months. The second family declined the temporary relocation and remained in their residence.

2. The ROD stated that the purchase of property may be necessary to ensure efficient access during construction. The ESD clarified the nature of this property acquisition as a permanent easement. During the remedial design, it became apparent that a permanent easement along the southern perimeter of the Site would be

required to accommodate the installation and maintenance of a drainage swale to convey surface water runoff from the cap to the detention basins. This permanent easement is located on the southern border of the Site in Rocky Ridge County Park and is approximately 0.75 acres in size.

EPA issued a second ESD for the Site in 2007 that assigned health-based ground water performance standards for the ground water contaminants identified in the ROD. Prior to the issuance of the second ESD, ground water remediation standards in the ROD were described as follows, "Based on ground water velocity and the elimination of the source, ground water concentrations at the landfill perimeter are expected to meet background levels within five years through natural attenuation." In addition, the ROD included 25 Pa. Code 75.264(n), as an Applicable or Appropriate and Relevant Requirement (ARAR) for the Site remedy. This ARAR was described in the ROD as, "hazardous substances must be remediated to "background" quality."

Status of Implementation

Landfill Cap

The Remedial Design was completed in September 1995. The U.S. Army Corps of Engineers (USACE) awarded the remedial action contract to Republic Environmental Systems, Inc. on May 30, 1997, and construction started on August 15, 1997. Another contractor, Geosyntec Consultants, was retained as an independent quality assurance/quality control contractor that was present during the entire remedial construction activities.

In order to achieve the required 4:1 slope requirements, approximately 60,000 cubic yards of refuse had to be excavated from the western side of the landfill and the landfill perimeter and relocated and compacted on-Site. The refuse relocation was necessary to cut back the approximate 80% toe slopes on the western and southern perimeter of the landfill. During the refuse relocation period, it was discovered that landfill refuse extended beyond the landfill property along the north side of the landfill along Deininger Road in Rocky Ridge County Park property. This area was subsequently over-excavated to remove the refuse from the park property and relocate it back on the landfill property.

The cap construction entailed the placement of the appropriate geotextile fabrics; installation of permanent settlement monuments; placement of a gas collection layer, geosynthetic clay liner, geonet-geotextile composite drainage layer, final cover soil, top soil and vegetative cover. A schematic of the landfill cap in cross section is included as Attachment 5. Storm water management systems for the cap consisted of the construction of detention basins, overflow structures and rip rap drainage channels. A fence was also constructed around the perimeter of the landfill property to restrict access to the landfill.

Following the completion of the landfill cap construction, disturbed areas outside the landfill property and within the temporary construction easements were re-landscaped with a variety of trees including white pine, hemlock, Douglass fir, and red sunset maples among others. These trees currently provide a partial visual barrier of the landfill from the adjacent Doersam Court subdivision and the road leading into Rocky Ridge County Park.

The Site achieved construction completion status when the Preliminary Close Out Report was signed on February 4, 1999.

Institutional Controls

The ROD requires institutional controls for the East Mount Zion Landfill property. The property is currently owned by Ridge Developers Inc. In September 2001, the EPA issued an Administrative Order to Ridge Developers to place institutional controls on the landfill property to ensure the protection of the cap. A "Notice of Access and Use Restriction" was recorded on April 11, 2002 in the Office of the Recorder of Deeds for York County, Pennsylvania, in Book 1489, Pages 7293 - 7299. Therefore, the institutional controls required in the ROD have been implemented at the Site.

Pursuant to the State Superfund Contract (SSC) which EPA and the Commonwealth of Pennsylvania entered into on March 28, 1995, the Commonwealth of Pennsylvania agreed to accept interest in a permanent easement which was placed on Rocky Ridge County Park property along the southern perimeter of the East Mount Zion Landfill property for the maintenance of a drainage swale for the cap. On June 17, 1996, a Deed Easement dated May 22, 1996 was filed in the York County Recorder of Deeds Office. The Deed Easement was between the County of York (Grantor) and the United States of America (Grantee) and is recorded in Book 1264, Page 7480.

IC Summary Table

Summary of Planned and/or Implemented ICs					
Media, engineered controls, and areas that do not support UU/UE based on current conditions	**ICs Needed**	**ICs Called for in the Decision Documents**	**Impacted Parcel(s)**	**IC Objective**	**Title of IC Instrument Implemented and Date (or planned)**
Landfill cap	yes	yes	landfill	Protect landfill cap	Notice of Access and Use Restriction (2002) - completed

Landfill Gas Monitoring

A total of fifteen landfill gas (LFG) monitoring wells are installed along the entire perimeter of the landfill property within the fence line. These LFG wells are permanent monitoring points and are part of the long-term monitoring program.

