

OHIO ENVIRONMENTAL PROTECTION AGENCY

**DECISION DOCUMENT
FOR THE**

**THE GREEN II LANDFILL SITE
HOCKING COUNTY, OHIO**

MARCH 1999

TABLE OF CONTENTS

| | <u>Page</u> |
|---|-------------|
| I. SITE BACKGROUND | 1 |
| II. NATURE and EXTENT of CONTAMINATION | 3 |
| A. Leachate Investigations | 3 |
| B. Groundwater Investigations | 3 |
| C. Surface Water Investigations | 6 |
| D. Air Investigations | 6 |
| E. Risk Assessment | 10 |
| III. OVERVIEW OF REMEDIAL ALTERNATIVES | 10 |
| No-Action Alternative | 11 |
| Alternative 1- Improvements to Existing Cover | 11 |
| Alternative 2 - Soil Additives/Improvements to Existing Cover | 13 |
| Alternative 3 - Natural Soil Cover System | 13 |
| Alternative 4 - Multilayered Cover | 13 |
| Alternative 5 - Synthetic Membrane Cover | 14 |
| Alternative 6 - Multilayered Synthetic Membrane Cover | 14 |
| Alternative 7 - Innovative Phytoremediation Leachate Management System | 14 |
| Supplementary Discussion of Alternative 7 | 15 |
| IV. SELECTION CRITERIA FOR REMEDIAL ALTERNATIVES | 15 |
| V. ANALYSIS OF ALTERNATIVES | 16 |
| VI. OHIO EPA's SELECTED REMEDY | 19 |
| VII. CONCLUSION | 21 |
| STANDARD DEFINITIONS | 22 |
| FIGURES | |
| TABLES | |

ATTACHMENTS

List of Figures

FIGURE 1: Site Location Map 2

FIGURE 2: Location of Historic Samples 5

FIGURE 3: Conceptual Tree Planting Design 9

List of Tables

TABLE 1: September 1997 Well Point Leachate Sampling Results 4

TABLE 2: May 1984 Leachate Seep Analyses 7

TABLE 3: February 1997 Major Seep Leachate Analysis 8

TABLE 4: Cost Comparison of Closure Alternatives 12

Attachments

Attachment A Responsiveness Summary

I. SITE BACKGROUND

The Green II Landfill is located in the southwest corner of Section 36, Green Township, Hocking County near Logan, Ohio (Figure 1) just off Clay Hill Road. The landfill was permitted as a waste disposal site by the Ohio EPA on July 16, 1974 and operated until closure in 1978. The Site, which occupies approximately 10 acres and encircles an approximately 1-acre bedrock knob that rises above the surrounding landfill, is located on an abandoned clay strip mine. Landfill operations consisted of the disposal of conventional solid wastes with commercial and industrial wastes.

Waste disposed at the Site, in addition to typical domestic garbage, included the following drummed material: polyols, isocyanates, alcohols, oils, waxes, paints, hydrocarbon solvents, washer cleaner sludge, paint booth sludge, and gelled organic resin (alkyd, polyester, or acrylic). Due to the lack of records available from the landfill operator, the total amount of solid, domestic, liquid, and drummed wastes are not known. Estimates of the actual landfill volume based on topographic mapping and the original landfill plans suggest that the total volume of waste material buried at the Site may have exceeded the original design capacity of 153,000 cubic yards of waste materials by 100 percent.

After closure of the landfill in 1978 (in accordance with OAC 3745-27-10, 1976 rules), periodic inspections of the Site by representatives of Ohio EPA revealed that leachate discharge problems existed at several locations. Following these inspections, Ohio EPA contacted the landfill owner and involved two PRPs to initiate activities to address Site problems. In response to a November 12, 1982 meeting with the Ohio EPA, the Goodyear Tire and Rubber Company (Goodyear) and PPG Industries, Inc. (two of the numerous PRP's for the Site) provided information to the Agency regarding the types and amounts of drummed wastes they sent to the Green II Landfill during its operation. It is reported that Goodyear took approximately 4,777 drums to the Green II Landfill from its Logan plant and PPG Industries disposed of 366 loads of wastes consisting of 20 drums per load.

