COMMONWEALTH OF PENNSYLVANIA
Department of Environmental Protection
Hazardous Sites Cleanup Program
Mazzaro McKees Rocks Landfill (LRP 5-2-128-1749)
Kennedy Township, Allegheny County

ANALYSIS OF ALTERNATIVES AND PROPOSED RESPONSE

The purpose of this Analysis of Alternatives (AOA) and Proposed Response (PR) document is to outline the decision-making process involved in the selection of the proposed response and to provide a description of the proposed response. This document will be included in the Administrative Record which will be compiled for this response pursuant to Section 506 of the Pennsylvania Hazardous Sites Cleanup Act, Act of October 18, 1988, P.L. 756 No. 108 ("HSCA"), 35 P.S. Section 6020.506.

The Department of Environmental Protection (DEP or Department) proposed response for the Mazzaro McKees Rocks Landfill (Site) includes the installation of two horizontal landfill gas (LFG) cutoff trenches along the northern and western property lines, combined with the use of some existing vertical vents at select locations. The response is intended to control the offsite migration of LFG that exceed target action levels for methane, as documented in the subsurface.

The work falls under the Prompt Interim Response category wherein the response budget is estimated at less than two million dollars and implementation of the work is expected to take less than one year following completion of the engineering design and deployment of the remediation contractor. In addition, a Prompt Interim Response has been designated to allow for the expedited deployment of a remedial solution to address the migration of potentially combustible LFG beyond the Site boundary into adjacent residential property areas. LFG field screening data up to, and through August 2018, indicate the off-site presence of LFG at some locations beyond the existing perimeter gas vent network, indicating that enhanced engineering measures are needed.

I. SITE INFORMATION

A. Location, Background and Description

The Site is located west of the Pittsburgh, Pennsylvania city limits in Kennedy Township, Allegheny County near the town of McKees Rocks. The Site consists of approximately 242 acres on multiple parcels and includes the Vietmeier Golf Center (Golf Center) building, driving range and miniature golf course. Overall, the Site is densely vegetated with grass, municipal, medical, and residual waste disposal areas. The Site is owned by the Estate of Richard E. Lang (Site Owner), and was used for disposal by various parties from the 1950's reportedly up to 1972.

Surface and underground coal mining of the Pittsburgh Coal seam occurred at the site prior to disposal. At some areas of the Site, the historic coal mining features influence the migration of LFG as well as the physical groundwater water flow conditions. These conditions have been evaluated by DEP as part of the HSCA site assessment process.

Immediately north of the Site there is a residential development consisting of three new apartment buildings, a club house and swimming pool operated as Kennedy Highlands Apartments LP, which is affiliated with the A.R. Building Company (AR Property). This approximately 8.3-acre parcel is located between the Site and McKees Rocks Road. The development of the AR Property parcel was initiated by Maronda Homes, Inc. and was subsequently assumed by Kennedy Highlands Apartments LP. To the west of the landfill there are some single-family residences along the private Longview Drive. DEP has informed the various commercial and private property owners of the HSCA activities related to LFG at the Site.

Two of the three site drainage features, which are in the eastern portion of the Site, merge in the southeastern portion of the Site and flow into Chartiers Creek. The third drainage is in the southwest corner of the Site and flows into Chartiers Creek. The eastern portion of the Site consists of a valley with steeply sloped sides and the southern portion consists of a steep wooded hillside that slopes downward Chartiers Creek. Property uses south of the Site include a scrap yard, a former oil recycling facility (Former Tri-State Petroleum HSCA Site), and a few private residences.

B. DEP Work History

DEP has conducted work at the Site pursuant to the Pennsylvania Hazardous Sites Cleanup Act (HSCA), Act 108 dated October 18, 1988. DEP activities have included: a site-wide Remedial Investigation, an Interim Response drum and exposed waste removal, a Supplemental Remedial Investigation focused mainly on LFG, along with the installation of a passive gas venting system. The March 2016 *Landfill Gas Migration Prevention System Remedial Alternatives Analysis Report* (RAA) includes an evaluation of remedial alternatives to address offsite gas migration, and the March 2017 *Landfill Gas Venting Pilot Test Summary Report* (Pilot Study Report) evaluated the option of an enhanced venting system along the property boundary.

