FEASIBILITY STUDY

AT THE

LOCKPORT CITY LANDFILL

LOCKPORT (C), NIAGARA (C), NEW YORK

NYSDEC SITE No. 9-32-010

CITY OF LOCKPORT, NEW YORK

REPORT

JULY 1992

PREPARED BY

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AT THE
LOCKPORT CITY LANDFILL

LOCKPORT (C), NIAGARA (C), NEW YORK
NYSDEC SITE NO. 9-32-010
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JULY 1992
DRAFT FINAL

Prepared For:

CITY OF LOCKPORT, NEW YORK
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9.0 INTRODUCTION

9.1 Purpose and Organization of FS Report

Investigations and subsequent studies at hazardous waste sites are designed to:

- Determine the extent to which contamination exists in the various environmental media at the site;
- Identify the risk to human health and to the environment associated with that contamination;
- Establish specific goals for remedial actions;
- Develop and evaluate alternative methods by which those goals can be reached; and
- Select the remedy best suited to the site for reaching those goals.

Information required for the first two items listed above is provided by the Remedial Investigation (RI), which is summarized in Section 9.2. The objective of the Feasibility Study (FS) is to accomplish the last three items on the list. The purpose of this report is to present the results of that study and describe the remedial action selected.

This report is organized as follows:

Section 10.0 presents the goals, or remedial action objectives, established for the site, followed by a listing of several generalized activities, or general response actions, to be applied to each environmental medium to satisfy the objectives. An estimation of the volume or area of the media of interest is also presented. The balance of the section is devoted to the development of alternative methods by which the response actions may be implemented. Initially, a list of general categories of potentially applicable technologies for each action is prepared and supplemented with specific process options which may be used to implement the technology. The combinations are screened to remove those not technically feasible and, if possible, to choose a single process for use with each feasible technology.

Section 11.0 describes the development and screening of remedial action alternatives. Feasible technologies are combined to form alternative measures for use in meeting the remedial objectives at the site. These are screened primarily on the basis of environmental and public health criteria.

Section 12.0 presents a detailed analysis of the alternatives passing the initial screen, a comparative evaluation of those alternatives, and the selection of the best remedy for the site.

Section 13.0 describes a conceptual design for the selected remedial alternative and presents a preliminary cost estimate for remediation.

9.2 Remedial Investigation Summary

Part I of this report, Sections 1.0 through 8.0, presents the results of an RI conducted at the Lockport City Landfill. The purpose of that investigation was to collect data and characterize the site in sufficient detail to allow an identification and evaluation of remedial alternatives as part of the FS. The key findings of the RI, upon which the FS is based, are as follows:

- The Lockport City Landfill is a 30-acre parcel of land located partially in the City and partially in the Town of Lockport, Niagara County, New York (see Figure 1-1 and Plate 1 of the RI report). The site, owned by the City, lies on an angular indentation of the Niagara escarpment, has variable topography, and is divided into two unequal areas by the Somerset Railroad right-of-way, which runs in a generally north-south direction.

- The site was operated by the City of Lockport as a municipal and industrial landfill from the early 1950s until 1976. Wastes deposited included sewage sludge, chemicals, steel barrels, and plastics, along with normal municipal wastes. Deposited wastes were burned daily and the residue covered with excavated materials.

- A small Class D stream, The Gulf, flows from south to north along the western edge of the landfill. The water surface is approximately 60 feet below the upper fill surface at the southern end of the area, with very steep (30% slope) banks occurring about 500-700 feet to the north. The land surface descends to the north, ending in a wetland area through which The Gulf flows eastward, forming the northern edge of the property.

- The fill areas are underlain by a low-permeability (3.37×10^{-6} cm/sec to 7.78×10^{-6} cm/sec) silty clay. The clay layer is, in turn, underlain by a series of stratigraphic units, with the Rochester Formation (shale) most commonly found immediately below. The Irondequoit Formation, which lies next beneath the Rochester, forms the bed of The Gulf adjacent to the fill area to the south. As the stream passes through the canyon (steep-sided) area, it rests on bedrock and, for the balance of its run along the western edge of the fill and through the wetlands, the bed is the silty clay layer.

- Sediment samples taken from The Gulf at locations upstream of, adjacent to, and downstream of the fill area were found to have similar contaminant concentrations. Surface water samples taken upstream and adjacent to the landfill, as well as the downstream sample nearest the landfill, exhibited similar characteristics. The sample taken further downstream contained a much greater number of SVOCs.

- A 36-inch diameter concrete pipe, installed to drain a natural spring in the upper reaches of the fill area, lies within the fill and discharges near The Gulf in the southwestern portion of this fill. Contaminants detected in water samples taken from the outfall were not detected in the fill however, contaminants found in some downgradient wells were similar.

- Groundwater samples were taken from wells installed in this and prior investigations were divided into three general groups: shallow wells screened in the unconfined aquifer, intermediate wells completed in the second water-bearing zone, and deep wells completed in the Irondequoit formation. In the shallow wells, only one organic compound (1,2-dichloroethene at 0.009 ppm) was detected in more than one round of sampling. Metals were detected more frequently, but at generally lower concentrations, in downgradient samples. Organic contamination in intermediate and deep well samples was either undetected or below quantitation limits except in MW-8D or MW-9I, both of which are considered downgradient, where vinyl chloride and 1,2-dichloroethene were found. These are the same contaminants found in the discharge of the 36-inch diameter concrete pipe.

- Subsurface soil samples were obtained at three locations outside the landfill and one location on site (MW-7 in the wetland areas). No VOCs or PCBs were detected at any location. SVOCs and pesticides were detected at MW-1 and one SVOC at MW-7. Onsite surficial soil samples were taken at five locations at depths of 0 to 6 inches. There were two detections of VOCs (both below quantitation limits), twenty-six of SVOCs, of which PAHs were the most common, and two of pesticides. PCBs were found in all five samples. Twenty-one metals were detected but mostly within the range of typical soils.

- Surficial waste samples were obtained from three locations. Analysis showed small quantities of VOCs, eighteen SVOCs, with PAHs the most common, and nineteen metals in generally greater concentrations than those found in soils. Subsurface waste samples (eleven samples) showed three VOCs, twenty-seven SVOC detections, six detections of pesticides, three PCBs, and twenty-one metals. Complete RCRA characterization was performed on eight fill samples, with no sample showing any analyte above regulatory limits.

- No significant habitats occur in the vicinity of the site and there are no known sightings of threatened or endangered species at or near the site. No fish were observed in The Gulf. There are five classified (I or II) wetlands in the area, the nearest being approximately one-half mile away, upstream of The Gulf's entrance into Eighteen Mile Creek, another Class D water body.

- To determine the impact of the site contaminants in the absence of remedial measures, a baseline health risk assessment was performed in accordance with USEPA guidelines. The results of that assessment show that contact (dermal and ingestion) with landfill soil/waste, without remedial action, would create a health risk that would exceed the USEPA acceptable range.

10.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

10.1 Introduction

The overall objective of this FS is to select an effective, implementable, and economically feasible alternative for the Lockport City Landfill site. This section of the FS describes the remedial technologies that were evaluated to satisfy the overall objective. The evaluation consists of three general steps as described below:

1. Development of remedial action objectives based on the potential for human exposure and/or impact on the environment for each medium of interest;

2. Development of general response actions (e.g. containment, removal, etc.) that apply to specific volumes or areas of those media and that satisfy the remedial objectives; and

3. Evaluation of relevant technologies (technology types and process options) in accordance with applicable criteria for screening (discussed in Section 10.4.1) to determine which technologies are most suitable for site remediation.

10.2 Media of Interest

Remedial objectives are developed based on the contaminants and media of interest at the site. The contaminants and media of interest are those that have a potentially significant adverse impact on human health or the environment. This potential adverse impact on human health or the environment is discussed for all media sampled during the RI in the remainder of this section.

A. Soil/Fill

Surficial soil/fill samples were contaminated most significantly by PAHs and PCBs. Subsurface soil samples were not significantly contaminated. However, significant concentrations of some VOCs, SVOCs, PCBs and metals were detected in subsurface fill.

Contamination in surficial soil/fill is the primary concern since there is a possibility that humans could be exposed to surficial contamination by way of direct contact with the contaminated media.

Erosion of surficial soil/fill is a potential source of contamination for The Gulf. Sediment samples, however, taken from The Gulf at locations upstream of, adjacent to, and downstream of the fill area were found to have similar contaminant concentrations. Consequently, potential erosion is considered much less significant than direct human contact with surface soil/fill.

Subsurface fill could potentially impact groundwater. Contaminants could be introduced into groundwater by direct contact with fill or as a result of infiltration of precipitation through fill above the water table. Contaminants of most concern under this scenario are VOCs since, of the compounds detected, they are generally considered the most mobile. Most groundwater flowing beneath the site is intercepted by The Gulf. As indicated earlier, however, the site does not appear to be significantly impacting The Gulf. Therefore, although contamination of The Gulf via leachate generation from fill is possible, it is considered less significant than potential human exposure resulting from direct contact. Transport of contamination off site in groundwater to human receptors is discussed in the next section.

No New York State SCGs exist for soil/fill. However, the RCRA hazardous waste parameters (i.e., EP toxicity, corrosivity, ignitability and reactivity) are often used as a guidance for evaluating soil contamination. Eight (8) subsurface and 3 surface fill samples were tested for RCRA hazardous waste characteristics. In accordance with RCRA, the samples tested are not considered hazardous since none of the regulatory limits for these parameters were exceeded. However, fill at the site cannot be classified as non-hazardous based on the data obtained since the site history indicates that hazardous waste was placed and burned at the site.

B. <u>Groundwater/Leachate</u>

Groundwater is not known to be used for human consumption in areas potentially affected by the landfill. The closest potential potable well is 600 feet from the site. The results of contaminant transport modeling (Section 5.2) indicate that migration of contamination to this well is likely to be insignificant. Therefore, the potential threat to human health is minimal. Consequently groundwater is not considered a significant threat to human health. There is a potential for adverse impact on The Gulf if contamination leaching from fill is transported to The Gulf in groundwater. However, as shown in the RI, the landfill does not appear to be significantly impacting The Gulf. Groundwater is not considered a medium of interest.

C. <u>Sediments</u>

Only three exceedances of stream sediment criteria were observed in sediment samples adjacent to the site. Comparison of upstream samples to those adjacent to the site indicate that the landfill is not contributing significantly to compounds found in the sediments. Consequently, sediments are not considered a medium of interest.

D. Surface Water

Contamination in The Gulf is minimal. The results of the RI indicate that the landfill is not contributing significantly to surface water contamination. There are no known water intakes downstream that are expected to be impacted by Gulf contaminants. The presence of fish or of other aquatic species is expected to be insignificant in The Gulf. Since potential human and environmental exposure to surface water contamination is also insignificant, surface water is not considered a medium of concern.

Very low levels of contamination were detected in landfill seeps, except for sample LL-2. This sample was collected in The Gulf at the outfall of the 36-inch drain pipe. Contaminants of concern detected included benzene, 1,2-dichloroethene, and vinyl chloride. However, none of these compounds were detected in surface or subsurface soil or fill. In addition, these compounds were not detected in a sample collected previously (L-2) in the same location. Based on the limited data collected to date, it cannot be determined with certainty whether contaminants from the landfill are being discharged from the outfall and impacting The Gulf. Consequently, specific corrective measures for the 36-inch drain pipe are not considered in the FS. However, the discharge from the drain pipe is indirectly addressed by capping options discussed further in subsequent sections, which will limit infiltration and greatly reduce contamination, if any, that may be discharging from the landfill through the drain pipe. Discharge from this outfall will be included in the on-going groundwater monitoring program described in Section 13.1.