EPA sampled the 15 permanent LFG monitoring wells quarterly for the first year after installation in May 2000. Subsequent monitoring of the LFG monitoring wells was conducted by PADEP on a quarterly basis beginning in December 2001. The first year of quarterly monitoring by EPA from May 2000 - May 2001 revealed that methane emissions were generally higher from gas monitoring wells located on the north and south sides of the landfill from those located on the east and west sides of the landfill.

PADEP regulations for gas control and monitoring (25 Pa. Code, Chapter 273.292) require that combustible gas levels may not equal or exceed the following:

1. 25% of the Lower Explosive Limit (LEL) for methane in a structure within the Site
2. The LEL for methane at boundaries of the Site (LEL for methane is 5% concentration)

During the 2007 Five Year Review, EPA and PADEP determined that methane concentrations at the landfill boundary exceeded the LEL. This was of particular concern along the western boundary of the landfill because residential housing is located immediately to the west of the landfill cap. Therefore, in 2007 EPA and PADEP arranged to have 10 additional passive landfill gas vents installed in the landfill cap to facilitate venting of landfill gas. A review of landfill gas monitoring data is included below (see Section IV below).

Systems Operations/Operation & Maintenance

Operations and maintenance (O&M) activities at the Site are the responsibility of PADEP. On a quarterly basis O&M activities include maintenance of the fence and gates, maintenance of the vegetative cover on the landfill cap, maintenance of the landfill cap, as well as landfill gas monitoring, and then ground water monitoring an annual basis. During 2016, PADEP noted a number of groundhog burrows on the Site. PADEP and in consultation with EPA and U.S. Fish and Wildlife Service replaced the vegetative cover on the landfill with Pennsylvania native species. This work will serve to create habitat for native bird and insect species, as well as create a vegetative cover which should dissuade groundhogs from re-colonizing the landfill cap area. A fact sheet distributed to the nearby public describing this work is included as Attachment 3.

III. PROGRESS SINCE THE LAST REVIEW

This is the fourth FYR for the Site. The previous Five Year completed in 2012, included the following protectiveness statement for the Site:

The remedy at the Site currently protects human health and the environment. The remedy is considered protective in the short term. For the remedy to achieve long-term protectiveness, the following actions need to be taken: ground water monitoring data should continue to be collected at the Site, including the parameters necessary to determine the extent to which natural attenuation of ground water contamination is occurring.

Evaluation of the efficacy of natural attenuation (as described in the ROD) to address ground water contamination at the Site (specifically with regard to manganese) is on-going, and described further below.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public notice was placed in the York Daily Record on March 17, 2017 announcing the five-year review and inviting the public to submit any comments to the. EPA. The results of the review and the report will be made available at the EPA Office and the local repository.

During the FYR process, EPA representatives spoke with local officials and residents to document any perceived problems or successes with the remedy. On January 23, 2017 EPA representatives met with representatives of Springettsbury Township and the York County Parks and Recreation at the Springettsbury Township building and no concerns were raised regarding the protectiveness of the remedy.

Also on January 23, 2017 EPA interviewed the residents who live near the landfill and they did not reveal concerns regarding the protectiveness of the remedy at the Site.

Document and Data Review

This Five-Year Review included a review of documents such as the Record of Decision and monitoring reports including the groundwater monitoring reports from 2013 to 2016 and the landfill gas reports from 2015 and 2016.

Ground Water Contamination

Ten monitoring wells currently in place at the Site are used to monitor the ground water for the attenuation of contaminants. The monitoring wells are present outside of the perimeter of the landfill cap and were installed during the Remedial Investigation. A map depicting the locations of the monitoring wells is included as Attachment 3 in this Report. Three of the wells (EA-1S, EA-2S, and EA-3S) are shallow wells and are screened in the unconsolidated saturated zone. The shallow wells were installed for the purposes of assessing the seasonal nature of the unconsolidated saturated zone and the ground water quality of the zone most intimately associated

with leachate from the landfill. The remaining seven wells (EA-1D, EA-2M, EA-3D, EA-4D, EA-5D, EA-6D, and EA-7D) are deeper wells.

Ground water monitoring is performed annually at the Site by PADEP. Ground water samples are collected at the Site by a PADEP contractor and are currently analyzed for the following analytical parameters: volatile organic compounds (VOCs), semi-VOCs (SVOCs), and total and dissolved metals.

As part of the current Five-Year Review, EPA evaluated the data included in the ground water monitoring reports for the list of contaminants listed in the ROD as contaminants of concern: manganese, arsenic, vinyl chloride, benzene, 1,1-dichloroethane, and bis(2-ethylhexyl)phthalate.

