

# **PHASE I**

## **VOLUME 1**

### **FORM D: ENVIRONMENTAL ASSESSMENT**

ATTACHMENT D-6: Line of Sight Study

**LINE OF SIGHT ANALYSIS  
RESOURCE RECOVERY LANDFILL**

**Rush Township, Centre County**

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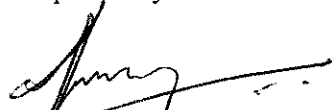
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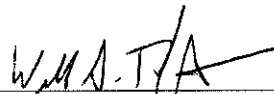
ARM Project 04144

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## 1.0 BACKGROUND

On behalf of Resource Recovery, LLC (RRLC), ARM Group Inc. (ARM) has prepared this Line-of-Sight (LOS) analysis to support the Phase I and Phase II Permit Applications (Application) for the proposed Resource Recovery Landfill (RRLF) submitted herewith to the Pennsylvania Department of Environmental Protection (DEP).

The RRLF property consists of approximately 5,758+/- acres in Rush and Snow Shoe Townships, Centre County, Pennsylvania. The proposed facility itself lies entirely within Rush Township. It is bordered on the south and east by Interstate Route 80 and on the west and north by Moshannon Creek. The eastern boundary of the site also runs along the Black Moshannon Creek in the Snow Shoe Township portion of the site. There are also portions of the property line at the northeastern part of the site that are irregular and not coinciding with any significant landmark.

The RRLF project involves the design, permitting, construction and operation of a state-of-the-art landfill and associated waste processing and operational support facilities, which include:

- Leachate collection, treatment, recirculation and disposal facilities;
- Landfill gas collection, treatment and processing facilities;
- Truck access roads and stacking areas and weigh scales;
- Small vehicle drop-off areas for residential waste and recyclables;
- Office and personnel support facilities;
- Truck wash, maintenance garage and fueling facilities;
- Storm water collection, sedimentation, and discharge facilities;
- Potable water system; and
- Earthen materials borrow and processing.

Only Municipal Waste and approved Residual Wastes will be disposed in the landfill. No hazardous waste will be accepted. The landfill will be constructed and operated in full accordance with DEP regulations. The Application proposes an average daily volume (ADV) of 5,000 tons of waste per day, and is designed to operate on either an 8-hour per day basis or on a 24-hour per day basis Mondays through Saturdays, with no Sunday or Holiday operations.

The proposed net waste capacity of the RRLF is approximately 40 million tons. With an average daily volume beginning at 2,000 tons per day in the first year of operation, increasing at 1,000 tons per day per year up to 5,000 tons per day, and 300 operating days per year, the proposed RRLF operational life will be approximately 28 years.

The site is uniquely suited for the proposed development because:

- It is centrally located within the Commonwealth of Pennsylvania.
- It is an historically disturbed site, previously mined for coal, logged, and in need of remediation/reclamation.



- Its size and configuration allow development of all elements of the project with substantial buffering from neighboring properties and environmentally sensitive resources.
- It is accessible by direct connection to a major interstate highway thereby allowing site operations without impact on local roads.
- Though not currently proposed as part of the Application, the site is accessible by rail utilizing existing rail beds and structures.
- Its geologic and hydrologic characteristics are conducive to safe and environmentally sensitive development and operations.
- The waste management and industrial activities can be located within a community (Rush Township) that desires such economic development; and the environmental enhancement activities can be located within a community (Snow Shoe Township) whose current comprehensive plan and zoning ordinance encourage those activities.

## 2.0 INTRODUCTION

RRLLC understands that, among the potential effects that the proposed RRLF may have, the DEP is concerned about the visual impact that the landfill may have to the neighboring communities. Therefore, examined herein are the potential visibility impacts of the proposed landfill.

From the inception of this project, RRLLC commissioned ARM to design the landfill with the following objectives:

- Maintain a fundamental sensitivity to community interests and concerns, particularly with respect to environmental issues such as aesthetics, stormwater, groundwater, air quality, traffic, noise and odor.
- Avoid designs that require significant clearing (deforestation) of the property and rechannelization of streams, and minimize wetlands impacts to the extent feasible.
- Prepare applications that are in full compliance with the current Pennsylvania Department of Environmental Protection (DEP) Chapter 271 and 273 regulations (most recently revised in September 14, 2002).
- Interact closely with RRLLC and DEP personnel so that the Permit Application is consistent with project objectives and DEP requirements, incorporating input from DEP personnel through pre-application meetings.