E. Air

A soil gas survey was conducted to identify locations for test borings and monitoring wells. Although readings were generally low, a few elevated readings were recorded. Borings were subsequently drilled at these locations. During drilling, methane or VOCs were encountered infrequently, and gas concentrations returned to below background levels very quickly. Remediation of this medium will not be considered further.

10.3 Remedial Action Objectives

Remedial objectives are based on the human health and environmental assessment and an evaluation of existing site conditions.

At the Lockport Landfill site, the soil/fill is the primary medium requiring remedial action. The greatest potential health risk, and the greatest concern, results from direct contact (via ingestion or dermal contact) with contaminants in the soil/fill. In addition, erosion of fill into The Gulf and migration of contamination to The Gulf in groundwater resulting from percolation of rainwater through soil/fill may have an adverse environmental impact. However, since the landfill appears to be having only minimal impact on The Gulf and since The Gulf is not used for human activity and is not expected to support extensive aquatic life, potential environmental impacts are not considered as important as the potential threat to human health. In light of these conditions, the following remedial objectives are established for the Lockport City Landfill site:

- Prevent ingestion or dermal contact with onsite contaminated soil/fill.
- Reduce erosion of onsite contaminated soil/fill into The Gulf.
- Reduce contaminant migration to The Gulf in groundwater, resulting from infiltration of rain water through soil/fill.

10.4 General Response Actions

General response actions, which are medium-specific, are general approaches to remediation that are more specifically defined by technologies and process options.

In developing general response actions, it is necessary to consider the appropriate range of options for the site-specific conditions and the extent of remediation.

For the Lockport City Landfill site, a municipal landfill site, source control actions are appropriate. A source control action is an action necessary to prevent the continued release of hazardous substances or pollutants (primarily from a source on top of or within the ground) into the environment. In accordance with the National Contingency Plan (NCP) [Sec. 300.430(e)(3)] and USEPA guidance (USEPA 1988) for source control actions, the following types of alternatives should be developed to the extent practicable:

- A number of treatment alternatives ranging from one that would eliminate or minimize to the extent feasible the need for long-term management (including monitoring) at a site to one that would use treatment as a primary component of an alternative to address the principal threats at the site. Alternatives within this range typically differ in the type and extent of treatment used and the management requirements of treatment residuals or untreated wastes.

- One or more alternatives that involve containment of waste with little or no treatment but that protect human health and the environment by preventing potential exposure and/or reducing the mobility of contaminants.

- A no-action alternative.

However, as stated in both the NCP [Sec 300.430(a)(1)(iii)(B)] and the USEPA guidance, treatment alternatives are not practical in some situations, e.g. for sites with large volumes of low-concentration wastes such as some municipal landfills. Treatment options are discussed more completely later in this section.

The area and volume of contaminated fill, the medium of interest at the site, estimated for the Lockport City Landfill site are 20 acres and 640,000 cubic yards, respectively. Based on data from the RI, contamination may be considered generally to be present at low concentrations. No "hot spots" or concentrated volumes of contamination have been identified.

For contaminated fill at the Lockport City Landfill site, general response actions were evaluated as follows:

> <u>No Action</u> - CERCLA requires that the no-action alternative be evaluated as a potential remedial alternative. The no-action alternative serves as a baseline for comparison with other remedial alternatives developed during the FS. Under the no-action alternative, the current status of the site would not change. There would be no additional action taken to physically restrict access to contaminated areas or to reduce risk to human health or the environment.
>
> <u>Institutional Action</u> - Institutional response actions are measures implemented to restrict current or future access to site contamination and/or to monitor the migration of contaminants off site. In large part, these measures are easily implemented, involve minimal technical evaluation, and are considered appropriate for the Lockport site.

Containment - Containment response actions provide a means by which chemical migration and/or chemical exposure may be minimized through the use of physical barriers. For example, capping is a common means of containing contaminated soil. As discussed above, such containment is considered appropriate for source control actions and will be evaluated in subsequent sections.

Excavation/ Disposal - Excavation is a response action that is generally performed in conjunction with other response actions. This action involves removal of contaminated material and subsequent disposal, treatment, or placement on site as applicable. Excavation/disposal is not considered a practical response for the large volume of fill present at the site. Although no "hot spots" have been identified on site, exposed waste (trash, empty drums, etc.) was observed along the steep embankment. Excavation/disposal is considered practical and appropriate for such waste.

Treatment - Treatment is not considered practical or appropriate for the Lockport City Landfill site. Treatment of soil/fill is considered appropriate for groundwater response actions. However, groundwater remediation is not an objective at this site. Treatment is also considered appropriate for source control actions when small areas of concentrated contamination ("hot spots") are present. However, no "hot spots" have been detected at the Lockport site. In accordance with the NCP and USEPA guidance for conducting feasibility studies (USEPA 1988), treatment is not considered appropriate or practical for large volumes of low-concentration waste such as are found at the Lockport City Landfill site. Consequently, treatment options for soil/fill will not be evaluated in the FS.

10.5 Identification and Screening of Technologies and Process Options

10.5.1 Introduction

This section identifies technology types and process options, hereinafter referred to as remedial technologies, that are most feasible for remediation of the Lockport City Landfill site. At least one remedial technology has been selected for each general response action as shown in Table 10-1.

The remedial technologies have been evaluated using the same general criteria (effectiveness, implementability, and cost) that will be applied to screening and detailed analysis of alternatives. However, the evaluation in this section is less detailed than in the analysis of alternatives. At this stage, effectiveness is considered more important than implementability or cost.

Specific remedial technologies were evaluated on their probable effectiveness in protecting human health and the environment and in satisfying one or more of the remedial objectives. The following considerations were included in this evaluation.

- The potential effectiveness of process options in both handling the estimated areas or volumes of contaminated media and meeting the remedial objectives.

- The effectiveness of the remedial technologies in protecting human health and the environment during the construction phase and after remediation.

Implementability includes both the technical and administrative feasibility of implementing the remedial technology. Technologies that are not technically feasible have been eliminated, and further evaluation

TABLE 10-1

REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS AS
RELATED TO REMEDIAL ACTION OBJECTIVES AND GENERAL RESPONSE ACTIONS

Environmental Medium	**Remedial Action Objective**	**General Response Action**	**Remedial Technology**	**Process Options**
Soil/fill		No Action	Not Applicable	Not Applicable
	Human Health: Prevent ingestion and dermal contact with onsite contaminated soil/fill	Institutional Action	o Access restrictions o Ongoing site monitoring	Deed restrictions, fencing, monitor existing wells.
		Containment	o Capping	RCRA, NYS part 360, soil.
	Environmental Protection: Reduce erosion of onsite contaminated soil/fill into the Gulf. Reduce contaminant migration to Gulf in groundwater resulting from infiltration of rainwater through soil/fill	Containment	o Capping	RCRA, NYS Part 360, soil.

is therefore based primarily on administrative implementability, i.e. on the possibility of obtaining permits, on compliance with SCGs, and on the availability of required equipment and labor.

Cost plays a lesser role in the screening of technologies. Relative capital and operating and maintenance (O&M) costs are used, rather than detailed estimates. At this stage in the screening process, the cost analysis is based on engineering judgement. Technologies are evaluated on a comparative basis, i.e. low, medium, or high.

Before selecting technologies to represent each general response action, feasible technologies are evaluated in greater detail. One remedial technology is selected, where possible, to simplify the subsequent evaluation of alternatives. However, more than one remedial technology is carried forward if technologies are sufficiently different to warrant further consideration.

10.5.2 Description and Screening of Remedial Technologies

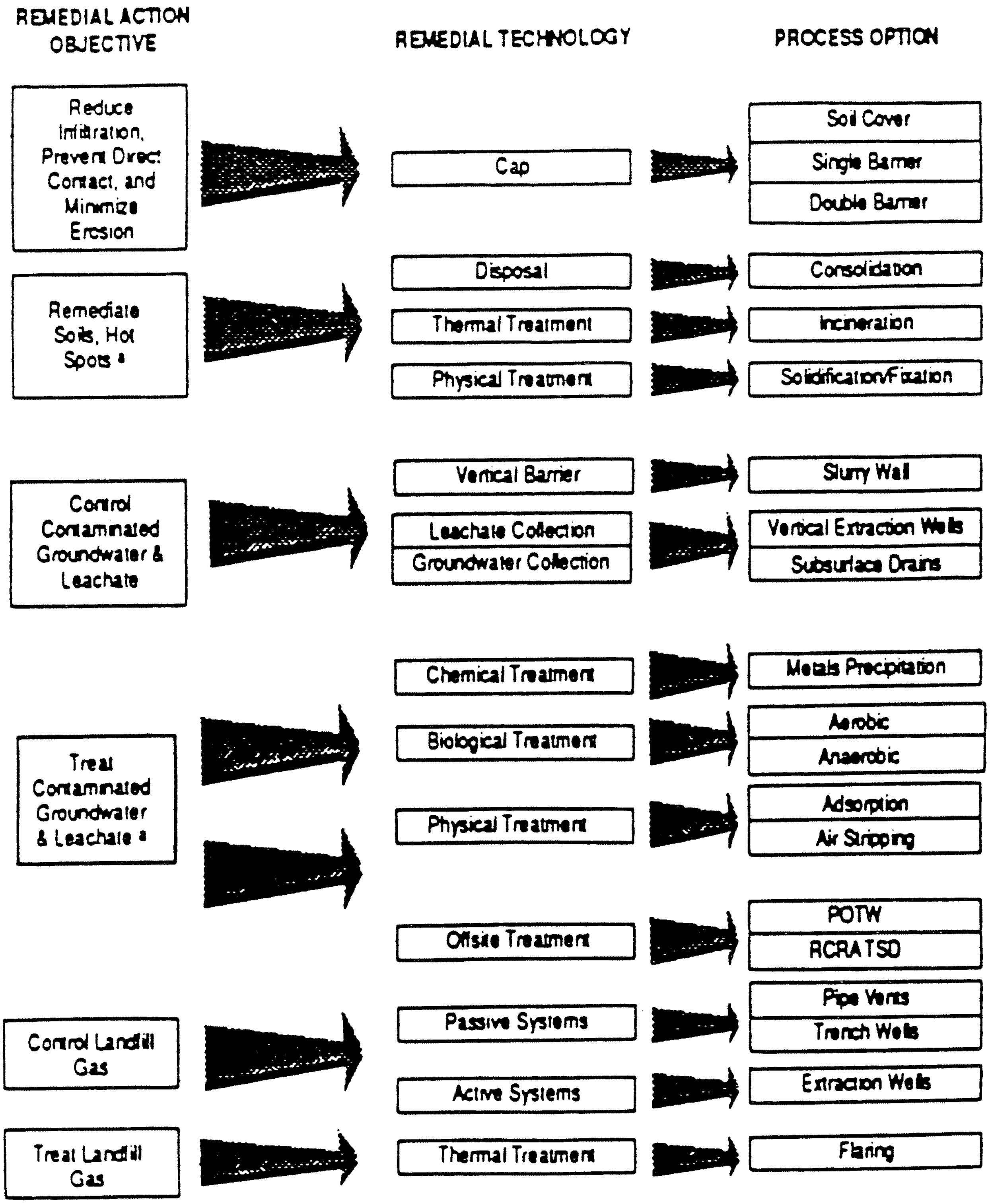
Remedial technologies are evaluated in this section in accordance with the criteria and methodology described above.