Review of ground water monitoring data reveals that manganese is the only contaminant that exceeds its health-based performance standards:

Summary of Ground Water Monitoring Data

Site-related contaminant	Performance standard (ppb)	*year/monitoring well #*	contaminant concentration in parts per billion (ppb)
Manganese (dissolved concentrations only)	730	*2013/EA-2M* *2013/EA-3S* *2013/EA-4D* *2013/EA-5D* *2014/EA-2M* *2014/EA-3S* *2014/EA-4D* *2014/EA-5D* *2015/EA-2M* *2015/EA-3S* *2015/EA-4D* *2015/EA-5D* *2016/EA-2M* *2016/EA-3S* *2016/EA-4D* *2016/EA-5D*	1376 1887 1754 5838 1212 3875 2082 6030 (duplicate sample = 5960) 1302 5548 2307 6429 1135 2079 2003 6034
Arsenic	10	*No exceedances*	*No exceedances*
Vinyl chloride	2	*No exceedances*	*No exceedances*
Benzene	5	*No exceedances*	*No exceedances*
1,1-Dichloroethane	27	*No exceedances*	*No exceedances*
Bis(2-ethylhexyl) phthalate	*6*	*No exceedances*	*No exceedances*

Manganese

As presented in the table above, manganese concentrations in several monitoring wells located on the south and west side of the landfill cap still exceed the health-based performance standard of 730 ppb.

As stated above, the residents living adjacent to the west of the landfill use the municipal water supply provided by York Water Company, not private wells. Adjacent land use on the other three sides of the landfill is county park land. Beyond the park land areas, there are residences that rely on private wells or the York Water Company municipal water supply.

During the performance of the 2017 Five Year Review, the PADEP collected water samples at one residential well to the south of the landfill in order to evaluate nearby residential wells for manganese. The sampled residence is located along Ridgewood Road, and is the closest residence to the landfill which uses a residential well. Manganese concentrations in the residential wells were less than 10 parts per billion, which is well below the ground water performance standard for manganese of 730 parts per billion. Therefore, although ground water which exhibits manganese concentrations above the ground water performance standard is present beyond the boundary of the landfill cap, nearby residential wells are not impacted.

Also during the performance of the 2017 Five Year Review, PADEP collected a water sample at an irrigation well located at a residence to the west of the landfill cap. Manganese concentrations at this irrigation well were 647 parts per billion (dissolved), which is below the ground water performance standard for manganese of 730 parts per billion. This location will be considered by EPA and PADEP when evaluating the natural attenuation of ground water contamination.

Landfill Gas

Landfill gas monitoring wells are present at the boundary of the landfill cap, as depicted in Attachment 4. Gas monitoring wells (GMW) 1, 2, 3, 4, 5, and 6 are adjacent to residential housing on the west side of the landfill. Other GMWs are adjacent to woods or a gravel parking lot, picnic and outdoor gym-set play area. Based on a review of the landfill gas monitoring reports from PADEP, methane levels are checked before and after the GMWs are purged. Post-purge sampling of the wells provides a measure of how quickly the methane concentrations rebound, thus an indicator of methane gas generation and potential for migration. GMWs adjacent to residential housing did not exhibit methane above lower explosive level (LEL) in post-purge samples on the west side of the landfill. However, GMWs on the the south side of the landfill, adjacent to a wooded public park, did exhibit methane levels above the LEL in pre-purge and post-purge samples. While above state landfill requirements, the GMWs with the elevated methane are adjacent to an undeveloped, wooded area, therefore they are not currently of concern for protection of human health. In the meantime, EPA and PADEP will continue to verify that the methane concentrations in the landfill gas monitoring wells adjacent to residential housing are below the LEL. Additionally, EPA and PADEP will ascertain if venting can be improved such that all landfill gas monitoring wells exhibit methane concentrations below the LEL.

Site Inspection

The inspection of the Site was conducted on January 23, 2017. In attendance were EPA Remedial Project Manager Mitch Cron, EPA geologist Mindi Snoparksy, and EPA community involvement coordinator Alex Mandell; and PADEP project officer Elise Juers. Overall the landfill cap and fence were observed to be in satisfactory condition.

V. TECHNICAL ASSESSMENT

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

Yes, the remedy is functioning, because human health and the environment are protected by the landfill cap that eliminates exposure to the buried landfill waste. The landfill cap minimizes the infiltration of rain water into the buried landfill waste. All institutional controls required in the ROD are in place and are effective in preventing exposure to Site contaminants.

The ground water contaminants meet the ground water remediation standards for the Site with the exception of manganese. The performance standard for manganese is 730 ug/l and manganese at monitoring wells EA-2M, EA-3S, EA-4D, EA-5D are detected above this value. EPA will continue to evaluate the manganese concentrations and the progress of the natural attenuation of manganese in ground water.

The remedy is compliant with the Applicable or Appropriate and Relevant Requirements (ARARs) with the exception of the levels of landfill gas at the southern boundary of the landfill that is adjacent to wooded areas. Landfill gas monitoring at the perimeter of the landfill detect methane above the lower explosive level (LEL) and as a results do not meet PADEP landfill regulations. The area with the elevated methane is adjacent to a wooded undeveloped area. PADEP continues to monitor the landfill gas levels on a quarterly frequency and report the results to EPA. EPA and PADEP will ascertain if venting can be improved such that all landfill gas monitoring wells exhibit methane concentrations below the LEL.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Yes, the assumptions are still valid for the Site. The performance standards for ground water that are summarized in ESD No. 2 have not been substantively revised. EPA will continue to evaluate the protectiveness of the performance standard for manganese in the ground water.