As part of the LFG activities, DEP and its contractors have screened and tested on- and off-site gas levels using an array of soil vapor points (SVPs) and vents along with various other surface and shallow gas surveys. During the DEP assessments, methane has been delineated using real-time, direct-read instruments, plus soil gas samples for laboratory analysis were subsequently collected from installed SVPs to confirm methane concentrations, as well as determine its source of origin. DEP has provided these data to the residential property developers, the Site Owner and Golf Center operator.

The HSCA work has included an assessment of site conditions, potential impacts and remedial approaches regarding gas migration at three main target areas:

1. Northern Boundary Area
2. Western Boundary Area
3. Golf Center Building Area

At each area, LFG including methane has been indicated at levels which prompted further action, including the installation of 23 passive vertical vents to capture LFG, consistent with industry standards. The passive vents have a positive effect on LFG capture and migration at selected areas of the Site, and have been shown to provide a degree of additional capture when actively operated

under a pilot test configuration. As indicated in the RAA and pilot test reports, engineered enhancements beyond the existing vent system are recommended to better manage LFG migration.

As a protective measure, DEP installed a real-time combustible gas monitor inside the Golf Center building, along with passive vents and SVPs adjacent to the building. DEP has notified the Site Owner that additional HSCA response actions are not planned for the Golf Center building due to impracticability issues, as described in Section C. In some other remote and unoccupied areas of the Site, elevated LFG has also been indicated in the subsurface; further LFG assessment may be needed if development is planned in those outlying areas.

Air emissions modelling and LFG analytical data were provided to the Allegheny County Health Department (ACHD) to support their evaluation of remedial actions for the Site. The ACHD has reviewed and approved the proposed remedial design option with respect to air quality compliance.

C. Threat of Release of Hazardous Substances

Work by DEP and its contractors has demonstrated that LFG including methane exists within the Site and beyond the Northern Boundary Area at levels that exceed the standards highlighted in Section III. Elevated LFG levels also exist inside the landfill property along the Western Boundary Area, with the possibility that migration beyond the western boundary may exist. During the Supplemental Remedial Investigation, offsite shallow soil gas screening generally did not detect LFG at the residential parcels along Longview Road where access was granted, however the overall LFG condition is indeterminate in that area due to access limitations. As a precautionary measure, DEP's engineering contractors recommend additional remedial action for methane along the Western Boundary Area, in addition to the existing vent system.

The Golf Center building is constructed directly on top of landfilled waste in an area of consistently elevated LFG concentrations, based on DEP evaluations. The structure is subsiding, apparently due to differential settlement, and has cracks in the concrete slab floor. Potentially combustible gas levels have not been confirmed inside of the Golf Center building, based on screening by DEP's contractors. The indoor combustible gas monitor has also not indicated elevated gas detections per Golf Center personnel. However, this condition could change with further settlement and cracking of the floor. DEP installed two vertical vents adjacent to the Golf Center building as an initial remedy. Beyond these DEP actions, the Site Owner is responsible for any further remedial action specifically for the Golf Center building.

Because of its potentially combustible nature, methane is typically assessed using the established lower explosive limit (LEL) of 5 percent methane by volume in air, which equates to 100 percent of the LEL. These methane levels have been detected in each of the three main target study areas, as documented in Site reports. The work has determined that the source of origin of the methane is biogenic (breakdown of organic matter) versus thermogenic (hydrocarbon/fuel material source).

II. RESPONSE CATEGORY

The response category is a Prompt Interim Response because it is anticipated to take less than one year to implement and cost less than two million dollars to complete, while timely action is warranted to address the ongoing potential risks associated with the landfill gas.

III. CLEANUP STANDARDS

DEP has not yet developed standards for methane as it applies to this type of HSCA site. Because of its potentially combustible nature, methane is typically assessed using its established lower explosive limit (LEL), which is 5 percent methane by volume in air (50,000 parts per million) which equals 100 percent of the LEL.

Specific to the Prompt Interim Response action related to LFG, the primary standard being applied to the Site includes Pennsylvania's Title 25, Chapter 273 regulations for combustible gas monitoring, off-site migration and mitigation at permitted municipal waste landfill sites. Under these requirements, combustible gas levels may not equal or exceed the LEL at the boundaries of the Site, or 25 percent of the LEL in a structure within the Site. If they do exceed these levels, then gas management methods are to be applied. Although the closed landfill was not a permitted operation, DEP considers the Title 25, Chapter 273 criteria to be applicable under this program.