A. No Action - This option does not require taking action to remediate the site. Evaluation of remedial technologies therefore is not required.

B. Institutional Action - The goal of this action is to restrict access to the site. Applicable technologies to meet this goal would include erection of a security fence and institution of deed restrictions. These actions would be implemented to prevent direct human exposure to contaminated soil/fill, which is the primary remedial objective. However, institutional action does not address the other remedial objectives, which are concerned with potential adverse environmental impact resulting from erosion or infiltration through contaminated fill. Since data from the RI indicate that the site is not significantly impacting the quality of The Gulf, institutional action is considered worthy of further consideration. This alternative includes environmental monitoring to assess the severity of impact on the environment so that further remedial measures may be implemented if required.

C. Containment - The containment technology that best meets the remedial objectives is capping. Utilization of capping to satisfy the site remedial objectives is in accordance with USEPA OSWER Directive #9355.3-11FS (USEPA Office of Solid Waste and Emergency Response, 1990) which presents RI/FS guidelines for municipal landfill sites. [See Figure 10-1, which is a reproduction of a figure appearing in the OSWER document]. Capping consists of placement of a barrier over the contaminated fill area. For this site, it is not recommended that the cap be placed in the area of the steep embankment. Because of the steep slope in this area, a retaining wall would have to be constructed at the toe of slope to permit the slope to be reduced to a gradient acceptable for slope stability. Construction in this area would also require large quantities of fill to build up the slope. Although technically feasible, construction in this area would be difficult and very expensive.

Absence of the cap in this area is not expected to have a significant adverse impact on human health or the environment. The steep slope makes the area nearly inaccessible to humans, and therefore human exposure via direct contact with surficial contamination would not be expected to occur. This area is heavily vegetated and erosion is therefore expected to be minimal. In order to further reduce any impact on the environment resulting from erosion, capping options would include removal and disposal of exposed waste (empty drums trash, etc.) on the embankment, and a drainage ditch at the top of the slope to prevent runoff from other areas of the site from reaching the steep embankment. The contaminants detected in this area (mainly PAHs and PCBs) are not water-



[a] Other treatment technologies may be appropriate

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TECHNOLOGIES FREQUENTLY IMPLEMENTED FOR REMEDIAL ACTION AT MUNICIPAL LANDFILL SITES

FIGURE 10-1

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soluble. Therefore, infiltration is not expected to introduce any significant contamination into The Gulf.

Since absence of the cap in the area of the steep embankment is not expected to adversely impact human health or the environment, and since difficulty in construction may delay completion of remediation, the large cost for capping the steep embankment is unwarranted. Consequently, capping in this area is not considered further.

Feasible capping options for this site include the following: RCRA cap; NYS Part 360 cap; soil cap.

RCRA Cap - A RCRA cap would consist of a 12-inch gas venting layer, 24 inches of low-permeability soil, a 6-inch sand protection layer, a minimum 20-mil HDPE synthetic membrane, a 12-inch sand drainage layer, a minimum of 30 inches soil protection layer, and 6 inches of topsoil. It would be the thickest capping option. A RCRA cap would be the most expensive capping option and would also require the most intensive construction effort. In particular, the low-permeability soil layer must be constructed carefully and efficiently by experienced crews in order to meet the stringent QA/QC requirements applied to these layers to ensure that the required degree of impermeability is achieved. Moreover, the additional degree of protection and reduced infiltration provided by a RCRA cap, when compared to the other capping options, would not justify its cost. For these reasons, a RCRA cap is rejected.

NYS Part 360 Cap - A New York State Part 360 cap, considered by NYSDEC to be an action-specific SCG for the site, consists of a gas venting layer, a minimum of 18 inches low-permeability layer (or minimum 40-mil HDPE), a minimum of 24 inches soil protection layer, and 6 inches of topsoil.

The Part 360 cap would significantly decrease infiltration into the fill and thereby reduce the mobility of the hazardous substances at the site. This type of cap would provide long-term protection to human health and the environment against the risks associated with contact with the contaminated soil and migration of the hazardous substances. A Part 360 cap is recommended by NYSDEC as an effective environmental control for landfills and is thus considered a successfully proven capping option. As discussed earlier, low-permeability soil layers require a careful construction effort to ensure that the required degree of impermeability is achieved. This increases the difficulty of implementing this option, as well as the cost of construction. This cap is retained for further consideration since it is an SCG.

NYS Part 360 Cap (with variances) - In accordance with subdivision 1.7(c) of Part 360, NYSDEC may grant a variance from one or more of the specific provisions of Part 360 if the provisions "tend to impose an unreasonable economic, technological, or safety burden" and if the proposed variance will not have "significant adverse impact on public health, safety, welfare, the environment, or natural resources".

According to subdivision 2.15(b), the final cover must consist of the following:

- a gas venting layer meeting the requirements of subdivision 2.13(p)

- a low-permeability layer and barrier protection layer meeting the requirements of either subdivision 2.13(q) or 2.13(r)

- a topsoil layer meeting the requirements of subdivision 2.13(s).

For the Lockport City Landfill site, variances from the first two provisions of this part are feasible and justifiable.

Fifteen (15) monitoring wells and 27 borings were drilled during the RI. Many of the borings were drilled in areas of expected significant contamination. Lower Explosion Limit (LEL) readings above background were recorded in only three of the borings. Gas generally quickly dissipated. In addition, no gas odors or stressed vegetation were detected during the field investigation. This evidence indicates that gas generation is not a concern at the site and that a gas venting layer is not required.

Since reduction of infiltration through contaminated fill is one of the primary remedial objectives for the site (the other being the elimination of direct contact), a low-permeability layer is required. In accordance with subdivision 1.7(c) of Part 360, however, an 18-inch barrier (permeability 10^{-5} to 10^{-4} cm/sec) with no protective layer is proposed. Such a barrier will address the remedial objective to reduce infiltration while significantly reducing the economic burden of full compliance with Part 360.

As proposed, the Part 360 cap with variance consists of an 18-inch low-permeability (10^{-5} to 10^{-4} cm/sec) layer and 6 inches of topsoil.

Soil Cap

A soil cap would consist of only a topsoil layer. Although this option would prevent direct contact it does not address infiltration through contaminated fill. The soil cap does not meet all remedial objectives or the Part 360 SCG, and is more expensive than institutional actions that will fulfill the remedial objectives. Therefore, the soil cap will not be considered further.

D. <u>Excavation/Disposal</u> - A cap is not considered to be a feasible option for the steep embankment located on the southwestern portion of the site near the Gulf. However, exposed fill in this area could impact the Gulf via erosion. Excavation of this area is feasible. Fill removal could be accomplished by backhoes, gradalls, front end loaders, or dragline cranes. However, because the slope is very steep and there are numerous trees in this area, excavation would best be accomplished by a combination of draglines and manual removal. This methodology is feasible since only a limited amount of material would need to be scraped from the surface to satisfy the remedial objectives. After excavation, the fill could be placed on a level area of the site, and be graded and capped. Excavation is a well documented technology for site remediation.

11.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

11.1 Development of Alternatives

Following guidance offered in 40 CFR 300 (National Contingency Plan, or NCP), a range of alternatives has been developed for the Lockport City Landfill site. In accordance with this guidance, the no-action alternative must be carried through. In addition, a range of alternatives that controls threats posed by hazardous substances and/or prevents exposure, such as containment or institutional controls, should be developed. Although the NCP guidance states a preference for development of treatment alternatives, this guidance also recognizes that treatment alternatives are not appropriate or practical for sites with large volumes of low-concentration wastes such as the Lockport City Landfill site. In accordance with USEPA FS guidance (USEPA 1988), and with USEPA OSWER Directive #9355.3-11FS (USEPA Office of Solid Waste and Emergency Response, 1990), containment and, in particular, capping options are most appropriate for the Lockport site. Viable alternatives for the site are listed on Table 11-1 and are discussed in detail in Section 11.2.

11.2 Screening of Alternatives

11.2.1 Screening Criteria

The purpose of screening is to reduce the number of alternatives carried through detailed analysis. Alternatives are screened according to three broad criteria, namely, effectiveness, implementability, and cost.

The effectiveness of the alternatives is evaluated based on the ability to protect human health and the environment. Both short- and long-term components of effectiveness are evaluated, short-term referring to the construction and implementation period, and long-term referring to the period following construction.

TABLE 11-1
REMEDIAL ALTERNATIVES

Number	Name	Major Components
1	No Action	Not Applicable
2	Institutional Action	a. Chain link fence with barbed wire surrounding the site b. Deed restrictions limiting current and future onsite activities c. Annual monitoring of groundwater using existing wells
3	Containment Option A	a. Part 360 cap (includes gas venting layer, low permeability layer [10^{-7} cm/sec] with barrier protection and topsoil layer) b. Excavation of fill in area of steep embankment (fill placed underneath cap) c. Annual monitoring of groundwater using existing wells
4	Containment Option B	a. Part 360 cap with variances (includes low permeability layer [10^{-5} to 10^{-4} cm/s] and topsoil layer) b. Excavation of fill in area of steep embankment (fill placed underneath cap) c. Annual monitoring of groundwater using existing wells

Implementability is a measure of both the technical and administrative feasibility of constructing, operating, and maintaining a remedial action alternative. Technical feasibility refers to the possibility of constructing the remedial technologies, and also includes operation, maintenance, replacement, and monitoring of remedial measures after completion of construction. Administrative feasibility refers to the possibility of obtaining required permits or approvals from appropriate regulatory agencies, commercial availability of the technologies required for remedial action, and the availability of equipment and personnel required to implement the remedial action.

The cost evaluation includes consideration of construction costs and the costs of operating and maintaining the remedy over time. The purpose of the cost evaluation at this stage is to make comparative estimates with relative accuracy. More detailed and accurate estimates for alternatives surviving screening are given in Section 12.0. The goal of the cost evaluation is to eliminate alternatives whose effectiveness and implementability are out of proportion to their cost.

11.2.2 Alternative 1 - No Action

11.2.2.1 Description

This alternative is the baseline against which other alternatives are evaluated. This alternative must be retained for detailed analysis per 40 CFR 300.

11.2.2.2 Evaluation

Effectiveness: This alternative does not satisfy the requirement of protectiveness of human health and the environment, nor does it eliminate or reduce the potential risk of direct human contact with contaminated soil/fill

Implementability: Since no action will be taken, no implementation of the remedy is required.

Cost: No cost is associated with this alternative.

Result of Evaluation: In accordance with NCP requirements, this alternative is retained for detailed analysis.