Risks due to potential exposure via vapor intrusion were evaluated using the groundwater performance standards for the benzene and vinyl chloride. The non-cancer and cancer risks from potential exposure to contaminants through vapor intrusion are within acceptable levels as long as the performance standards in ground water are met.

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

No information has come to light that questions the protectiveness of the remedy.

VI. ISSUES / RECOMMENDATIONS

Issues and Recommendations Identified in the Five-Year Review:

OU(s):1	**Issue Category:** Monitoring			
	Issue: Manganese remains above the ground water remediation standard.			
	Recommendation: Continue to evaluate the natural attenuation of manganese in the ground water.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PADEP	EPA	6/21/2018
OU(s):1	**Issue Category:** Operations and Maintenance			
	Issue: On south side of landfill, adjacent to wooded areas, methane exceeds lower explosive limit at landfill boundary. This is not consistent with PADEP landfill regulations.			
	Recommendation: Monitoring will continue to verify methane concentrations on the west side of the landfill remain below lower explosive limits. Continue monitoring methane at landfill boundary, and determine if venting could be improved to maintain methane levels below the LEL.			

Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	PADEP	EPA	6/21/2018

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit *Site wide*	*Protectiveness Determination:* Short-term Protective

Protectiveness Statement:
The remedy at the Site currently protects human health and the environment. The landfill cap minimizes infiltration of precipitation and minimizes the amount of leachate. The remedy is considered protective in the short term. For the remedy to achieve long-term protectiveness, EPA and PADEP will continue to evaluate the natural attenuation of manganese in the ground water and EPA and PADEP will continue to monitor landfill gas and ascertain if landfill gas venting can be improved to maintain methane levels below the LEL at the boundary of the landfill.

VIII. NEXT REVIEW

The next five-year review report for the Site is required five years from the completion date of this review.

East Mount Zion Five Year Review
2017
Attachment 1: Map depicting location of Site