Twenty six line-of-sight profiles extending 3 miles out from the proposed landfill are discussed and presented later in this report. Based on these illustrations, and the mitigating conditions discussed below, visual impacts are minimal with respect to line-of-sight impact (i.e., 0.71-degree worst-case change), and do not constitute a harm that would have severe intensity, high receptor sensitivity, nor reach.



The proposed maximum elevation, which is approximately 1,903 feet, or 97 feet above the current maximum existing ground elevation of 1,806 feet within the permit area, as viewed from a bystander approximately 3 miles away, will result in an approximately 0.35-degree impact to his/her line of sight. This change is essentially imperceptible, equating to the view of an object only 7 inches tall from 100 feet away. The closest vantage point from which the final grade of the landfill could be potentially viewed is approximately 1.5 miles away because of the setbacks and buffers incorporated into the site selection and design. Due to the view of the landfill being obscured by trees and topographic barriers, the maximum exposure of the landfill resulting in the worst-case line-of-sight change that could be potentially viewed is approximately 120 feet, and this is based on a tree height of 50 feet, though the predominant tree heights are approximately 80 feet high and will mature at 90 to 100 feet high. This worst-case line-of-sight effect occurs at a distance of approximately 9,600 feet away and results in a line-of-sight change of 0.71 degrees.

To limit the aesthetic effects of the proposed landfill to the community, RRLLC incorporated the use of mechanically stabilized earth (MSE) berms to reduce the size of the proposed landfill footprint, while otherwise attaining the same capacity. This design feature substantially reduced the tree loss and soil disturbance that would have otherwise been necessary to achieve the disposal capacity required to meet the project objective. Furthermore, this design feature provides a visual and noise buffer from the landfill working face operations when the working face is close to the perimeter of the landfill footprint.

In addition to the siting and positioning of the landfill on the property and previously mentioned designed features, RRLLC will take further steps to mitigate detrimental visual impacts of the facility and to account for the specific terrain and line-of-sight characteristics of the area. However, the line-of-sight analysis herein demonstrates that there is little visual effect to surrounding land due to the proposed landfill. The only areas from which the landfill will be potentially visible will be from Cooper Township, Clearfield County, and at least 1.5 miles away from the landfill. Overall, the visibility due to the proposed landfill will affect approximately 0.9 percent of the area of Rush, Snow Shoe, and Cooper Townships.

In planning to be an enduring business and physical feature within the region, RRLLF has given considerable thought to developing the proposed design, cell sequence, and landfilling progression to limit and mitigate any harm to communities and to provide the greatest degree of community benefits with minimal environmental and visual impact.

### 3.0 METHODOLOGY

In accordance with the DEP's customary requirements for landfill permit applicants, and on behalf of RRLLC, ARM prepared a line-of-sight analysis within a 3-mile radius of the proposed landfill footprint while considering the highest future elevation.

Using digital elevation models (DEM) from the United States Geological Survey (USGS) for Frenchville dated 1959 and revised in 1983, Karthaus dated 1959 and revised in 1981, Snow Shoe dated 1996, Bear Knob dated 1998, Black Moshannon dated 1994, and Philipsburg dated 1994, ARM created topographic surfaces in AutoCAD to generate radial profiles from the future



highest points of the landfill. The radial profiles extend outward 3 miles from the proposed waste footprint, as shown in Sheets LS1 and LS2. The proposed peaks for RRLF are at 1,903 and 1,864 feet AMSL and located approximately 4,100 feet apart. The two landfill peaks, and radial profile lines are shown on Sheets LS1 (topographic map) and LS2 (aerial map). The profiles indicate where the landfill, with its proposed elevation, will be visible within a 3-mile radius. The line-of-sight profiles are shown on Sheets LS3 through LS11 for the proposed conditions.

The information derived from the 26 radial profile lines was used to generate the plan view shading depicting proposed landfill visibility areas. These areas are depicted on the topographic map (Sheet LS1) and aerial photograph map (Sheet LS2), and labeled accordingly as "Proposed Landfill Visible Area".

ARM took numerous photographs from locations in the community located west of the proposed RRLF, within the area from which the proposed landfill is predicted to be visible, to provide additional perspective of the visibility of the landfill and to verify the desktop analysis. The photographs were obtained during the winter season when the leaves were absent from trees. ARM took 36 photographs from the locations noted on Sheets LS1 and LS2 within the 3-mile study area. The photos are reproduced on Sheet LS12.