11.2.3 Alternative 2 - Institutional Action

11.2.3.1 Description

The institutional action alternative includes the following components:

- chain link fence topped with barbed wire surrounding the site
- deed restrictions limiting future site activities
- annual monitoring of groundwater using existing wells

11.2.3.2 Evaluation

Effectiveness: Erection of a fence would result in virtual elimination of risks associated with dermal contact and ingestion of soil, which is the primary remedial objective. However, it does not address potential adverse impacts on the environment resulting from erosion or infiltration through soil/fill. Since only minimal construction would be required, the short-term impact on human health and the environment would be minimal. Deed restrictions would eliminate future development of the site for residential or recreational purposes. Industrial development could be permitted if the site were covered over (e.g., with concrete or asphalt) during development. Long-term impacts would be eliminated under these restrictions. Some limited short-term impacts would result from industrial development.

Implementability: This technology is easily constructed. Contractors, equipment, and personnel required to implement the alternative are readily available. Only a minimal amount of coordination with other outside agencies would be required to institute this action.

Cost: The cost of this alternative is lower than all other alternatives except no-action.

Results of Evaluation: Although there are no chemical-specific SCGs for soil/fill, the health risk assessment indicates that human health risk will be virtually eliminated through implementation of this alternative. However, NYSDEC considers a Part 360 cap an action-specific SCG for the site. This requirement is not met by the institutional action alternative. In addition, potential environmental impacts are not addressed. Nevertheless, the alternative may be considered effective (by eliminating the human health risk associated with direct contact with contaminated soil/fill) in relation to its cost, and therefore, is retained for detailed analysis.

11.2.4 Alternative 3 - Containment Option A

11.2.4.1 Description

Containment Option A includes the following components:

- installation of a Part 360 cap over all areas of fill except the steep embankment. [The cap includes a gas venting layer, a low permeability (10^{-7} cm/s) layer, a barrier protection layer and a topsoil layer.]

- excavation of waste (empty drums, trash, etc.) on the steep embankment, and placement of waste under the cap

- o annual monitoring of groundwater using existing wells

11.2.4.2 **Evaluation**

Effectiveness: The Part 360 cap satisfies all remedial objectives and the action-specific SCG. Short-term impacts on human health and the environment (mainly resulting from fugitive dust emission) are expected to be minimal. They are, however, expected to be higher than for the institutional alternative.

Implementability: Construction and maintenance of the cap requires common construction techniques and practices. Use of the cap surface must be restricted to prevent damage to the cap. Coordination with government agencies during implementation is expected to be normal.

Cost: The cost of this alternative is the highest of the four alternatives evaluated.

Results of Evaluation: Although this alternative is the most costly, it is also the most effective alternative. Therefore, this alternative will be retained for further analysis.

11.2.5 **Alternative 4 - Containment Option B**

11.2.5.1 **Description**

Containment Option B includes the following components:

- o Installation of a Part 360 cap (with variances) over all areas of fill except the steep embankment. [The cap includes a low-permeability (10^{-5} x 10^{-4} cm/s) layer and a topsoil layer.]

- Excavation of exposed waste (empty drums, trash, etc.) on the steep embankment and placement under the cap.

- Annual monitoring of groundwater using existing wells.

11.2.5.2 Evaluation

Effectiveness: This option satisfies all the remedial objectives but does not meet the action-specific SCG. Moreover, the long-term effectiveness of this alternative is somewhat less than Containment Option A since the barrier is somewhat more permeable. Short-term impacts (from fugitive dust generated during construction) are expected to be minimal.

Implementability: Construction and maintenance of the cap requires common techniques and practices. Use of the cap surface must be restricted to prevent damage to the cap. Coordination with government agencies during implementation is expected to be normal.

Cost: The cost of this alternative is expected to be significantly less than Containment Option A. Its cost is high when compared to institutional action.

Results of Evaluation: This alternative is somewhat less effective than Containment Option A, but considerably less costly. Therefore, this alternative is retained for further analysis.

11.3 Summary of Screening

The four remedial alternatives vary in effectiveness and cost. However, in general, all the alternatives (except no action) may be considered effective in relation to the relative cost. All alternatives are easily implemented. Consequently, all four alternatives will be carried forward to detailed analysis.

12.0 DETAILED EVALUATION OF ALTERNATIVES AND SELECTION OF A REMEDY

12.1 General

In this section, the alternatives previously developed and summarized in Table 11-1 are subjected to a detailed evaluation in order to select the most appropriate and cost-effective remedy for the site. The scoring system presented in the Division of Hazardous Waste Remediation Technical and Administrative Guidance Memorandum on the Selection of Remedial Actions (TAGM HWR-89-4030) (NYSDEC, 1989) is used as an aid in the evaluation process. An evaluation is performed in which the alternatives are compared using the results of the scoring system. A recommended remedial alternative is then selected following the comparative analysis of alternatives.

12.2 Scoring System

12.2.1 Procedure

The selection of a site remedy based on a scoring system approach involves a quantitative evaluation of the alternatives using the following criteria:

- Short-term impacts and effectiveness;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, and volume of hazardous waste;
- Implementability;
- Compliance with NYS Standards, Criteria, and Guidance (SCGs);
- Overall protection of human health and the environment; and
- Cost.

These criteria are described briefly below:

Short-Term Impacts and Effectiveness - This evaluation criterion assesses the effects of the alternative during the construction and implementation phase. Factors involved in the evaluation include protection of the community during remediation, potential environmental impacts, required time to the complete response, and protection of workers during remedial activities.

Long-Term Effectiveness and Permanence - This evaluation criterion assesses effects of the alternative after implementation and when the response objectives have been met. Factors addressed in evaluation of the criterion include alternative performance, magnitude of remaining risk, and adequacy and reliability of controls.

Reduction of Toxicity, Mobility, and Volume - This criterion evaluates an alternative's use of treatment technologies to permanently and significantly reduce toxicity, mobility, or volume of hazardous waste.

Implementability - This criterion addresses the technical and administrative feasibility of implementing an alternative. Technical concerns include reliability of the technology, potential construction difficulties, and required monitoring. Administrative concerns include coordination with agencies (e.g., permitting) and availability of services and materials to implement the remedy.

Compliance with NYS Standards, Criteria, and Guidance (SCGs) - This criterion is used to determine how each alternative complies with applicable or relevant and appropriate state Standards, Criteria and Guidance. The three categories of SCGs include chemical-, action-, and location-specific SCGs. Chemical-specific SCGs are presented for each medium in Section 6 of the RI, and in Section 7 of the RI, which contains the results of the HRA. Action-specific SCGs pertain to each selected remedial technology. NYSDEC considers a NYS Part 360 cap an action-specific SCG for this site. Remedial activities in the wetland present on site would violate a location-specific SCG. However, no such action is proposed.

Overall Protection of Human Health and the Environment - This evaluation criterion provides a final check to assess whether an alternative is protective of human health and the environment. This assessment is based on a composite of other factors already assessed, especially long-term effectiveness and performance, short-term effectiveness, and compliance with SCGs.

Cost - This criterion evaluates the capital and O&M costs associated with implementation of each alternative. An alternative with the lowest present worth is assigned the highest score of 15. Other alternatives are assigned a cost score inversely proportional to their present worth cost.

In the scoring system, each alternative is numerically rated against the factors developed for each criterion as detailed in TAGM HWR-89-4030 (NYSDEC, 1989). The results of the scoring are presented in Table 12-1 and are discussed in detail below. Present-worth costs have been summarized in the following subsections, and are presented in detail in Section 12.3.

12.2.2 **Alternative 1 - No Action**

Short-term Impacts and Effectiveness - Score: 10 out of 10

Since no construction is required to implement this alternative, there are no associated risks to the community, environment, or workers.

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SCORING SYSTEM FOR REMEDIAL ALTERNATIVES

SHORT-TERM IMPACTS AND EFFECTIVENESS (Relative Weight = 10)

FACTOR	BASIS FOR EVALUATION	WEIGHT	ALTERNATIVE NUMBER			
			1	2	3	4
1. Protection of community during remedial actions	- Are there significant short-term risks to the community that must be addressed? (if no, go to factor 2)	Yes - 0 No - 4	4	4	0	0
	- Can the risk be easily controlled?	Yes - 1 No - 0	-	-	1	1
	- Does the mitigative effort to control risk impact the community lifestyle?	Yes - 0 No - 2	-	-	2	2
2. Environmental Impacts	- Are there significant short-term risks to the environment that must be addressed? (If no, go to factor 3)	Yes - 0 No - 4	4	4	0	0
	- Are the available mitigative measures reliable to minimize potential impacts?	Yes - 3 No - 0	-	-	3	3
3. Time to implement the remedy	- What is the required time to implement the remedy?	<2 yr - 1 >2 yr - 0	1	1	1	1
	- Required duration of the mitigative effort to control short-term risk.	<2 yr - 1 >2 yr - 0	1	1	1	1
SUBTOTAL (MAXIMUM = 10)			10	10	8	8

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SCORING SYSTEM FOR REMEDIAL ALTERNATIVES

LONG-TERM EFFECTIVENESS AND PERMANENCE (Relative Weight = 15)

FACTOR	BASIS FOR EVALUATION	WEIGHT	ALTERNATIVE NUMBER			
			1	2	3	4
1. Permanence of the remedial alternative	- Will the remedy be classified as permanent in accordance with Section 2.1(a),(b) or (c) of the NYSDEC TAGM for the "Selection of Remedial Actions at Inactive Hazardous Waste Sites", Sept. 13, 1989? (if yes, go to factor 3)	Yes - 5 No - 0	0	0	0	0
2. Lifetime of remedial actions	- Expected lifetime or duration of effectiveness of the remedy	25-30 yr - 4 20-25 yr - 3 15-20 yr - 2 <15 yr - 0	0	0	4	4
3. Quantity and nature of waste or residual left at the site after remediation	i. Quantity of untreated hazardous waste left at the site	None - 3 <25% - 2 25-50% - 1 >50% - 0	0	0	0	0
	ii. Is there any treated residual left at the site? (if no, go to factor 4)	Yes - 0 No - 2	2	2	2	2
	iii. Is the treated residual toxic?	Yes - 0 No - 1	-	-	-	-
	iv. Is the treated residual mobile?	Yes - 0 No - 1	-	-	-	-
4. Adequacy and reliability of controls	i. Operation and maintenance required for a period of:	<5 yr - 1 >5 yr - 0	0	0	0	0
	ii. Are environmental controls required as a part of the remedy to handle potential problems? (if no, go to "iv")	Yes - 0 No - 2	0	0	0	0
	iii. Degree of confidence that controls can adequately handle potential problems	Moderate to very confident - 1 Somewhat to not confident - 0	1	1	1	1
	iv. Relative degree of long-term monitoring required (compare with other alternatives)	Minimum - 2 Moderate - 1 Extensive - 0	0	0	2	2
SUBTOTAL (MAXIMUM = 15)			3	3	9	9

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SCORING SYSTEM FOR REMEDIAL ALTERNATIVES

REDUCTION IN TOXICITY, MOBILITY AND VOLUME OF HAZARDOUS WASTE(Relative Weight = 15)