As industrial contributors of waste at the Green II Landfill, the Goodyear Tire and Rubber Company, Inc. and PPG Industries, Inc. agreed to perform an environmental assessment to evaluate the environmental and human health impacts of the Site. The "Environmental Assessment, Green II Landfill - Hocking County, Ohio" and associated appendices were completed in November 1984. Due to deficiencies in the construction of one of the Site's original monitoring wells, additional groundwater monitoring work was performed. The results of this additional work were presented in an addendum report entitled "Environmental Assessment, Addendum Report, Green II Landfill - Hocking County, Ohio, February 1986". As noted in the Introduction, additional assessment of the Site was performed by consultants representing PPG and Goodyear in October, 1997. Their report was entitled: "Well Point Installation Report for the Green II Landfill Site."

Figure 1.

II. Nature and Extent of Contamination

A. Leachate Investigations

Leachate consists principally of water from precipitation that has filtered through wastes and contaminated soils, picking up contaminants as it moves. Eighteen leachate seeps were identified on and around the landfill during Ohio EPA field inspections of the Site in 1984. Currently, most of these former seeps are no longer present. But one major seep continues to discharge leachate continuously, year round, to a surface water stream adjacent to the south side of the landfill. Recent analyses of this leachate using well points (September, 1997) indicates the presence of contaminants including several United States Environmental Protection Agency (USEPA) priority pollutants. These results are presented in Table 1.

The average thickness of the existing landfill cover is approximately twenty-one (21) inches and consists of sandy clay, sand, and clay. Erosion is evident on portions of the Site, especially along the lower out slopes. In these areas, the thickness of the cover is significantly less than the average. Poor cover conditions allow for increased infiltration of precipitation, thereby potentially increasing leachate production.

B. Groundwater Investigations

Most domestic/private water wells in the area are drilled to the Black Hand Sandstone (Injun Sand) which is approximately 150-350 feet below the land surface, depending on topography. Because the Green II Landfill is located at the top of a ridge, approximately 250 feet of mostly shale and fine-grained sandstone bedrock separates the landfill from the Black Hand Sandstone. This separation reduces the potential for landfill contamination to reach the Black Hand Sandstone Aquifer.

While the Black Hand Sandstone has historically supplied most of the drinking water to local private households, shallow water bearing zones are noted on several drillers' logs above the Black Hand in the vicinity of the Green II Landfill. These shallow water bearing zones consist of thinly bedded sandstones, siltstones, shales and limestone which may produce enough groundwater to supply a domestic household.

Groundwater monitoring has been performed at the Site using monitoring wells MW-1, MW-2, and MW-3 (Figure 2). It was determined during the 1984 Environmental Assessment that MW-2 may have been improperly installed and could be providing a pathway for contamination to reach underlying rock formations. This well showed signs of contamination from landfill leachate and was decommissioned. Additional work conducted for the 1986 "Environmental Assessment Addendum Report . . ." included installation of another monitoring well (MW-4, later renamed MW-2 to replace the old decommissioned monitoring well). The Addendum Report also included an evaluation of the characteristics of underlying geologic formations, further definition of the Site geology based on information from the drilling of the new monitoring well, plus sampling and analysis of the existing and new monitoring wells in a manner consistent with the previous Environmental Assessment. The sampling and analysis of these wells in 1996 and 1997 by Ohio EPA and Sharp & Associates does not indicate ground water contamination in the vicinity of the

monitoring wells.

Table 1.

Figure 2.

Since groundwater in the vicinity of the landfill has been utilized as a drinking water resource, a survey was made of area groundwater users in the past. During May 1983, Ohio EPA conducted sampling of private wells in the area of the Green II Landfill to determine if the groundwater resources have been affected by landfilling activities. Five private water wells located at residences along Clay Bank and Clay Hill Roads were involved in the sampling effort. The wells selected for sampling appeared to be those located closest to the Site. Personnel from the Ohio EPA collected the samples which were analyzed by the Ohio Department of Health.