The proposed Prompt Interim Response is specific to LFG including methane and does not relate to other constituents or media at the Site, which have been addressed separately under HSCA. The proposed response is not a final remedial response pursuant to Section 504 of HSCA and therefore is not required to meet the cleanup standards which apply to final remedial responses. Additional response action may be needed to achieve a complete and final cleanup for the site for LFG and other media of interest.

IV. APPLICABLE, RELEVANT and APPROPRIATE REQUIREMENTS (ARARs)

The following standards, requirements, criteria or limitations are legally applicable, or relevant and appropriate under the circumstances presented by the site.

For the proposed Prompt Interim Response, the primary applicable, or relevant and appropriate requirement (ARAR) being applied to the Site includes Pennsylvania's Title 25, Chapter 273 regulations for combustible gas monitoring, as described in Section III. In addition, ARARs related to the characterization, transportation and disposal of investigation and remediation-derived wastes consistent with the Pennsylvania Solid Waste Management Act will be followed.

V. ANALYSIS OF ALTERNATIVES

The March 2016 *Landfill Gas Migration Prevention System Remedial Alternatives Analysis Report* includes an evaluation of five categories of remedial alternatives in addition to a no action alternative to address gas migration specific to the Northern Boundary Area. The same list of remedial alternatives applies to the Western Boundary Area. The March 2017 *Landfill Gas Venting Pilot Test Summary Report* presents additional field data that helps refine the technology selection for the Site.

- **Alternative 1: No Action:** Maintain Existing Vent System with Continued Screening
- **Alternative 2: Enhanced Gas Venting:** Modify Existing Vent System with Active Recovery of LFG

- **Alternative 3: Passive Trench Venting System:** Horizontal Trench with Passive Venting
- **Alternative 4: Semi-Active Trench Venting System:** Modify Alternative 3 with Semi-Active Micro-Turbines
- **Alternative 5: Active Trench System:** Modify Alternative 3 with Active Extraction
- **Alternative 6: Impermeable Barriers:** 6.a.: Slurry Wall Barrier with Passive Vertical Vents (Northern Boundary); 6.b.: Waste Removal and Clay Barrier (Western Boundary)

The cost estimates presented herein are for planning purposes and do not necessarily represent the actual final amounts for implementation. Specific budgets will be available following the engineering design and subcontractor procurement process, in which case higher or lower values may result. Some alternatives may have additional expenditures related to erosion and sedimentation control, grading, restoration, surveying, construction QA, etc.

Alternative 1: No Action

This option includes taking no additional action to address LFG at the Site, beyond continuing to operate the existing passive vent system. A total of up to 23 vents will continue to operate, at locations along the Northern and Western Boundary Areas and adjacent to the Golf Center building.

Compliance with ARARs

Under the HSCA program, the existing vertical vent system was designed and installed by qualified experts consistent with industry standards for perimeter LFG control at municipal waste sites. While this system is somewhat effective at controlling offsite LFG migration, it does not fully comply with ARARs as it does not comprehensively address gas migration within the target response area. Measured LEL levels exceed target values at and beyond the Northern Site boundary at some locations, and may continue to be elevated under the current passive vertical venting scheme, per the RAA and Pilot Study Reports. LEL values along the Western Boundary Area may also present a potential concern due to the proximity of receptors beyond the Site.

Cost Effectiveness

The cost of this estimate is essentially $0, based on the absence of capital expenditure. There is little O&M associated with this option, other than periodic gas screening and inspection and the possibility that some vents may require minor repair or replacement in the future.

Alternative 2: Enhanced Gas Venting System

This option involves modifying the existing passive vertical vent system and/or using an expanded vent network with mechanically powered methods to increase the recovery of LFG.

Compliance with ARARs

The Pilot Study Report concluded that the conversion of the passive vertical vent system to active recovery (with the option for using additional vents) would only be partially effective at controlling

the offsite migration of LFG beyond the northern property line. DEP's engineering contractor determined that the radius of influence using an enhanced vertical vent system would not uniformly limit offsite LFG movement to the degree that ARARs would consistently be met.

Cost Effectiveness

According to the RAA, the estimated capital and operational cost (power usage) for the Northern Boundary Area for one year is $283,000, excluding a contingency. This is based on installing infrastructure plus mechanical enhancements to the existing passive vertical vent array. The O&M associated with this option includes power consumption, periodic inspection, and possible repairs that may be needed in the future. An estimate of $237,000 would apply to the Western Boundary Area, where there would be fewer vents to retrofit and power. The total estimated cost for both areas is $520,000, without contingency.