FACTOR	BASIS FOR EVALUATION	WEIGHT	ALTERNATIVE NUMBER			
			1	2	3	4
1. Volume of hazardous waste reduced (reduction in volume or toxicity)	i. Quantity of hazardous waste destroyed or treated	100% - 10 80-99% - 8 60-80% - 6 40-60% - 4 20-40% - 2 <20% - 0	0	0	0	0
	ii. Are there any concentrated hazardous wastes produced as a result of (i)? (if no, go to factor 2)	Yes - 0 No - 2	2	2	2	2
(If subtotal = 12, go to factor 3)	iii. How is the concentrated hazardous waste stream disposed?	On-site land disposal - 0 Off-site secure land disposal - 1 On-site or off-site destruction or treatment - 2	-	-	-	-
2. Reduction in mobility of hazardous waste	i. Method of Reduction - Reduced mobility by containment - Reduced mobility by alternative treatment technology	 1 3	0	0	1	1
	ii. Quantity of wastes immobilized	<100% - 2 >60% - 1 <60% - 0	0	0	0	0
3. Irreversibility of the destruction or treatment of hazardous waste	- Completely irreversible - Irreversible for most of the hazardous waste constituents - Irreversible for only some of the hazardous waste constituents - Reversible for most of the hazardous waste constituents	3 2 1 0	0	0	0	0
SUBTOTAL (MAXIMUM = 15)			2	2	3	3

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SCORING SYSTEM FOR REMEDIAL ALTERNATIVES

IMPLEMENTABILITY (Relative Weight = 15)

FACTOR	BASIS FOR EVALUATION	WEIGHT	ALTERNATIVE NUMBER			
			1	2	3	4
1. Technical Feasibility						
a. Ability to construct technology	i. Not difficult to construct. No uncertainties in construction ii. Somewhat difficult to construct. No uncertainties in construction iii. Very difficult to construct and/or significant uncertainties in construction	3 2 1	3	3	2	2
b. Reliability of technology	i. Very reliable in meeting the specified process efficiencies or performance goals ii. Somewhat reliable in meeting the specified process efficiencies or performance goals	3 2	3	3	3	3
c. Schedule of delays due to technical problems	i. Unlikely ii. Somewhat likely	2 1	2	2	1	1
d. Need of undertaking additional remedial action, if necessary	i. No future remedial action may be anticipated ii. Some future remedial actions may be necessary	2 1	1	1	2	2
2. Administrative Feasibility a. Coordination with other agencies	i. Minimal coordination is required ii. Required coordination is normal iii. Extensive coordination is required	2 1 0	2	2	1	1
3. Availability of Services and Materials						
a. Availability of prospective technologies	i. Are technologies under consideration generally commercially available for the site-specific application?	Yes - 1 No - 0	1	1	1	1
	ii. Will more than one vendor be available to provide a competitive bid?	Yes - 1 No - 0	1	1	1	1
b. Availability of necessary equipment and specialists	i. Additional equipment and specialists may be available without significant delay	Yes - 1 No - 0	1	1	1	1
SUBTOTAL (MAXIMUM = 15)			14	14	12	12

SCORING SYSTEM FOR REMEDIAL ALTERNATIVES

COMPLIANCE WITH STANDARDS,CRITERIA,AND GUIDANCE NYS(SCGs) (Relative Weight = 10)

FACTOR	BASIS FOR EVALUATION	WEIGHT	ALTERNATIVE NUMBER			
			1	2	3	4
1. Compliance with chemical-specific SCGs	Meets chemical-specific SCGs	Yes - 2.5 No - 0	0	0	0	0
2. Compliance with action-specific SCGs	Meets action-specific SCGs	Yes - 2.5 No - 0	0	0	2.5	2.5
3. Compliance with location-specific SCGs	Meets location-specific SCGs	Yes - 2.5 No - 0	2.5	2.5	2.5	2.5
4. Compliance with appropriate criteria, advisories and guidelines	The alternative meets all relevant and appropriate Federal and State guidelines that are not promulgated	Yes - 2.5 No - 0	0	0	0	0
SUBTOTAL (MAXIMUM = 10)			2.5	2.5	5.0	5.0

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT (Relative Weight = 20)

FACTOR	BASIS FOR EVALUATION	WEIGHT	ALTERNATIVE NUMBER			
			1	2	3	4
1. Use of site after remediation	Unrestricted use of the land and water (if yes, go to end of table)	Yes - 20 No - 0	0	0	0	0
2. Human health and the environment exposure after the remediation	i. Is the exposure to contaminants via air route acceptable?	Yes - 3 No - 0	3	3	3	3
	ii. Is the exposure to contaminants via groundwater/surface water acceptable?	Yes - 4 No - 0	4	4	4	4
	iii. Is the exposure to contaminants via sediments/ soil acceptable?	Yes - 3 No - 0	0	3	3	3
3. Magnitude of residual public health risks after the remediation	i. Health risk ii. Health risk	<1 in 1,000,000 - 5 <1 in 100,000 - 2	0	5	5	5
4. Magnitude of residual environmental risks after the remediation	i. Less than acceptable ii. Slightly greater than acceptable iii. Significant risk still exists	5 3 0	3	3	5	5
SUBTOTAL (MAXIMUM = 20)			10	18	20	20

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SCORING SYSTEM FOR REMEDIAL ALTERNATIVES

COST (Relative Weight = 15)

BASIS FOR EVALUATION	WEIGHT	ALTERNATIVE NUMBER			
		1	2	3	4
" An alternative with the lowest present worth shall be assigned the highest score of 15. Other alternatives shall be assigned the cost score inversely proportional to their present worth."		15	13	0	4
SUBTOTAL (MAXIMUM = 15)		15	13	0	4
TOTAL SCORE (MAXIMUM = 100)		56.5	62.5	57	61

NOTES:
Alt 1 - No Action
Alt 2 - Institutional Action
Alt 3 - Containment Option A
Alt 4 - Containment Option B

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Long-term Effectiveness and Performance - Score: 3 out of 15

This alternative is neither an effective nor a permanent remedy to the risks posed by the contaminants at the site. However, points were given as there is no treated residual left at the site.

Reduction in Toxicity, Mobility, and Volume of Hazardous Waste - Score: 2 out of 15

This alternative does not reduce the toxicity, mobility, or the volume of hazardous waste at the site. However, points were given because no concentrated hazardous waste is produced.

Implementability - Score: 14 out of 15

The no-action alternative does not require implementation. However, it fails to provide a reliable remedy to the problem. Moreover, some future remedial action is likely to be necessary.

Compliance with SCGs - Score: 2.5 out of 10

Implementation of this alternative would not result in compliance with chemical-specific SCGs for soil, groundwater, or surface water. It would not be in compliance with the action-specific SCGs, which call for a NYS Part 360 Cap. It would be in compliance with the location-specific SCGs, which limit activities in wetlands. As this alternative does not meet the promulgated standards (chemical-specific SCGs), it is doubtful that it will meet the non-promulgated (generally more stringent) guidelines.

Overall Protection of Human Health and the Environment -
Score: 10 out of 20

If this alternative were implemented, the risks to human health and the environment posed by the contaminants at the site would remain. However, currently the groundwater/surface water and air routes do not pose unacceptable health risks.

Cost - Score: 15 out of 15

There is no cost associated with this alternative.

TOTAL SCORE - 56.5 out of 100

12.2.3 Alternative 2 - Institutional Action

Short-term Impacts and Effectiveness - Score: 10 out of 10

Since minimal construction would be required to implement this alternative (assuming that existing groundwater monitoring wells can be used for the long-term monitoring program), there would be no associated risks to the community, environment, or to workers.

Long-term Effectiveness and Permanence - Score: 3 out of 15

The institutional controls (fence and monitoring) will be maintained over the full 30-year period and will be effective in negating human health risk. However, the alternative is not effective with regard to potential adverse environmental impact. Therefore, no points were awarded for factor 2 (lifetime of remedial actions) under this category. Points were given as there is no treated residual left at the site.

Reduction in Toxicity, Mobility, and Volume of Hazardous Waste -
Score: 2 out of 15

This alternative does not reduce the toxicity, mobility, or volume of hazardous waste at the site. However, points were given because no concentrated hazardous waste is produced.

Implementability - Score: 14 out of 15

This alternative may be implemented without difficulty. The need for future remedial action is a possibility and would be continually evaluated, as long-term monitoring is included under this alternative.

Compliance with SCGs - Score: 2.5 out of 10

Implementation of this alternative would not result in compliance with chemical-specific SCGs for groundwater or surface water. However, the reduction in site access will reduce exposure to soil to acceptable levels. It would not be in compliance with the action-specific SCGs, which call for a NYS Part 360 Cap. It would be in compliance with the location-specific SCGs, which limit activities in wetlands. As this alternative does not meet the promulgated standards (chemical-specific SCGs), it is doubtful that it will meet the non-promulgated (generally more stringent) guidelines.

Overall Protection to Human Health and the Environment - Score: 18 out of 20

Currently the groundwater/surface water and air routes do not pose unacceptable health risks. If this alternative were implemented, soil contamination would remain, although potential exposure to contamination would be greatly reduced. If the proposed fence is properly maintained, the frequency of direct exposure to soil contamination should be reduced essentially to zero. However, a potential for adverse impact on the environment (mainly The Gulf) remains, although data from the RI indicate that the landfill is not significantly contributing to contamination in The Gulf.

Cost - Score: 13 out of 15

This alternative has the second lowest relative cost compared to the other alternatives. The estimated present worth of the capital and operation and maintenance (O&M) costs is $544,600 (See Section 12.3).

TOTAL SCORE - 62.5 out of 100

12.2.4 Alternative 3 - Containment Option A

Short-term Impacts and Effectiveness - Score: 8 out of 10

This alternative includes limited excavation of fill and some earthwork required to obtain suitable grades for the cap. Short-term impacts on the community and environment may result from the generation of dust during construction, although mitigative measures to control dust will be undertaken.

Long-term Effectiveness and Permanence - Score: 9 out of 15

The duration of this alternative is expected to be the full 30-year period. There will be no treated residual left at the site. This alternative will require minimum long-term monitoring.

Reduction in Toxicity, Mobility, and Volume of Hazardous Waste - Score: 3 out of 15

This alternative does not reduce the toxicity or volume of hazardous waste, but the presence of a cap does reduce contaminant mobility.

Implementability - Score: 12 out of 15

A Part 360 cap is somewhat difficult to construct, and delays during construction are possible.

Compliance with SCGs - Score: 5 out of 10

Chemical-specific SCGs for soil may be met with the cap, although such SCGs for groundwater and surface water will not be met. The Part 360 cap complies with the action-specific SCG. As this alternative does not meet the chemical-specific SCGs for groundwater and surface water, it is doubtful that it will meet the non-promulgated guidelines.

Overall Protection to Human Health and the Environment - Score: 20 out of 20

Currently the groundwater/surface water and air routes do not pose unacceptable health risks. This alternative would eliminate the health risk posed by direct contact with surficial soil/fill and reduce environmental risks to an acceptable level. Future use of the site would still be restricted.

Cost - Score: 0 out of 15

This alternative had the highest relative cost compared to the other alternatives. The estimated present worth of the capital and operation and maintenance (O&M) costs is $5,390,800 (see Section 12.3).

TOTAL SCORE - 57 out of 100

12.2.5 Alternative 4 - Containment Option B

Short-term Impacts and Effectiveness - Score: 8 out of 10

This alternative includes limited excavation of fill and some earthwork required to obtain suitable grades for the cap. Short-term impacts on the community and environment may result from the generation of dust during construction, although mitigative measures to control dust will be undertaken.