In June 1983, the Ohio EPA informed the five well owners that sampling results showed no contamination of their water supplies by the Green II Landfill at that time. An additional round of samples was collected from private wells in August & September of 1985 with similar results.

Further definition of the hydrogeologic setting is proposed once a detailed remedial design is chosen. The objective of the work will be to provide additional hydrogeologic information on the currently monitored water bearing zone. The remedial design work plan will provide for additional hydrogeologic information, including:

- A description of the water bearing zones underlying the Site.
- The direction and rate of ground water movement.
- The horizontal and vertical extent of ground water contamination, if any, associated with the Green II Landfill.
- The hydrogeologic characteristics of the water bearing zones (i.e. permeability and ground water yield.)

The work plan will also provide for a determination of the integrity of the existing monitoring wells and the future use of the wells as part of the monitoring program.

C. Surface Water Investigations

During the 1984 Environmental Assessment field investigation, a series of seep samples were collected on and around the Site, as generally illustrated in Figure 2. Results from these 1984 samples are contained in Table 2. In February, 1997, Ohio EPA personnel collected a sample of surface water leaving the "major seep" area (as labeled in Figure 2) on the south side of the landfill. The analysis, displayed in Table 3, still indicates major surface water contamination from volatile organic compounds in the leachate discharged from the landfill. In 1998, the most severely affected location of surface water contamination at the Site continued to be the "major seep" area, as illustrated in Figure 2.

D. Air Investigations

Air quality was measured at all the seep areas illustrated in Figure 2 during the mid 1980s. Since the seeps represented discharge points and weak areas or discontinuities in the integrity of the soil cover, it was expected that organic vapors escaping from the landfill would be greatest in these locations. Prior to on-site air sampling, the background level was determined upwind of the Site. Background volatile organic compound readings varied from 3 to 3.5 parts per million (ppm). Air quality data obtained from the seep areas varied from 3 ppm to 9 ppm with an average of approximately 5 ppm.

In response to the preliminary air monitoring, additional limited air sampling was performed. Seep Nos. 9, 12, and 14 were selected for this additional sampling effort due to relatively high

Table 2.

²⁴ Table 3.

Figure 3.

readings at these seeps. Low concentrations of methane gas were detected at seep Nos. 9 and 12. The concentrations of methane detected at seep Nos. 9 and 12 were well below the lower explosion limit for methane of 5.3 percent and were below levels that would pose risks as an asphyxiant (a substance that causes suffocation). No volatile organic compound emissions were detected. Because gaseous waste emissions appear to have decreased over time, and no new evidence of emissions is currently present during landfill inspections, additional air quality surveys have not been conducted during the 1990s to determine current air quality levels.

E. Risk Assessment

The risk assessment evaluated the current and potential future risks to human health and the environment from the constituents of concern at the site. The risk assessment included an Exposure Assessment.

The following routes of contaminant exposure for human and ecological receptors have been identified at the Green II Landfill.

- Skin contact/ingestion of leachate or leachate contaminated surface water.
- Skin contact/ingestion of leachate contaminated sediment.
- Ingestion of shallow ground water (to be addressed in a subsequent hydrogeologic investigation during Remedial Design)
- Air emissions

The following media, therefore, present an existing or potential threat to public health and the environment:

- Leachate
- Leachate Contaminated Surface Water
- Leachate Contaminated Sediment
- Ground Water
- Air

III. OVERVIEW OF REMEDIAL ALTERNATIVES

Based upon the results of the 1984 Environmental Assessment Report and the 1986 Environmental Assessment Addendum Report, the Ohio EPA requested that Goodyear and PPG Industries conduct a Feasibility Study (FS) to identify and screen technologies and alternatives for addressing the risks associated with the contamination problems at the Site. The FS evaluated methods to meet remedial action goals designed to protect public health and the environment from contaminants in buried wastes, leachate, surface water, ground water and air.