The visual screening by wooded areas within the study area was projected from the aerial photographs (Sheet LS2), which were taken in year 2004. An average tree height of 50 feet was considered for the analysis. However, based on ARM's site investigations, the predominant tree heights along the buffer areas of the RRLF property that would dictate visibility of the landfill from other properties are 80 feet, and at maturity will be 90 to 100 feet in height. Accordingly, the analysis herein is conservative, meaning that the predicted visibility of the landfill is overstated and, in reality, it will not be seen from some areas where this analysis shows that it will be visible. All trees within 100 feet of the landfill were removed to allow for landfill construction and, consequently, any line-of-sight obstruction that would have been present due to these trees has been neglected in this analysis for conservatism.

#### 4.0 ANALYSIS OF RESULTS

By inspection of the profiles, it is evident where the view of the landfill is obscured by terrain and obscured by wooded areas, even when leaves are absent. The tree density and length/width of the wooded areas provide complete visual screening because only substantial stands of trees were accounted for in determining visibility obstructions. Also, as stated above, the average tree height used for the analysis was 50 feet. The actual tree height in areas where trees are the predominant factor in obscuring the view are usually considerably higher (i.e., 80 feet or more).

By combining the topographic mapping and aerial photographs, it is further evident where the landfill is obscured by topographic barriers and wooded buffers. Numerous photographs were taken from areas from which the landfill will be visible based on predictions of the desktop analysis. These photographs were taken on February 2, 2006 and, therefore, represent winter conditions with leaves absent. Photograph vantage points and corresponding photograph



locations are shown on Sheets LS1 and LS2. Photographs (i.e., view from the corresponding vantage points) are provided on Sheet LS12. The line-of-sight profiles and resultant highlighting where the landfill will be visible attempt to account for the two primary visual buffers (topography and expansive stands of trees). However, small clusters of trees, road cuts (embankments), isolated single-family dwellings, farms, silos, and other landscape features that obscure the view of the landfill were neglected. Therefore, the area from which the landfill is visible, as depicted on Sheets LS1 and LS2, is overstated, and the population estimated to have view of the landfill is, therefore, correspondingly overestimated.

It is important to note that some inferences were made in assembling the visibility area highlighting because it was developed, in part, based on integrating the profiles to create an area-based line-of-sight from a linear interpretation. In any case, based on this conservative portrayal, the proposed landfill will be visible from approximately, and not more than, 0.9 percent of the 3-mile radial area, and this will only occur after approximately 20 to 25 years.

To determine the number of and location of residential areas within the study area, tax parcel maps were obtained from the Centre County and Clearfield County GIS Departments. As shown on Sheet LS13, no residential areas or other areas in Centre County will have visibility of the landfill due to the presence of an extensive vegetative buffer. The parcel map for Clearfield County, which was last updated in November 2005, was consulted to determine the number of residents living within the areas from which the landfill will be visible. This number was determined by counting individual residential units and multiplying the units by the average household size cited in the US Census, 2000. The results indicated that the landfill visibility will be, at a maximum, only 3.2 percent of the total population of the municipalities that have borders or portions of their borders within a 3-mile radius. Statistics identifying visibility patterns, areas, and affected population by municipality are summarized on Table 1.

#### **4.1 Landfill Visibility by Land Area**

ARM analyzed the percent area from which the landfill will be visible when it reaches its proposed peak elevation. According to ARM's analysis, the proposed landfill will be seen by approximately, and not more than, 0.95 percent of the area within a 3-mile radius, excluding the area occupied by the RRLLC property.

#### **4.2 Landfill Visibility by Municipality Area**

ARM analyzed the percent area within each municipality from which the landfill will be visible when it reaches its proposed elevation. As shown in Table 1, the area from which the landfill will be visible within a 3-mile radius of the landfill footprint is approximately, and not more than, 0.9 percent for Cooper Township based on the total municipality area. The landfill will not be visible from within Rush Township or Snow Shoe Township. In the aggregate, the landfill will only be visible from approximately 0.1 percent of the land area of the three local municipalities. On an area basis, the landfill will be visible from approximately 0.36 square miles in Cooper Township in a worst-case scenario after approximately 20 to 25 years of



operation, not accounting for structures and small clusters of trees that would further obscure the view from some of this area, and not accounting for trees over 50 feet in height that would also further obscure the view.