Long-term Effectiveness and Permanence - Score: 9 out of 15

The duration of this alternative is expected to be the full 30-year period. There will be no treated residual left at the site. This alternative will require minimum long-term monitoring.

Reduction in Toxicity, Mobility, and Volume of Hazardous Waste - Score: 3 out of 15

This alternative does not reduce the toxicity or volume of hazardous waste, but the presence of a cap does reduce contaminant mobility.

Implementability - Score: 12 out of 15

A Part 360 cap (with variances) is somewhat difficult to construct, and delays during construction are possible.

Compliance with SCGs - Score: 5 out of 10

Chemical-specific SCGs for soil will be met with the cap although groundwater and surface water will not be met. The alternative Part 360 cap (with variances) complies with the action-specific SCG. As this alternative does not meet the chemical-specific ARARs for groundwater and surface water, it is doubtful that it will meet the non-promulgated guidelines.

Overall Protection to Human Health and the Environment -
Score: 20 out of 20

Currently the groundwater/surface water and air routes do not pose unacceptable health risks. This alternative would eliminate the health risk posed by direct contact with surficial soil/fill and reduce environmental risks to an acceptable level. Future use of the site would still be restricted.

Cost - Score: 4 out of 15

This alternative has the second highest cost. The estimated present worth of the capital and operation and maintenance (O&M) costs is $3,960,800 (see Section 12.3).

TOTAL SCORE - 61 out of 100

12.3 Economic Evaluation of Alternatives

12.3.1 General

Present-worth costs for each of the three alternatives were presented in the preceding section. The following discussions provide the details of the capital and operation and maintenance (O&M) costs for each of the technologies comprising an alternative. For every alternative, each technology component is evaluated within the alternative section under which it will be incorporated, and then the costs for each alternative are summarized.

The specific aspects and quantities of each component which are used as the basis for the capital and annual O&M costs are discussed in detail below (Sections 12.3.3, 12.3.4, and 12.3.5). The capital and annual O&M costs for each alternative are presented on separate tables and accompany the discussions. The sources of the unit prices are referenced on the tables. Several cost items are estimated as a percentage of the total cost. These include standard items such as mobilization/demobilization; construction administration; design engineering; bonds and insurance; contingencies (for example, to account for change orders during construction); markups to reflect bonding requirements and construction at sites containing hazardous waste, and the limited number of contractors available to work under these conditions; and provisions for health and safety protection, specifically for workers, but also for the community and the environment as required. The accuracy of the estimated costs lies within a range of -30% to +50% of the actual construction costs.

Tables 12-2 through 12-8 present the capital and O&M costs developed for each of the three alternatives. For the cost-effectiveness evaluation of the alternatives, the capital and annual O&M costs are converted to their equivalent present worth. A 30-year performance period with a 10 percent annual interest rate is used in the determination of the present worth of the cost of each alternative.

12.3.2 Alternative 1 - No Action

The no-action alternative has no cost associated with it.

12.3.3 Alternative 2 - Institutional Action

The institutional action alternative includes the following:

- o Fencing of the site
- o Monitoring of groundwater at the site using existing monitoring wells (sampling and analysis)

TABLE 12 - 2

LOCKPORT CITY LANDFILL
CAPITAL COST ESTIMATE

FENCING

ITEM NO.	ITEM	UNITS	QUANTITY	UNIT COST	SOURCE	TOTAL COST
1.	8 ft high chain link fence with 3 strands of barbed wire , including posts, 3-double leaf swing gates (2-10 ft leaf) & 3-mangates.	FT	9100	$20	1	$182,000

SUBTOTAL **$182,000**

Mobilization/Demobilization (10%)	$18,200
Construction Markup for Overhead and Profit (25%)	$45,500
Construction, Administration, and Design Engineering (15%)	$27,300
Level "D" Health and Safety Requirements (5%)	$9,100
Bonds and Insurance (5%)	$9,100
Contingency (10%)	$18,200

TOTAL **$309,400**

SOURCES : 1 - URS Estimate

TABLE 12 – 3

LOCKPORT CITY LANDFILL
ANNUAL O & M COST ESTIMATE

FENCING

COMPONENT	ITEM	UNITS	ANNUAL QUANTITY	UNIT COST	SOURCE	TOTAL COST
1. Inspection	Inspection of Fence (2 person)	hr	16	25	1	$400
2. Maintenance	Minor Repair, Removal of Vegetation	hr	20	30	1	$600
3. Repair	Repair of Fence with New Fabric	FT	50	20	1	$1,000

SUBTOTAL **$2,000**

Mobilization/Demobilization (5%)	$100
Contractor Markup for Overhead and Profit (25%)	$500
Level "D" Health and Safety Requirements (5%)	$100
Contingency (10%)	$200

TOTAL ANNUAL COST **$2,900**

SOURCES : 1 – URS Estimate

TABLE 12 – 4

LOCKPORT CITY LANDFILL
ANNUAL O & M COST ESTIMATE

GROUNDWATER MONITORING

ITEM	UNITS	ANNUAL QUANTITY	UNIT COST	SOURCE	TOTAL COST
Sampling					
– Labor	mandays	3	$400	1	$1,200
– Equipment	misc	1	$150	3	$150
Analysis					
– TCL	sample	9	$1,500	2	$13,500
QA / QC	mandays	9	$400	1	$3,600
SUBTOTAL					**$18,450**
Administration and Engineering (15%)					$2,768
Contingency (10%)					$1,845
TOTAL ANNUAL COST					$23,063
				Say	**$23,100**

SOURCES : 1 – URS estimate.
2 – Recent laboratory quote.
3 – For Level "C" protection.

TABLE 12-5

LOCKPORT LANDFILL
CAPITAL COST ESTIMATE

CONTAINMENT OPTION A

COMPONENT	ITEM	UNITS	UNIT COST	SOURCE	QUANTITY	TOTAL COST
1. CLEARING	Cut and Remove Trees and Large Obstacles	ac	$4,900.00	1	16	$78,400
2. GRADING						
	Unclassified Grading	cy	$10.00	2	1,000	$10,000
3. GAS VENTING LAYER	a)Furnish, Deliver and Install Drainage Net	sqft	$0.30	2	696,960	$209,088
	b)Filter Fabric	sqft	$0.12	2	696,960	$83,635
4. GAS VENTS	a)Excavate	cy	$455.00	1	16	$7,280
	b)Furnish, Deliver, Haul and Place Stone	cy	$27.00	1	16	$432
	c)Furnish and Install Pipes	ea	$182.00	1	16	$2,912
	d)Seals	ea	$30.00	1	16	$480
5. 60 mil HDPE GEOMEMBRANE	a)Furnish, Deliver and Install	sqft	$0.80	2	696,960	$557,568
6. GENERAL FILL LAYER	a)Purchase	cy	$1.75	1	64,530	$112,928
	b)Haul	cy	$12.20	1	64,530	$787,266
	c)Place and Grade	cy	$0.61	1	64,530	$39,363
7. 6 IN TOPSOIL LAYER	a)Purchase	cy	$8.90	1	12,907	$114,872
	b)Haul	cy	$15.42	1	12,907	$199,026
	c)Place and Grade	cy	$3.46	1	12,907	$44,658
8. COVER	Seed, Mulch and Fertilize	ac	$4,340.00	1	16	$69,440
9. REFUSE DISPOSAL	a)Remove Refuse	cy	$50.00	2	1,000	$50,000
10. DRAINAGE SWALE	a)Purchase	cy	$1.75	1	600	$1,050
	b)Haul	cy	$12.20	1	600	$7,320
	c)Place and Grade	cy	$0.61	1	600	$366
SUBTOTAL						$2,376,084

Mobilization/Demobilization (5%)	$118,804
Contractor Markup (25%)	$623,722
Construction, Administration and Design Engineering (15%)	$467,792
Level "D" Health and Safety Requirements (2.5%)	$89,660
Bonds and Insurance (10%)	$367,606
Contingency (10%)	$404,367
Change Order Contingencies (10%)	$444,804
SUBTOTAL	$2,516,755
TOTAL	$4,890,000

SOURCES :
1 - Means, 1990
2 - Bids on Previous URS Projects

TABLE 12-6

LOCKPORT CITY LANDFILL
ANNUAL O & M COST ESTIMATE

PART 360 AND ALTERNATE PART 360 CAP

COMPONENT	ITEM	UNITS	ANNUAL QUANTITY	UNIT COST	SOURCE	TOTAL COST
1. INSPECTION	Inspection of Cap	hr	16	$25	1	$400
2. MAINTENANCE	Maintain Vegetative Cover and Topsoil	hr	640	$30	1	$19,200
3. REPAIR CAP BREAK-THROUGHS	a. Replacement of General/Select Fill	CY	30	$15	1	$450
	b. Replacement of Topsoil	CY	15	$28	1	$420
	c. Re-vegetate	Acre	0.02	$3,300	1	$66

SUBTOTAL $20,536

Mobilization/Demobilization (5%)	$1,030
Contractor Markup for Overhead and Profit (25%)	$5,134
Level "D" Health and Safety Requirements (5%)	$1,030
Contingency (10%)	$2,054

TOTAL ANNUAL COST $29,784

Say $30,000

SOURCES: 1 - URS Estimate

filename:capo&m

TABLE 12-7

LOCKPORT LANDFILL
CAPITAL COST ESTIMATE

CONTAINMENT OPTION B

COMPONENT	ITEM	UNITS	UNIT COST	SOURCE	QUANTITY	TOTAL COST
1. CLEARING	Cut and Remove Trees and Large Obstacles	ac	$4,900.00	1	16	$78,400
2. GRADING	Unclassified Grading	cy	$10.00	2	1,000	$10,000
3. SELECT FILL LAYER	a)Purchase	cy	$11.12	1	38,721	$430,578
	b)Haul	cy	$15.42	1	38,721	$597,078
	c)Place and Grade	cy	$3.46	1	38,721	$133,975
4. 6 IN TOPSOIL LAYER	a)Purchase	cy	$8.90	1	12,907	$114,872
	b)Haul	cy	$15.42	1	12,907	$199,026
	c)Place and Grade	cy	$3.46	1	12,907	$44,658
5. COVER	Seed, Mulch and Fertilize	ac	$4,340.00	1	16	$69,440
6. Refuse Disposal	a) Remove Refuse	cy	$50.00	2	1000	$50,000
7. Drainage Swale	a)Purchase	cy	$11.12	1	600	$6,672
	b)Haul	cy	$15.42	1	600	$9,252
	c)Place and Grade	cy	$3.46	1	600	$2,076
SUBTOTAL						**$1,678,026**

Mobilization/Demobilization (5%)	$83,901
Contractor Markup (25%)	$440,482
Construction, Administration and Design Engineering (15%)	$330,361
Level "D" Health and Safety Requirements (2.5%)	$63,319
Bonds and Insurance (10%)	$259,609
Contingency (10%)	$285,570
Change Order Contingency (10%)	$314,127
SUBTOTAL	**$1,777,370**
TOTAL	**$3,460,000**

SOURCES : 1 - Means, 1990
2 - Bids on Previous URS Projects

filename:socap

TABLE 12-8

LOCKPORT CITY LANDFILL
COST ESTIMATES FOR REMEDIAL ALTERNATIVES

ITEM	No Action 1	Institutional Action 2	Containment Option A 3	Containment Option B 4
CAPITOL COST				
Fencing		$30,9400	NA	NA
Cap		NA	$4,890,000	$3,460,000
TOTAL CAPITOL COST	0	$30,9400	$4,890,000	$3,460,000
ANNUAL O & M COSTS				
Fencing		$2,900	NA	NA
Groundwater Monitoring Wells		$23,100	$23,100	$23,100
Cap		NA	$30,000	$30,000
TOTAL ANNUAL O & M COSTS	0	$26,000	$53,100	$53,100
PRESENT WORTH OF O & M COSTS	0	$245,200	$500,800	$500,800
PRESENT WORTH OF O & M TOTAL COSTS (CAPITOL AND O & M)	0	$544,600	$5,390,800	$3,960,800

NOTE: Present worth analysis is based on a 30-year performance period at 10% interest per year.