The September 1990 FS (which can be found in the public repository located at the Hocking County District Library in Logan) identifies, develops, and evaluates six remedial action alternatives in addition to a no-action alternative. The no-action alternative was included as a baseline for comparison to other alternatives. Additionally, a preliminary evaluation of excavation and removal of the landfill's hazardous constituents was performed, and this option

was determined to be infeasible. This concept was not developed into an alternative for evaluation because the removal of these wastes would result in unacceptable additional human and environmental exposure to wastes during Site work, transportation, and redisposal. In May 1998, an additional innovative technology alternative was proposed and is identified below as alternative 7.

The assembled remedial alternatives were developed by combining suitable remedial technologies. Most of the alternatives contain a capping, surface water control, gas control, leachate collection, leachate transport, and leachate treatment technology component. Leachate transportation and treatment costs are a function of the location of the treatment plant with respect to the Green II Landfill and its specific treatment cost schedule.

Certain Site improvements are common to all of the alternatives, detailed below (except the no-action alternative). For example, the removal and reburial of wastes, as necessary, for the construction of remedial structures and/or slope reduction is a component of each remedy. The construction of a woven wire perimeter fence around the Site is also common to all the alternatives.

An undisturbed bedrock knob is situated in the west central portion of the Site. The possibility of incorporating the knob into a capping system and/or the removal of the knob would be evaluated during the preliminary design study conducted for any capping technology selected. For the approximate costs of all evaluated alternatives, including capital costs, twenty years of Operations & Maintenance costs, please refer to Table 4.

No-Action Alternative

This response action consists of performing no remedial action work at the Site. This action is used as a baseline against which the effectiveness of all other actions are compared. This alternative would result in the continued discharge of contaminated leachate from the Site, with continuing associated risks.

Alternative 1- Improvements to Existing Cover

The major components of Alternative 1 are:

- Upgrading of existing cover (including repair of soft spots at leachate outbreaks and repair of eroded areas)
- Run-on/runoff control
- Gas control
- Perimeter leachate collection
- Leachate transport by pumping to local sanitary sewer
- Leachate treatment at Publicly Owned Treatment Works (POTW)

Table 4.

Alternative 2 - Soil Additives/Improvements to Existing Cover

The major components of Alternative 2 are:

- Upgrading the existing cover/application of soil additives to decrease permeability
- Run-on/runoff control
- Gas control
- Perimeter leachate collection
- Leachate transport by pumping to local sanitary sewer
- Leachate treatment at a POTW

Alternative 3 - Natural Soil Cover System

The major components of Alternative 3 are:

- Constructing a natural soil cover (two feet of low permeability clay covered with one foot of soil/vegetation)
- Run-on/runoff control
- Gas control
- Perimeter leachate collection
- Leachate transport by pumping to local sanitary sewer
- Leachate treatment at a POTW

Alternative 4 - Multilayered Cover

The major components of Alternative 4 are:

- Multilayered cover (two feet of impermeable clay, covered with a one-foot layer of permeable material, covered with a soil layer of sufficient thickness to support vegetation and protect the clay layer from damage due to root penetration and frost.)
- Run-on/runoff control
- Gas control
- Perimeter leachate collection
- Leachate transport by pumping to local sanitary sewer
- Leachate treatment at a POTW

Alternative 5 - Synthetic Membrane Cover

The major components of Alternative 5 are:

- Synthetic liner (six-inch layer of granular base material covered with a synthetic liner covered with one foot of soil/vegetation)
- Run-on/runoff control
- Gas control
- Perimeter leachate collection
- Leachate transport by pumping to local sanitary sewer
- Leachate treatment at a POTW

Alternative 6 - Multilayered Synthetic Membrane Cover

The major components of Alternative 6 are:

- Multilayered synthetic liner (two feet of impermeable clay, covered with a synthetic liner, covered with a one foot drainage layer, which is covered with a two foot layer of soil/vegetation)
- Run-on/runoff control
- Gas control
- Perimeter leachate collection
- Leachate transport by pumping to local sanitary sewer
- Leachate treatment at a POTW