Alternative 3: Passive Trench Venting System

This approach involves the installation of gravel-filled linear trenches sealed with compacted clay at the surface, with horizontal and vertical piping to capture and direct the flow of gas. The trenches are estimated to be approximately 500 lineal feet (LF) along both the northern and western property boundaries. The target installation depths will generally correspond with the base of waste/fill and/or the depth to the base of the Pittsburgh Coal seam, depending on location. Waste excavation and disposal are necessary to install the trenches. An average installation depth of 25 feet was used for estimation purposes. The system relies on gas pressure and concentration gradients to drive migrating gas into a passive piping network. Installation would be achieved with one-pass trenching where feasible to minimize disturbance. No electric power service is needed. If needed, the system can be incrementally modified from passive operation to semi-active or active to increase effectiveness in migration prevention, as described in Alternatives 4 and 5.

Compliance with ARARs

The horizontal trench design is a more effective means to intercept LFG at the property boundaries compared to vertical vent methods, where the effective radius of influence and capture areas is variable. There is a reasonable likelihood that a passive trench system will effectively mitigate elevated LEL levels from within the target response areas, leading to compliance with ARARs. Post-remedial construction monitoring would be conducted to assess LFG levels with respect to gas capture and the LEL attainment levels.

Cost Effectiveness

The estimated capital cost for the passive trench system in the Northern Boundary Area under Alternative 3 is $800,000, excluding a contingency. For the Western Boundary Area, some pre-final design test boring work and a geotechnical evaluation are recommended prior to trench construction, which would relate to an estimated budget of $850,000, excluding a contingency or any further soil stabilization measures that may be needed for construction in this area. A total project budget of $1,650,000 is estimated for both passive trench systems, without continency or any additional geotechnical work. This estimate reflects a downward revision from the costs

presented in the original RAA, wherein DEP's engineering contractor revised the unit installation length and depth assumptions to better reflect subsurface conditions. No electric power service is needed. Future budget items include periodic gas screening, inspection and possible repairs to piping components. Solar-powered vent flares could potentially also be added to the vent pipes to destroy methane emissions and reduce odor, if needed.

Alternative 4: Semi-Active Trench Venting System

This option represents an incremental modification of the Alternative 3 passive trench system with the addition of solar- or wind-propelled semi-active micro blowers mounted on vertical vent pipes to create a vacuum within the piping network. Solar-powered vent flares could also be added to the vent pipes to destroy methane emissions and reduce odor, if needed. The system relies on a combination of gas pressure/concentration gradients and semi-active vacuum to drive migrating gas into the piping network.

Compliance with ARARs

The addition of micro blowers will induce a relatively low-level vacuum which would be more effective than a purely passive vent system. The ability to attain ARARs for LFG control would therefore meet or exceed that of Alternative 3. The retrofit/upgrade to Alternative 4 would not be needed if compliance with ARARs is met under the Alternative 3 passive trench approach.

Cost Effectiveness

The estimated capital cost for a basic semi-active trench system in both the northern and western areas under Alternative 4 is $2,068,000, excluding a contingency. No electric power service is needed. While the design is intended to extract/dissipate gas better than Alternative 3, solar or wind energy is non-continuous so the induced vacuum condition may be variable and intermittent. Battery backups could be used at an additional cost to provide uninterrupted operation, and vent flares could be added if conditions warrant. Future budget items include periodic gas screening, inspection and possible repair or replacement of system components.

Alternative 5: Active Trench System

This option represents a modification of the Alternative 3 passive trench system with the addition of an active vacuum extraction system (single or series of electric blowers for each trench) under continuous electric power. A solar or electric-powered flare could also be added after the electric blowers to destroy methane emissions and reduce odor, if warranted.

Compliance with ARARs

Alternative 5 represents the most effective system involving trenching, since electricity is generally continuous and reliable, other than under infrequent maintenance or storm outages. Electric-powered blowers are highly effective at driving migrating gas into the piping network, leading to predictable LFG capture and the attainment of ARARs in the target areas.

Cost Effectiveness

Of the three trenching options, Alternative 5 would have the highest capital and operational costs, owing to the cost of the electric service connections, blower systems and continuous electrical demand. The estimated capital and operational cost (power usage) for both the northern and western areas for one year is $2,400.000, excluding a contingency and vent flares if conditions warrant. Future budget items include periodic gas screening, inspection and possible repair or replacement of system components, and electric supply costs.