NA - Not Applicable

file:costest

12.3.3.1 Fence

Capital Costs

For institutional action, a fence would be erected around upper and lower portions of the site as divided by the railroad right-of-way. Assumed specifications for the fence include the following:

- 9-foot total height, including 8 feet of fabric and 3-strand barbed wire
- galvanized steel construction
- a total of 3 double leaf swing gates and 3 man gates
- 4-foot deep foundation for each fence post

The total capital cost is estimated to be $309,400 as shown on Table 12-2.

Annual O&M Costs

The annual O&M costs for the fence are estimated to be $2,900 as shown on Table 12-3. It is assumed that inspection of the fence will be performed annually and that approximately two days per year will be required for fence repair.

12.3.3.2 Groundwater Monitoring

Capital Cost

Long-term monitoring of groundwater is proposed using three upgradient offsite wells (MW-8, MW-10, and MW-1) and three downgradient onsite wells (MW-9, MW-3, and MW-2). All wells currently exist at the site. Therefore, no capital cost is associated with groundwater monitoring.

Annual O&M Costs

Items which comprise the O&M costs of long-term groundwater monitoring are the sampling and laboratory analysis of six groundwater samples and three quality control samples and validation of the laboratory results by a qualified chemist. For the present, it is assumed that the entire Target Compound List (TCL) as given in the New York State Analytical Services Protocols (ASP) document will be analyzed. However, it is expected that the actual list of parameters will be reduced during remedial design. Contingencies, administration, and engineering have been added for future report preparation. The total annual O&M cost for groundwater monitoring is estimated to be approximately $23,100. A breakdown of the costs is provided in Table 12-4.

12.3.3.3 Summary of Costs for Alternative 2 - Institutional Action

The institutional action alternative requires construction of a perimeter fence, and groundwater monitoring. Total capital costs are $309,400; annual O&M costs are $26,000; and the total present-worth cost of this alternative is $544,600.

12.3.4 **Alternative 3 - Containment Option A**

Containment Option A consists of the following components:

- Part 360 cap
- Remove waste from steep embankment and place on the landfill under the cap
- Groundwater monitoring

12.3.4.1 **Part 360 Cap**

Capital Costs

The estimated capital cost for the Containment Option A is $4,890,000. A breakdown for the cost of the cap is given in Table 12-5. The basis for the capital cost estimate is given below.

The cap will cover approximately 16 acres. This is the estimated areal extent of fill at the landfill with the exception of the steep embankment. The cap will not be placed over the steep embankment.

Prior to the construction of the cap, it is assumed that the site will be cleared and grubbed, loose debris will be compacted or crushed, and trees and logs will be chipped and placed on the landfill. Large trees will be cut at ground surface and the stumps treated/killed in place. No other intrusive activities during clearing and grubbing are required.

To provide a stable surface that promotes positive drainage, the following configuration is presumed for the Part 360 cap:

- Slopes varying from 5 to 20 percent
- Site runoff generally from east to west
- Drainage ditches on both sides of the railroad tracks, draining south to north.
- Placement of fill at the southeast portion of the western landfill to achieve minimum slope, and to create a ditch along the tracks
- Landfill surface runoff drainage distance of generally 200 to 700 feet

- Construction of a ditch at the top of the steep embankment section, to control runon and runoff
- Preservation of current surface drainage flow patterns. Surface water will drain to The Gulf, as in the present condition.

The Part 360 cap will comprise the following:

- Vegetative cover
- 6" topsoil
- 24" general fill layer (barrier protection layer)
- 60-mil HDPE geomembrane (low-permeability layer)
- HDPE drainage net (gas venting layer)
- Filter Fabric
- Gas Vents (1 per acre)

A typical section is presented in Figure 12-1. Waste material (empty drums, trash, etc.) from the steep embankment will be removed, placed on flatter portions of the landfill, and be covered with the cap. The estimated volume of the waste is 1,000 cubic yards.

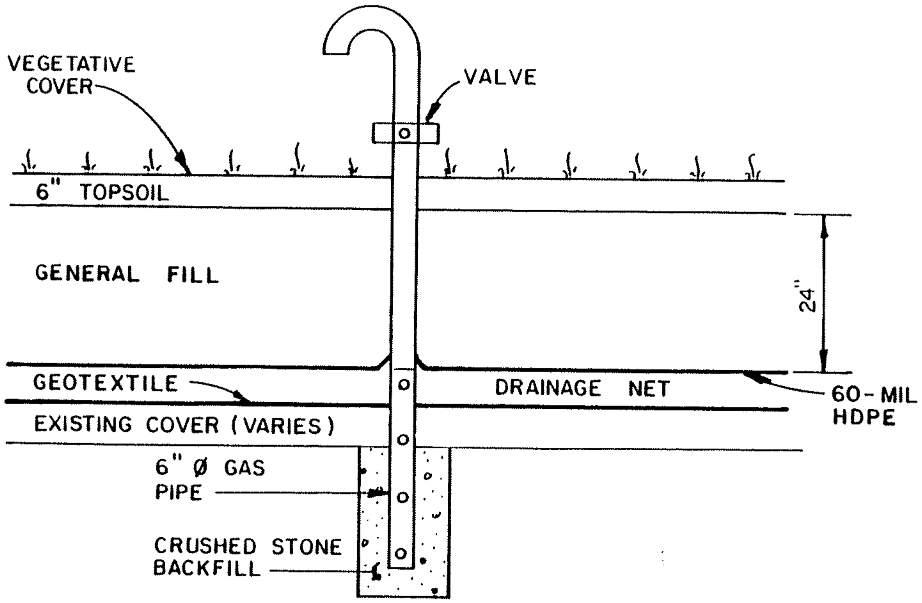
It is assumed that all fill used for construction will be obtained from an offsite source.

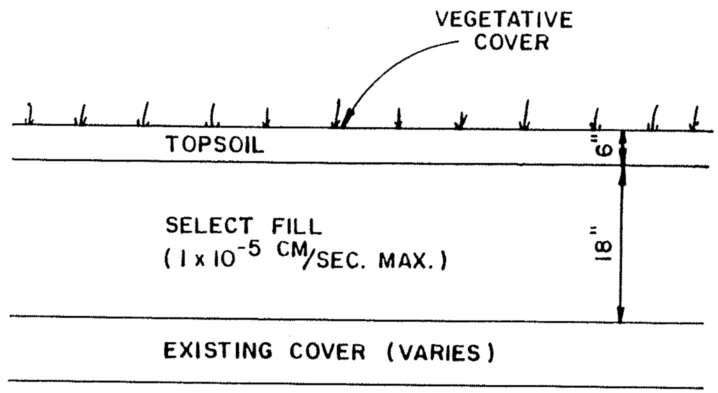
Unit costs for soil are based on in-place volumes, and account for the variability in working volumes of soil due to compaction and to expanded loose volumes during excavation and hauling.

Annual O&M Costs

The estimated annual O&M costs for the soil cap are $30,000. A breakdown of the O&M costs for the cap is given in Table 12-6.

A-4152





SECTION THROUGH ALTERNATE PART 360 CAP

SECTION THROUGH PART 360 CAP

NOT TO SCALE

URS CONSULTANTS, INC

CAP CROSS SECTIONS

FIGURE 12-1

It is assumed that inspection of the cap will be performed on a routine basis, averaging 2 times per year and requiring 8 hours per day. Maintenance of the vegetative cover will require 640 man-hours per year, primarily for cutting grass and refilling eroded areas. Equipment costs are included under vegetative cover maintenance.

For the O&M cost estimate it was assumed that a total area of 800 square feet (approximately 1% of the cap surface area) would require repair annually due to cracking. The cap would be completely restored to its original configuration.

12.3.4.2 Groundwater Monitoring

For a discussion of capital costs and O&M costs related to groundwater monitoring, refer to the groundwater monitoring discussion covered under Alternative 2 - Institutional Action (Section 12.3.3.2).

12.3.4.3 Summary of Costs for Alternative 3 - Containment Option A

The containment alternative requires construction of a Part 360 cap, including excavation and placement of waste from the steep embankment under the cap, and groundwater monitoring. Total capital costs are $4,890,000; annual O&M costs are $53,100; and the total present worth of the cost for this alternative is $5,390,800.

12.3.5 Alternative 4 - Containment Option B

Containment Option B consists of the following components:

- Part 360 cap (with variances)
- Remove waste from steep embankment and place on the landfill under the cap
- Groundwater monitoring

The estimated capital cost for containment Option B is $3,460,000. A breakdown for the cost of the cap is given in Table 12-7.

12.3.5.1 Part 360 Cap (With Variances)

Capital Costs

The Part 360 cap (with variances) will comprise the following:

- Vegetative Cover
- 6" topsoil
- 18" compacted fill (10^{-5} to 10^{-4} cm/s for low-permeability layer).

A typical section is presented in Figure 12-1. All other bases for cost are as for containment Option A (Section 12.3.4.1).

Annual O&M Costs

The estimated annual O&M costs for the Containment Option B are considered to be the same as for Containment Option A. A breakdown of O&M costs is given in Table 12-6.

12.3.5.2 Groundwater Monitoring

For a discussion of capital and O&M cost related to groundwater monitoring, refer to groundwater monitoring discussion in Section 12.3.3.2.

12.3.5.3 Summary of Costs for Alternative 4 - Containment Option B

This containment alternative requires the construction of a Part 360 cap (with variances) including excavation and placement of waste from the steep embankment under the cap, and groundwater monitoring. Total capital costs are $3,460,000, annual O&M costs are $53,100, and the total present worth of the alternative is $3,960,800.

12.4 Comparison of Alternatives

To facilitate understanding of the discussion below, reference should be made to Tables 12-1 and 12-8.

Short-term Impacts and Effectiveness

Alternatives 1 (No Action) and 2 (Institutional Action) received perfect scores under this category since limited (Alternative 2) or no (Alternative 1) construction activities are required. Alternatives 3 and 4 (Containment Options A and B) scored somewhat lower since limited excavation and earthwork required for this alternative could generate fugitive dust emissions.

Long-term Effectiveness and Performance

Alternatives 1 (No Action) and 2 (Institutional Action) received low scores in this category. The score for Alternative 2 is low since it does not address potential environmental concerns, although it is effective in regard to potential human health risk. Alternatives 3 and 4 (Containment Options A and B) scored considerably higher since they reduce potential adverse environmental impact and will require less long-term monitoring.