Alternative 7 - Innovative Phytoremediation Leachate Management System

The major components of Alternative 7 are:

- Plant a high density of hybrid poplars and hybrid willows on the existing landfill cover to begin consuming leachate; (See Figure 3 for specific tree planting plans).
- De-inventory the landfill's stored leachate with a series of extraction points installed with pumps;
- Install a leachate collection system
- Truck transport of leachate to a local POTW
- Leachate treatment at a POTW
- Monitoring and evaluation system for the phytoremediation component
- Implement contingency remedy (Alternative 4) if the system fails to meet performance goals.

Supplementary Discussion of Alternative 7

Alternative 7 has many of the same remedial components as the conventional capping alternatives (i.e. leachate collection and treatment). However, Alternative 7 also involves an innovative technology component which substitutes for the placement of a natural or synthetic cap over the landfill. It calls for the planting and maintenance of a high density of select hybrid poplar and hybrid willow trees on the existing surface of the Green II Landfill. The purpose of establishing a tree cover on the landfill surface is to minimize the infiltration of precipitation through the landfilled material, thereby preventing leachate production.

Unlike a conventional landfill cap, which promotes the drainage and runoff of direct precipitation on the landfill surface, a tree cover will absorb infiltrating rainfall via a dense network of roots below the ground surface. The moisture is then transpired (breathed) back to the atmosphere through leaf pores. The tree root system will also seek existing subsurface moisture currently existing in the landfill. Current leachate in the landfill would then be absorbed and transpired by leaf pores as previously noted. However, in this latter case, contaminated water would be absorbed by the trees. Based on current data and research, most leachate contaminants are transformed or fully decomposed prior to their release in leaf pore water.

Heavy metal contaminants are an exception to contaminant destruction by plants. Metals tend to concentrate in the woody tissue and leaves of plants. However, based upon the Remedial Investigation conducted at the Site, heavy metals are not currently considered contaminants of concern. Additional evaluation by the PRPs will be required to determine if metals will accumulate in tree biomass.

The ability of plants to reduce the toxicity and volume of existing leachate makes them an attractive remedial technology. However, this technology has several offsetting limitations. Trees are a part of a solar driven, biological system, as opposed to an engineering controlled, mechanical system. The trees will tend to absorb landfill soil moisture at varying rates depending on the age of the tree, the time of day, the time of year, the amount of sunshine, the season of the year and other climatic and geographic factors.

Ohio EPA believes the greatest challenge to the entire system (biologic and mechanical) will be its performance during the winter season when very little evapotranspiration takes place in deciduous trees. Another limitation of the Innovative Phytoremediation Leachate Management Remedy is that its establishment and implementation is slower than conventional mechanical systems. Capping remedies for landfills can be achieved in less than one year. The phyto plan is not expected to be fully effective for three to five years.

IV. SELECTION CRITERIA FOR REMEDIAL ALTERNATIVES

In selecting the remedial alternative, Ohio EPA will consider the following eight criteria:

1. Overall protection of human health and the environment addresses whether or not a

remedy provides adequate protection, and describes how risks are eliminated, reduced or controlled through treatment, engineering controls, and/or institutional controls.

2. Compliance with all State and Federal laws and regulations addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements (ARARs) of State and Federal environmental statutes and/or provide grounds for invoking a waiver.
3. Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once clean-up goals have been met.
4. Reduction of toxicity, mobility, or volume is the anticipated performance of the treatment technologies to yield a permanent solution. This includes the ability of the selected alternative to reduce the toxic characteristics of the chemicals of concern or remove the quantities of those chemicals to an acceptable risk concentration or regulatory limit and/or decrease the ability of the contaminants to migrate through the environment.
5. Short-term effectiveness involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until clean-up goals are achieved.
6. Implementability is the technical and administrative feasibility of a remedy, including the availability of goods and services needed to implement the chosen solution.
7. Cost includes capital and operation and maintenance costs.
8. Community acceptance will be assessed in the Decision Document following review of the public comments received on the Feasibility Study and the Preferred Plan.