#### **4.3 Population Affected in each Township**

The landfill will have little visibility relative to the total population of the surrounding townships. ARM analyzed the percent of municipality population to which the landfill will be visible when it reaches its proposed peak elevation. As shown in Table 1, the population from which the landfill will be visible within a 3-mile radius of the landfill peak is approximately 252 people in a worst-case scenario. This number is based on all lots designated as residential within the affected area having occupants living on the premises, which likely overstates the actual population in this area, since some of these parcels are unoccupied based on ARM's observations of these properties when photographs of the site were taken. The residential area and population estimates are based on the Clearfield County Tax Map obtained from the Clearfield County GIS department.

According to U.S. Census Bureau data (US Census 2000), the combined population of the three municipalities that have borders within or partly within a 3-mile radius of the landfill is 7,957. In Rush and Snow Shoe Townships, the analysis indicates that there will be no visibility of the landfill. Overall, the landfill will be potentially visible to about 3.2 percent of the population within the three local municipalities in a worst-case scenario.

#### **4.4 Photographic Verification**

Photographs were taken from the western portion of the 38-square mile study area, the area from which the proposed landfill will be seen, as predicted by this LOS analysis. The purpose of taking the photographs was to assist in determining from where the landfill may be visible, where structures obscure landfill visibility, and to verify and enhance our interpretation of visibility patterns indicated by topographic and forest buffers on the mapping (Sheets LS1 and LS2).

ARM identified 7 locations that may be considered as churches and 1 park location within the 3-mile radial area (i.e. 38-square miles, accounting for two peaks), based on tax exempt status. ARM did not identify any campgrounds or schools located within the study area based on maps obtained from the Clearfield and Centre County GIS departments. Photographs were taken from some church locations and a park location. They are identified as Photos 7, 27, 30 and 32, as shown on Sheets LS1 and LS2. Except for one church location, between 2 and 3 miles from the waste footprint, all other structures are located outside of the area from which the landfill may be visible. However, even this location is surrounded by structures, not accounted for in the analysis and, therefore, will likely not be able to see the RRLF.



## 5.0 CONCLUSIONS

ARM performed a thorough line-of-sight analysis of the proposed landfill to determine the visibility of the landfill to surrounding townships within a 3-mile radius. These analyses included: Landfill Visibility by Land Area; Landfill Visibility by Municipality Area; and Populations Affected in each Township.

In addition to the factors discussed above, the long development period of the landfill will greatly limit its visual impact. Approximately 28 years will be required to develop the landfill, with only a small section of the total landfill active in any given year. Only 10 to 15 acres per year will be active, with smaller portions actually receiving waste on a daily and monthly basis. The rest of the landfill will consist of grassy slopes.

As presented in the analysis above and Table 1 referenced therein, the area from which the proposed landfill will be visible is approximately 0.9 percent, at a maximum, of the area within a 3-mile radius of the landfill. The population to which the proposed landfill will be visible is approximately 252, at a maximum, within a 3-mile radius of the landfill. This population represents approximately 3.2 percent of the total population of the municipalities (pop. 7,957) that have borders within or partly within a 3-mile radial area of the landfill.

The potential visibility of the landfill and the population potentially affected would occur at or beyond a 1.5-mile radial distance. Therefore, it is important to note that the further away an observer is from the landfill, the less visual impact the proposed landfill has. For example, at 9,600 feet (less than 2 miles), the worst-case visible portion of the landfill (120 feet) is equivalent to an angular rotation of 0.7 degrees, which would barely be detectable to an observer. Moreover, greater tree heights than used in the analysis, and which exist in the viewshed, would reduce the visible portion of the landfill to less than 120 feet and proportionately reduce the line-of-sight effect to less than 0.7 degrees. In addition, the shape of the completed landfill, as depicted in the proposed final grading plan, is a grass-covered ridge that is compatible with the regional topography and in harmony with the neighboring landscape. Finally, the ability to actually see landfill features at a distance of 1.5 to 3 miles is limited by weather conditions, visual acuity, structures and clusters of trees not considered for analysis, and other factors, further lessening the potential visual impacts of the landfill.

It is well established within the engineering and regulatory communities that landfills, which are crucial to solid waste management practice in the United States, are most appropriately located on or near topographical high points. These locations generally offer flood protection, sufficient isolation distance from the regional groundwater table, and sound geologic characteristics (i.e., not sinkhole-prone carbonate formations that are prevalent in the valleys of central and eastern Pennsylvania). Consequently, the prominent visibility of landfills is fairly common throughout the country. Ultimately, the majority of the landfill will be a vegetated hill when it reaches the proposed elevation.