Reduction in Toxicity, Mobility, and Volume of Hazardous Waste

Scores for all alternatives were low. Alternatives 3 and 4 received one point more than Alternatives 1 and 2 since a point is awarded for the reduction of contaminant mobility resulting from capping the site.

Implementability

Alternatives 1 and 2 received near-perfect (14 out of 15) scores since there is no or little construction required. A point was deducted from the score since future action is likely to be required. Alternatives 3 and 4 scored two points lower (12 out of 15) since construction may be somewhat difficult, delays are possible, and some coordination with government agencies will be required.

Compliance with SCGs

Alternatives 1 and 2 both received 2.5 points in this category. These alternatives are not in compliance with SCGs or other guidelines pertaining to surface water or groundwater or the action-specific SCG requiring a Part 360 cap. Points were awarded since activities will not occur in the wetland. Alternatives 3 and 4 received 5 points each since they are in compliance with the action-specific capping requirement.

Overall Protection to Human Health and the Environment

Alternatives 3 and 4 were awarded the maximum score of 20. Alternative 2 scored 18. Alternative 2 scored slightly lower because it does not reduce potential environmental risks associated with erosion or infiltration through fill. Alternative 1 scored significantly lower (10) than other alternatives since this alternative does not address human health or environmental risks at the site.

Cost

Alternative 1 was awarded the maximum score of 15 since no cost is associated with this alternative. Alternative 2 was awarded a score of 13 since its cost was comparatively low. Alternative 3 was awarded the lowest score of 0 since its cost was significantly higher than the other alternatives.

Alternative 4 received a score of 4. Scores for cost are inversely proportional to the present worth of the alternative.

Total Scores

Alternative 2 scored the highest (62.5) of the three alternatives. Alternatives 4, 3, and 1 followed with scores of 61, 57, and 56.5, respectively.

12.5 Selection of Remedial Approach

Based on detailed evaluation of alternatives, the recommended remedial approach for the Lockport Landfill site is Alternative 3 - Containment Option A. Alternative 3 is considered superior to Alternative 2 although Alternative 2 scored higher. Alternative 3 addresses potential environmental impacts and the associated remedial objectives that Alternative 2 does not. In addition, Alternative 3 meets the action-specific SCG requiring a Part 360 cap. Based on the criteria of the TAGM scoring system, Alternatives 3 and 4 (the two containment options) are considered equal in all categories except cost. However, Alternative 3 (full Part 360 cap) may be considered more effective on a practical basis since it will reduce infiltration through contaminated fill. Despite its higher cost, Alternative 3 is selected over Alternative 4.

13.0 CONCEPTUAL DESIGN AND PRELIMINARY COST ESTIMATE OF SELECTED REMEDIAL ALTERNATIVE

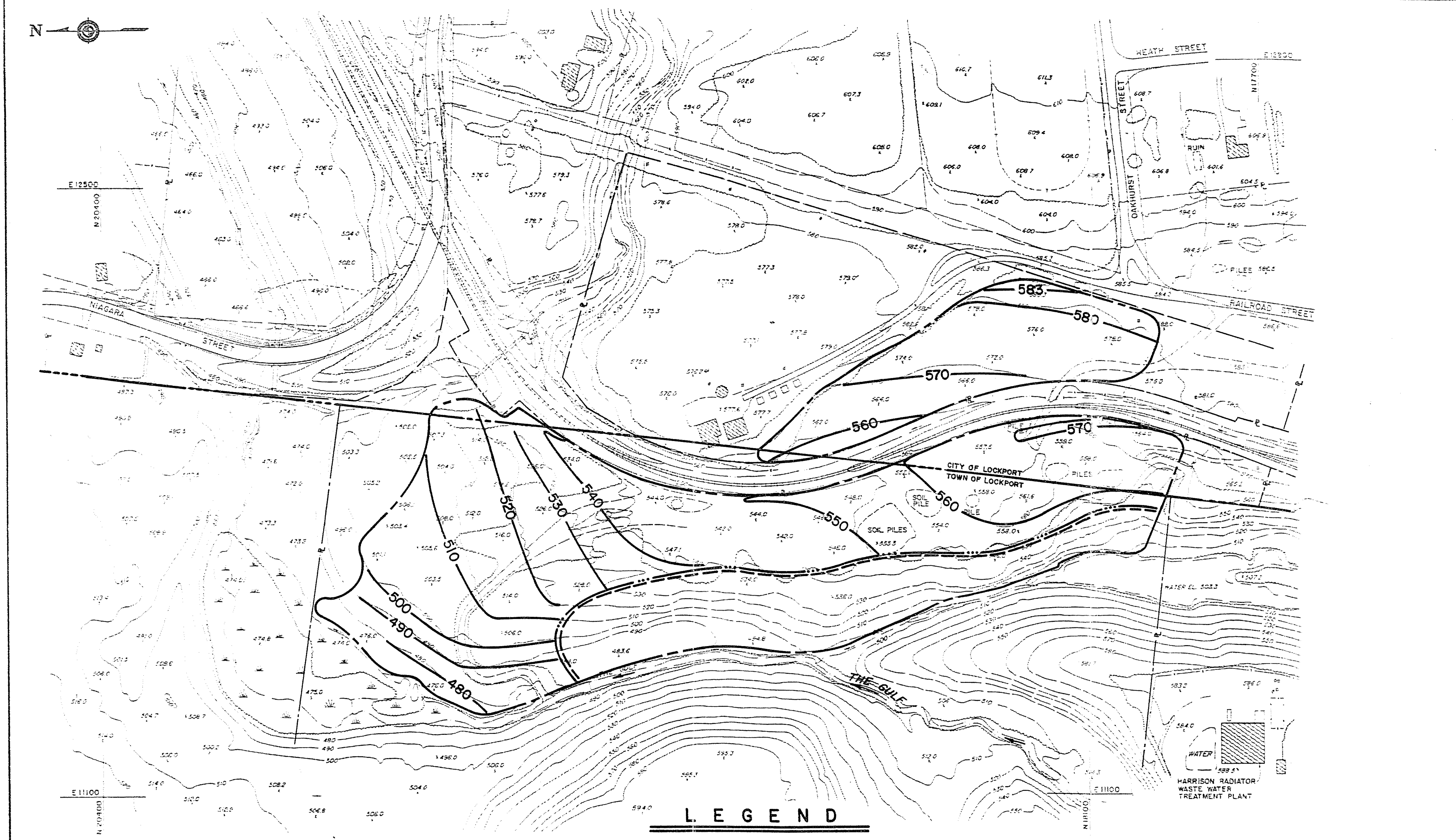
13.1 Conceptual Design

The selected remedial approach for the Lockport City Landfill site (Alternative 3) consists of a Part 360 cap, deed restrictions, and groundwater monitoring.

A cap will be placed over the area of contaminated soil/fill with the exception of the railroad right-of-way and the steep embankment. The extent of the cap (estimated at 16 acres), including a proposed subgrade plan, is shown in Figure 13-1. The cap will consist of a barrier protection layer (i.e., 24 inches of general fill overlying 60-mil HDPE, 6 inches of topsoil, and a vegetative cover. Note that the sub-grade in each area is designed to carry surface water away from the capped fill. The area on the easterly side of the track will drain to the west and north into the drainage swale running along the railroad right-of-way, while the area on the westerly side will drain generally north and east into the other drainage swale as well as into the northerly wetlands as at present. A cross-section is shown in Figure 12-1. Annual inspection and a repair of the cap will be performed to ensure the integrity of the cap.

In design of the remediation, care must be taken to stress the need for minimization of environmental impact in both the short and long term. In particular, concerns related to solids entering The Gulf during debris removal, encroachment of remedial measures into the wetland area to the north of the site, and discharge of surface runoff must be addressed. The design documents must be written in a manner which will keep those concerns paramount during construction.

Deed restrictions may be implemented to prevent future development of the site that could lead to direct contact with contaminated soil/fill.



LEGEND

- 550 — SITE GRADING CONTOURS
- DRAINAGE SWALE
- LIMIT OF STEEP EMBANKMENT
- APPROXIMATE LIMITS OF FILL

SCALE 0 100 200 FEET

NOTE:
ALL PROPERTY LINES SHOWN ARE TAKEN FROM CITY AND TOWN OF LOCKPORT TAX MAPS AND ARE APPROXIMATE IN THEIR LOCATION. PHYSICAL FEATURES (AND CONTOURS WHEN SHOWN) ARE TAKEN FROM PHOTOGRAMMETRIC MAPPING PLOTTED BY LOCKWOOD SUPPORT SERVICES, ROCHESTER, N.Y., USING APRIL 1989 AERIAL PHOTOGRAPHY.

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION

REVISIONS

DESIGNED BY:
DRAWN BY: KLW
CHECKED BY:
PROJ. ENGR.:

URS Consultants, Inc.
CONSULTING ENGINEERS
NEW YORK NEW JERSEY
JOB No. 35180

FEASIBILITY STUDY

LOCKPORT CITY LANDFILL
CITY OF LOCKPORT NIAGARA COUNTY NEW YORK

SITE GRADING PLAN
Scale: AS SHOWN Date: Dec. 91
FIGURE 13-1

C-2387

Development of the site for residential or recreational purposes would be prohibited. Limited industrial development of the site could be permitted if the site were covered (e.g., asphalt or concrete) to prevent human contact and infiltration through contaminated material.

Perimeter groundwater monitoring will be conducted during the post-closure monitoring period. The groundwater monitoring plan will be developed in conjunction with the remedial design, and will include up- and down-gradient monitoring of the respective water-bearing zones identified during the remedial investigation. In addition, the discharge of the 36-inch diameter concrete pipe drain will be included in the groundwater monitoring program. As currently envisioned, sample analysis would include the complete TCL. However, this could be modified in the future as more data become available. This sampling will be conducted to determine if the site has any significant impact on groundwater or surface water quality in the future.

13.2 Preliminary Cost Estimate

The total capital cost required for implementation of this remedy is $4,890,000. The total annual O&M cost is $53,100. The 1991 present worth of the total cost (capital plus O&M) using a 30-year performance period and 10 percent annual interest rate is $5,390,800. For a breakdown of the capital and O&M costs, refer to Table 13-1. The capital and annual O&M costs were developed in Section 12.0. Therefore, reference should also be made to that section for additional details.

13.3 Implementation of Remedy

Construction of the cap is expected to be completed in approximately 18 months (two construction seasons) after award and approval of the construction contract.

TABLE 13-1

PRELIMINARY COST ESTIMATE

		Cost
Site Preparation		$ 88,400
Refuse Disposal		$ 50,000
Cap		$2,237,684
Indirect Costs (per Table 12.5)		$2,516,755
	TOTAL	$4,890,000

****

		Cost
Capital Costs		$4,890,000
O&M Costs (30 years)		$ 500,800
	TOTAL PRESENT WORTH	$5,390,800

FS REFERENCES

1. NYSDEC, Technical and Administrative Guidance Memorandum on the Selection of Remedial Actions, TAGM-HWR-89-4030, September 13, 1989.

2. R.S. Means Company, Inc., Site Work Cost Data, 9th Annual Edition, 1990.

3. USEPA, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, October 1988.

4. USEPA, Office of Solid Waste and Engineering Response, Streamlining the RI/FS for CERCLA Municipal Landfill Sites, OSWER Directive # 9355.3-11FS, September 1990.