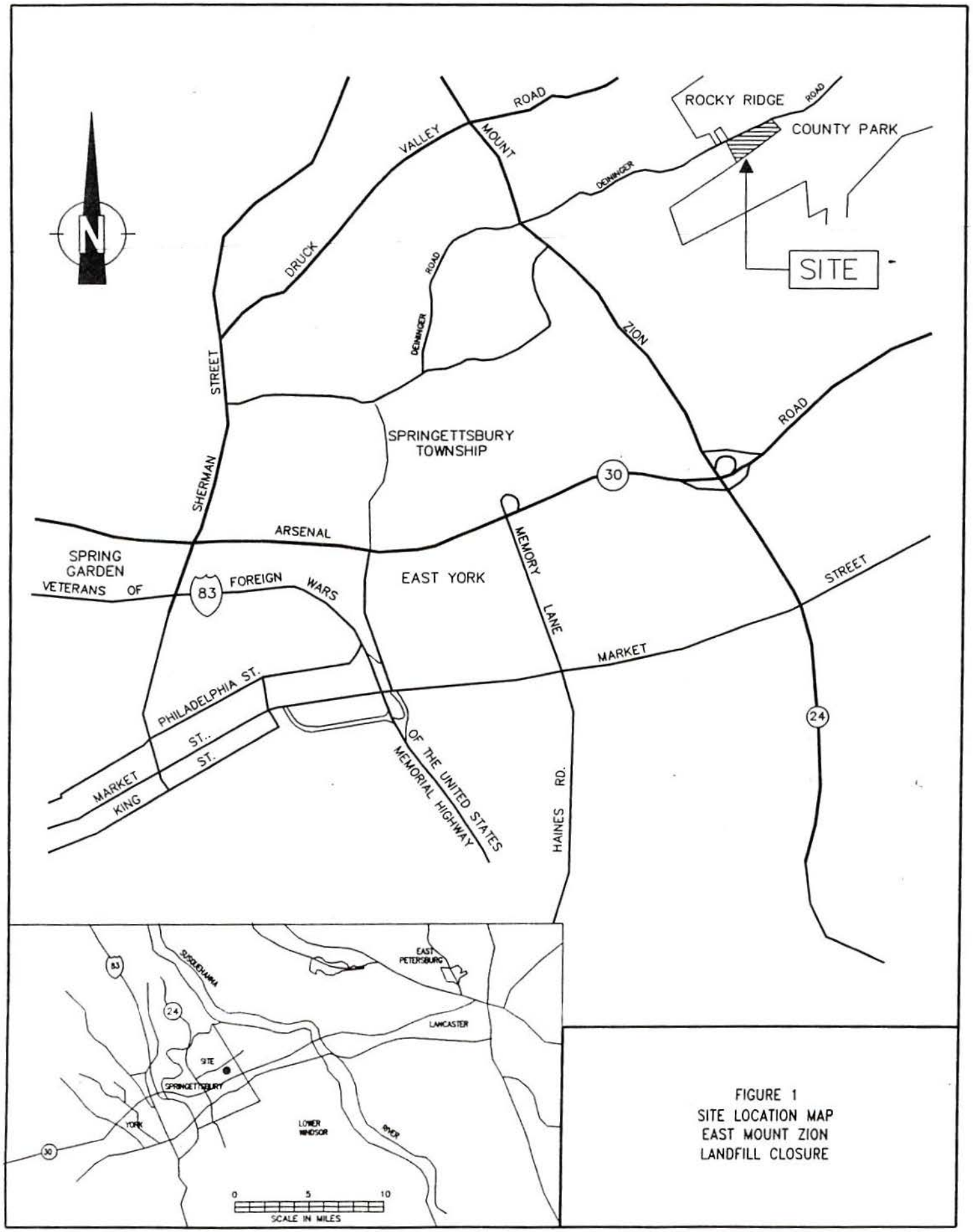


FIGURE 1
SITE LOCATION MAP
EAST MOUNT ZION
LANDFILL CLOSURE

East Mount Zion Five Year Review
2017
Attachment 2 Map of the East Mount Zion Landfill Superfund Site (with ground water monitoring wells)