In summary, RRLLC will take on-going steps to mitigate detrimental visual impacts of the facility and account for the specific terrain and line-of-sight characteristics of the area, as follows:

- Maintain the working face area (as much as is practical) facing north, east, or south, where potential visibility is not a concern due to the lack of any nearby residences in these directions from the proposed facility;
- Maintain compact daily disposal areas (working face, etc.) and employ a filling sequence that completes outer slope areas first, creating a berm and buffer that minimizes the visual impact of operations, obscuring the more extensive interior areas of the landfill;
- Apply intermediate cover as soon as practical to areas that reach final grade and revegetate areas to achieve ground cover and a “green” appearance;
- Apply final cover as soon as practical to areas that reach final grade and revegetate areas to achieve ground cover and a “green” appearance;
- Utilize “full cut-off” light fixtures, designed and installed to minimize “spillover” beyond the property boundaries; and
- RRLLC will consider suggestions from the DEP and the community to further mitigate the visual impact of the facility. However, it is important that those who comment and/or provide suggestions recognize that:
  - There is no visual effect due to the proposed landfill within 1.5 mile of the landfill footprint. The further away an observer is from the landfill, the less visual impact the proposed height has. For example, at 9,600 feet (less than 2 miles away), the worst-case visible portion of the landfill (120 feet) is equivalent to an angular rotation of 0.7 degrees, which would barely be detectable to an observer. If tree heights of 80 to 100 feet are used in the analysis, this visibility is practically non-existent.
  - The shape of the completed landfill, as depicted in the proposed final grading plan, is a grass-covered ridge that is compatible with the regional topography and in harmony with the neighboring landscape.

The weighing of the known and potential harms and benefits presented in the Application and the analysis presented herein demonstrate that the benefits associated with the proposed landfill clearly outweigh the known and potential environmental harms. The potential harms are relatively minor, are clearly outweighed by host community fees and other benefits, and are minimized by the favorable location and design of the facility. The visual impacts are negligible when considered against a standard of reasonableness, as analyzed and described in the above line-of-sight analysis.



**TABLE 1  
LINE OF SIGHT ANALYSIS STATISTICS**

**RESOURCE RECOVERY LANDFILL  
RUSH TOWNSHIP, CENTRE COUNTY**

ARM Project 04117

**Area Visibility Statistics of Proposed Landfill**

Township	Total Municipality Area (sq. miles)	RRLLC Property Area within Municipality (sq. miles)	RRLLC Property Area within 3-Mile Radius (sq. miles)	Municipality Area within a 3-mile Radius of Proposed Landfill Footprint (sq. miles)	Percentage of Total Municipality Area within a 3-Mile Radius of Proposed Landfill Footprint	Municipality Area from which Proposed Landfill is Visible within a 3-mile Radius of Landfill Footprint (sq. miles)	Percentage of Total Municipality Area from which Proposed Landfill is Visible within a 3-mile Radius of Landfill Footprint
Cooper	39.1	0.00	0.00	14.90	38%	0.36	0.9%
Rush	150.8	3.84	3.84	12.94	9%	0.00	0.0%
Snow Shoe	83.4	5.15	2.98	3.73	4%	0.00	0.0%
Total	273.3	9.00	6.82	31.57		0.36	0.1%
	Values are rounded.	Values are rounded.	Values are rounded.	Values are rounded.	Values are rounded.	Values are rounded.	Values are rounded.

**Population Visibility Statistics of Proposed Landfill**

Township	Total Municipality Population Census (2000)	Total Number of Housing Units in Municipality	Total Housing Units in the Study Area from which Landfill is Potentially Visible	Average Household Size	Maximum Population to which the Proposed Landfill is Potentially Visible	Percentage of Total Municipality Population to which the Landfill is Visible
Cooper	2,731	1,211	97	2.60	252	9.2%
Rush	3,466	1,687	0	2.53	0	0.0%
Snow Shoe	1,760	858	0	2.62	0	0.0%
Total	7,957	3,756	97		252	3.2%
					Values are rounded.	Values are rounded.

Notes:

1. RRLLC property occupies approximately 6.8 square miles of the 38.39 square mile area occupied by a 3-mile radius circle.
2. Percentages of area from which landfill is visible exclude RRLLC property.
3. Population is estimated based on average household size from U.S. Census Bureau 2000.
4. The residential buildings include all the parcels characterized by number "4" in the land use code by the Clearfield County GIS Department.