Alternative 6: Impermeable Barriers

For the Northern Boundary Area, the RAA evaluated an impermeable barrier option (referred to herein as 6.a.) that includes the placement of a linear slurry wall along the property boundary, along with vertical vent pipes to help capture LFG. A trench would be excavated and backfilled with cement/bentonite slurry to form an impermeable barrier ("wall") to prevent gas migration. A relatively significant amount of waste excavation and disposal would be necessary to install the trench. A series of vertical perforated vent pipes would be installed along the landfill side of the wall to vent accumulated gas. The vent pipes would be surrounded with aggregate to facilitate the release of accumulated gas at the slurry wall interface. Solar-powered flares could be added to some or all the vertical vent pipes to destroy methane emissions and reduce odor, if needed.

For the Western Boundary Area, the impermeable barrier option (6.b.) described in the RAA involves the initial removal of wastes along the property boundary behind the residences along Longview Road. A barrier consisting of compacted, low permeability clay soils would then be installed between the landfill and properties to create a gas-impermeable barrier. This option would require authorization from property owners to excavate wastes adjacent to the toe of the slope in their back yards, approximately along the 1130 ft. elevation contour line. The distribution of waste indicated in prior studies would need to be verified prior to work. Soil vapor points would be needed outside of the barrier to verify LFG capture, if this option were selected.

Compliance with ARARs

Slurry walls are not considered to be a feasible approach for target areas at the Site, however this method has been presented herein to reflect the analysis conducted in the RAA. While slurry walls can be effective barriers to gas migration, the existence of mine voids, fractured bedrock, porous backfill and waste materials indicates that slurry wall construction is not be feasible. There would be a loss of slurry into these features at various locations, and ARARs would therefore not be met since the slurry wall would not intercept all migration pathways. Additionally, the associated vertical vents would not be connected within a continuous trench or piping network, and pockets of accumulated gas could build-up between the vents. Future modifications to enhance performance would be limited since the vertical vent pipes would not be part of a piping network, as pressure buildup at the slurry barrier could also create new subsurface preferential pathways, causing potential impacts to the integrity of the wall.

While the second impermeable barrier option described in the RAA (6.b.) could potentially address ARARs along the Western Boundary Area, concerns with this approach include acceptance by the private home owners, access limitations, waste handling challenges and odor/gas issues. In

addition, construction could exacerbate differential settlement and slope stability issues. Continuous long-term monitoring and maintenance of the soil barrier would be needed, including the repair of any openings and cracks to ensure that gas would not be able to by-pass the barrier.

Cost Effectiveness

The estimated capital cost for the slurry wall/vertical vent alternative (Option 6.a.) as originally presented in the RAA was approximately $815,000 for the Northern Boundary Area without contingency, based on 700 lineal feet and a target average depth of 35 feet. The actual length and depths could be less leading to a lower estimated cost; however, this recalculation is not included since the technology will not effectively meet ARARs, and has been screened out from further consideration.

For the Western Boundary Area, the estimated capital cost for the waste removal and impermeable barrier (Option 6.b.) as presented in the RAA is approximately $520,000, without contingency. This estimate is based on the removal of 5400 cubic yards of waste and placement of 2,444 cubic yards of imported clay soil material. The actual volumes of material are unknown and would vary based on field conditions. Unspecified costs may also be incurred to address possible odor/LFG issues during remediation, along with potential geotechnical stabilization activities. Long-term inspection and repair would be needed to evaluate and maintain the integrity of the soil barrier.

VI. PROPOSED RESPONSE

The Department has selected Alternative 3, Passive Trench Venting System, for both the northern and western boundary areas. At each location, this will consist of a gravel-filled trench with horizontal and vertical perforated pipes to passively capture and vent LFG, to prevent potential offsite LFG migration. This is the preferred design to cost-effectively achieve ARARs for landfill gas including methane, consistent with Pennsylvania Title 25, Chapter 273.

Post-construction monitoring would be employed to monitor the effectiveness of the Passive Trench Venting System. If needed, the system can be incrementally modified from a passive to semi-active to an active system to increase effectiveness in migration prevention, if post-construction monitoring were to indicate a need for this.

VII. DEP APPROVALS

FOR THE COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

for Ronald A. Schwartz, P.E., BCEE
Regional Director

10/19/18
Date