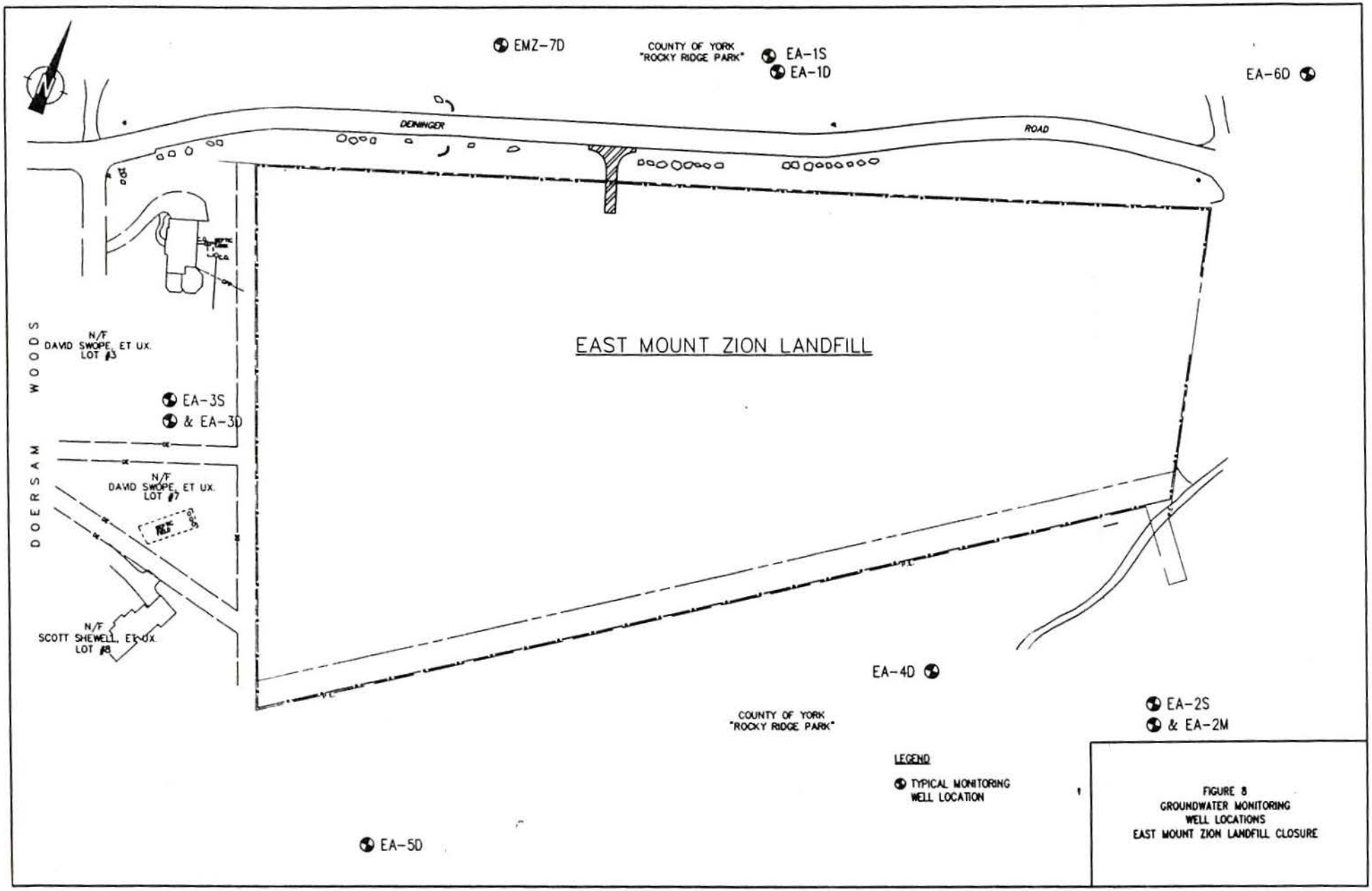


FIGURE 8
GROUNDWATER MONITORING
WELL LOCATIONS
EAST MOUNT ZION LANDFILL CLOSURE

East Mount Zion Five Year Review
2017
Attachment 3 Fact sheet regarding re-planting of landfill cap (2016)

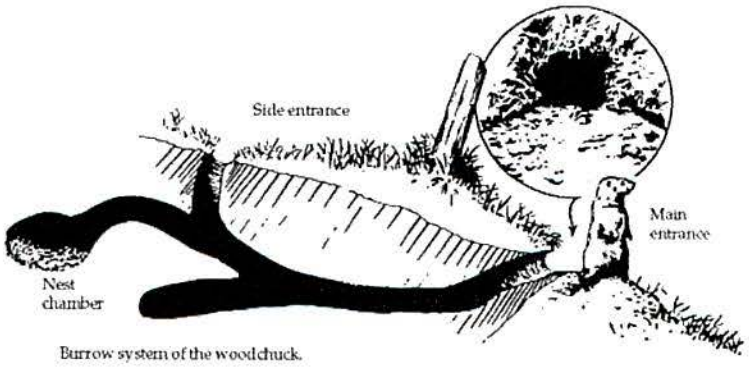
East Mount Zion Landfill
Re-vegetation of landfill cap
Spring 2016

What is planned?

The Pennsylvania Department of Environmental Protection (PADEP) is planning to convert the vegetation cover on the landfill from mostly weeds and invasive species to native species typical of a native Pennsylvania meadow. This activity will reduce long-term maintenance costs on the landfill, which are paid for by the State of Pennsylvania, and will promote the use of the landfill cap by non-destructive native Pennsylvania species, including butterflies, bees, song birds, and ground birds.

Why is this work being performed?

The landfill cap currently exhibits substantial areas of weed and invasive species, and requires mowing several times per year. The regular mowing creates short, grass-like cover vegetation on the cap which is desirable habitat for groundhogs. At present, groundhogs have colonized the landfill cap area and have dug a large number of burrows. PADEP is currently preparing to mobilize to the Site to perform a substantial maintenance event to fill in the burrows.



Burrow system of the woodchuck.

PADEP has consulted with the U.S. Environmental Protection Agency (EPA) and the U.S. Fish and Wildlife Service (FWS) to outline a strategy to prevent further colonization of the landfill cap by groundhogs. The strategy includes converting the cap vegetation from weeds and invasive species to native species typical of a Pennsylvania meadow. After several years, the height of the Pennsylvania meadow species will create a habitat on the landfill cap which is not desirable for groundhogs (higher vegetation will impede their line-of-sight, which they don't like).

How will this work be performed?

Later in March 2016, PADEP will mobilize to the Site to fill in the groundhog burrows. During April, FWS will mobilize to the Site to apply an herbicide to the weeds and invasive species. Herbicide application will be carefully monitored by qualified FWS personnel. When the weeds and invasive species have been eliminated from the landfill cap in April/May, FWS will seed the

landfill with a mix consisting of native Pennsylvania plant species. A list of the plant species is included below. Careful maintenance activities and limited mowing will be performed for several years to promote the Pennsylvania native species, until they're well established on the landfill cap.

Plant species to be planted on the landfill cap include:

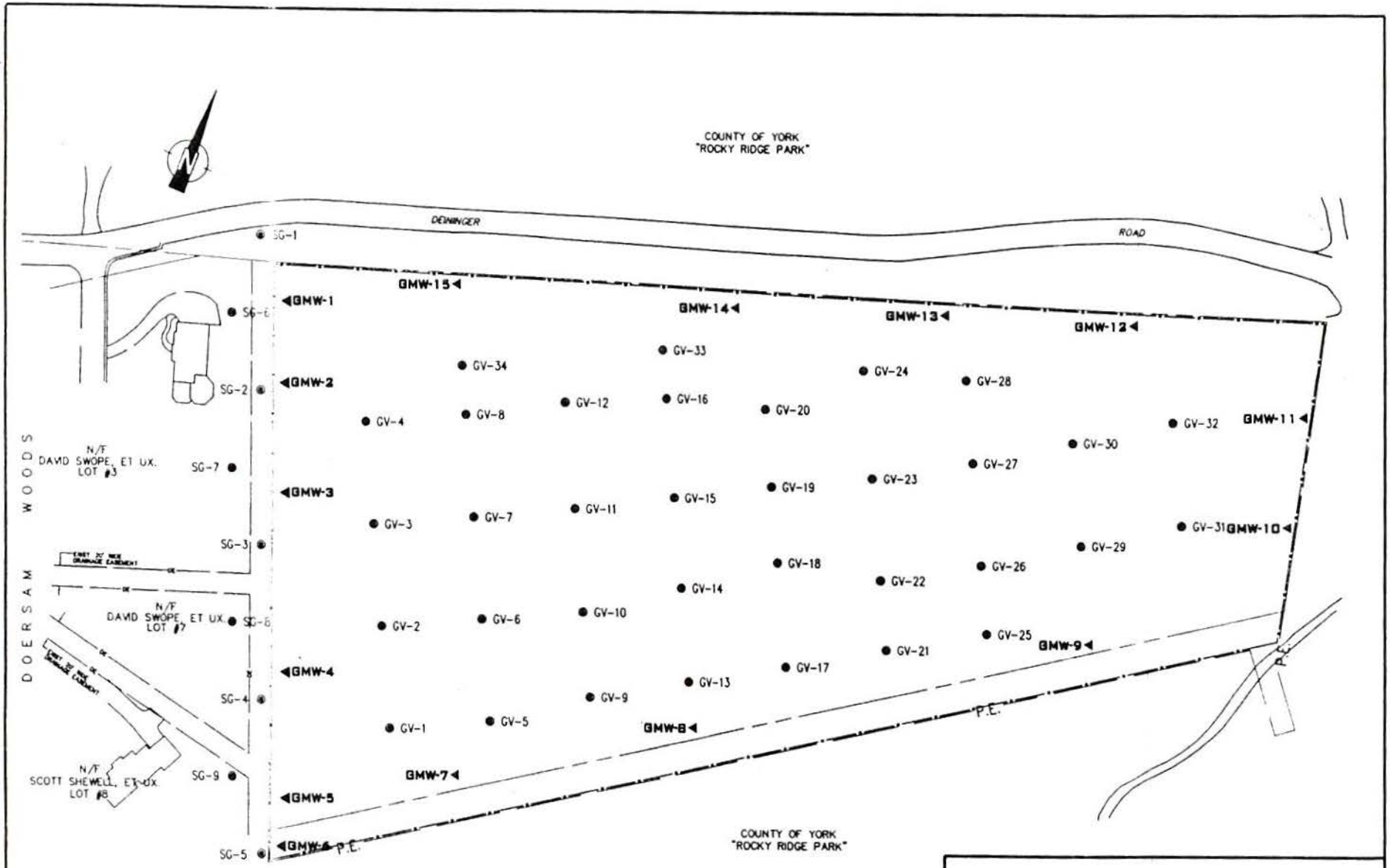
Common Milkweed	Black Eyed Susan
Smooth Aster	Brown Eyed Susan
Heath Aster	Purple Top
Partridge Pea	Deer tongue
Canada Wild rye	Switch grass
Virginia Wild rye	Narrow Leaved Mountain Mint
Ox-Eye Sunflower	Little Bluestem
Wild Bergamot	Indian grass

What is the anticipated cost and benefit of this plan?

The cost to convert the vegetation on the landfill cap from weeds and invasive species to native Pennsylvania meadow species is estimated to be $6,000. The benefit to this work is that, once the native Pennsylvania meadow plants are established, the mowing costs and costs to repair groundhog damage will decline. Over time, the cost savings are expected to greatly exceed the $6,000 investment. Also, once the Pennsylvania meadow vegetation is established, a habitat will be created that will be used by non-destructive Pennsylvania species, including butterflies, bees, song birds, and ground birds.

For information, please contact Elise Juers
Project Manager
Department of Environmental Protection
909 Elmerton Avenue, Harrisburg, PA 17110
Phone: 717-705-4852 , Fax 717-705-4830
Email: ejuers@pa.gov

East Mount Zion Five Year Review
2017
Attachment 4 Map of the East Mount Zion Landfill Superfund Site (with landfill gas vents and landfill gas wells)

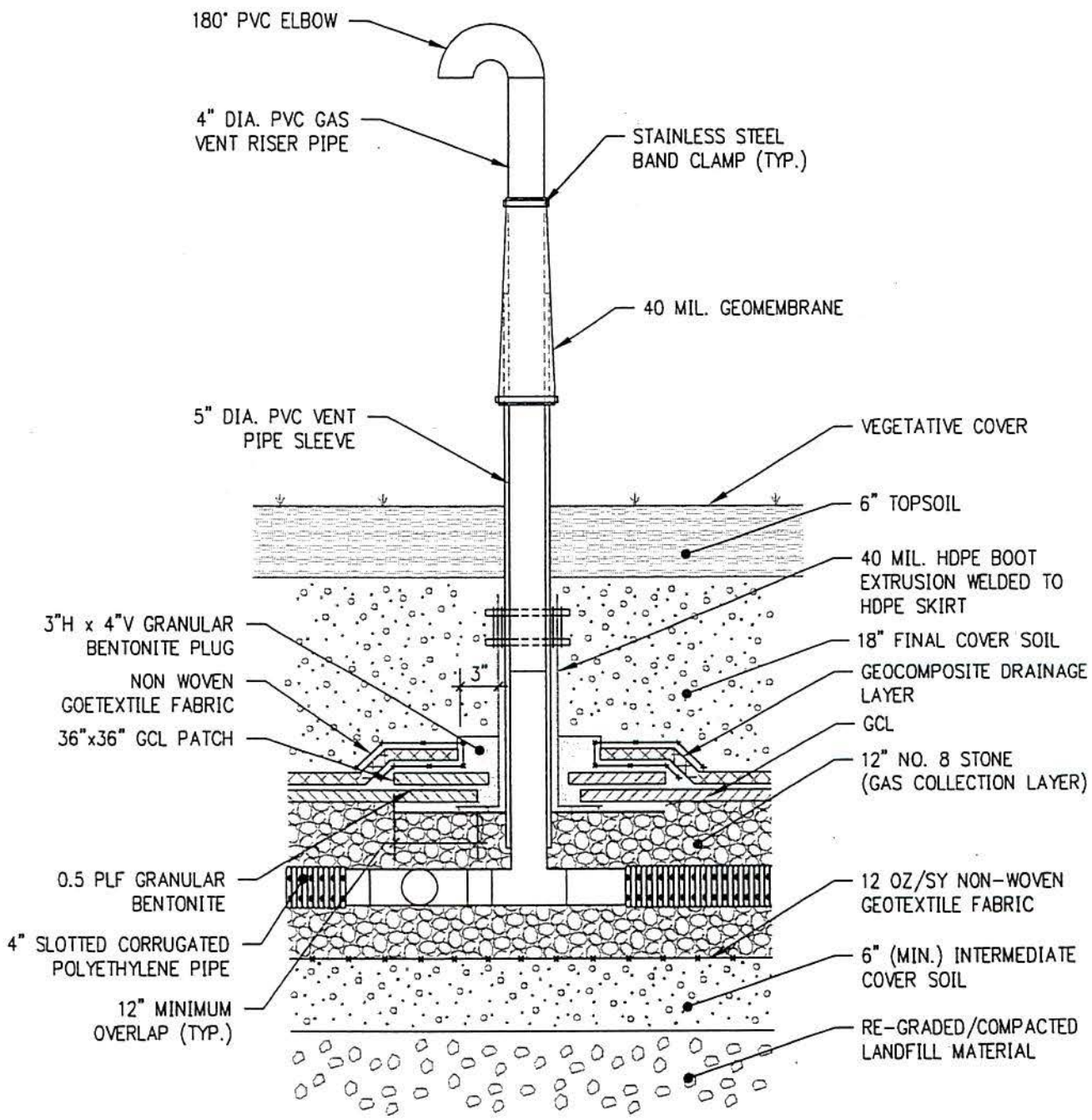


LEGEND

GMW = SOIL GAS MONITORING WELL LOCATION
GV = GAS VENT MONITORING LOCATION
SG = PERIMETER LFG SOIL MONITORING LOCATION

FIGURE 9
GAS VENTS and
MONITORING WELL LOCATIONS
EAST MOUNT ZION LANDFILL CLOSURE

East Mount Zion Five Year Review
2017
Attachment 5 Schematic of landfill cap



TETRA TECH
ENGINEERS ARCHITECTS SCIENTISTS
56 West Main Street, Christiana, Delaware 19702-1501 USA
ph. 302 738-7551 fax 302 454-5980

FIGURE 2-2
TYPICAL LANDFILL CAP SECTION AND GAS VENT RISER EAST MOUNT ZION LANDFILL CLOSURE

FILENAME: T:\0386\O&M\FIG2_2

East Mount Zion Five Year Review
2017
Attachment 6 Photographs of Site

East Mount Zion Landfill Superfund Site
2017 Five Year Review report
Photograph log prepared by Mitch Cron, EPA

Photograph of southwest corner of landfill. Landfill gas vent in center of photo. View of wooded area to south of landfill in background.

Photograph of south side of landfill. Landfill boundary fence in center of photograph. Wooded area south of the landfill in background.

Photograph of south side of landfill. Landfill gas vents are depicted in photograh.

Photograph of southeast side of landfill. Note storm water basin in center of photograph.

Photograph of southeast side of landfill. Note storm water basin in center of photograph.

Photograph of main gate to landfill cap.