V. ANALYSIS OF ALTERNATIVES

This section looks at how each of the selection criteria enumerated in the previous section of this report is applied to the remedial alternatives found in section III.

1. Overall Protection of Human Health and the Environment

The assessment of protectiveness to human health and the environment requires the identification of exposure pathways from the Site. The greatest exposure potential has been identified as the discharge of leachate from the Site. This action pollutes surface water and sediment and allows human and environmental exposure to take place. In addition, the production and storage of leachate in the landfill mass also poses the threat of contaminating local ground water and may promote the evolution of gaseous discharges from the Site. Therefore, those alternatives which prevent or minimize the production and storage of leachate in the landfill are most protective,

overall, to human health and the environment. The goal of all the alternatives is to minimize or eliminate leachate production. Alternatives 1 through 4 are projected to continue producing leachate into the future. Alternatives 5 and 6 are projected to completely eliminate the production of any leachate in the future. Alternative 7, while allowing the temporary production of some leachate in the future, will consume and/or eliminate more leachate than the landfill is capable of producing. Alternatives 5, 6 and 7 are projected to no longer need leachate collection within a few years after their implementation.

2. Compliance with all State and Federal Laws and Regulations

Alternatives 4, 5, 6, and 7 comply with applicable solid waste regulations pertaining to obligations to control and manage leachate production at solid waste facilities. However, Alternatives 4, 5, and 6 involve traditional landfill capping remedies, while Alternative 7 utilizes an innovative technology to meet the same performance standards. Alternatives 1, 2, 3 do not meet current solid waste regulations.

3. Long-Term Effectiveness and Permanence

Alternatives 4, 5, 6 and 7 are believed to be the most capable remedies offering long-term effectiveness and permanence. Although all the remedies require some maintenance following their installation, Alternative 7 will also require tree care and replanting maintenance. This additional maintenance, however, will not alter the long term effectiveness and permanence of Alternative 7.

4. Reduction of Toxicity, Mobility, or Volume

Alternative 7 is clearly the most effective technology to reduce the toxicity, mobility and volume of wastes in the landfill over time. Root penetration by thousands of trees would promote the biodegradation of waste materials in the landfill by soil microorganisms. Alternatives 4, and to a greater degree, 5 and 6, would reduce the waste mass the least among the Alternatives suggested. Alternatives 1, 2 and 3, will, to the degree they allow infiltration through their caps, allow some reduction in toxicity over time, but some of that reduction would result in the removal of waste via leachate production and collection.

5. Short-Term Effectiveness

The construction of Alternatives 1 through 6 can be implemented more quickly than Alternative 7. Alternatives 4, 5 and 6 will offer superior protection by their reduction in leachate production. The tree planting component of Alternative 7 will not be very effective in the short-term (its first few years), but will increase in effectiveness with time. Since the landfill is currently storing approximately 3.7 million gallons of leachate, all the remedies propose collecting this leachate via perimeter leachate collection systems. Only Alternative 7 provides for the installation and pumping of leachate from well points placed into the landfill mass. This may result in a quicker reduction in stored landfill leachate than the other alternatives.

6. Implementability

The technical feasibility of the synthetic capping remedies (Alternatives 5 and 6) would require the most challenging engineering designs to deal with steep slopes on Site. The natural capping materials would require fewer slope stability issues. For Alternative 7, the drilling of holes for tree and well point installation may be challenging, depending on the nature of the waste materials encountered.

7. Cost

Table 4 compares the approximate costs of these options, expressed in the present worth of construction and maintenance for 20 years of operation. These cost estimates are taken from two different sources and two different times, but agree closely. Among the more favorable remedies (Alternatives 4 through 7), Alternative 7 is the most cost effective.

8. Community Acceptance

Community acceptance assessment will be included in the Decision Document following a review of the public comments received on the Revised Preferred Plan. It is anticipated that Alternatives 4 through 7 are acceptable remedies to the Community and that Alternative 7 may have additional aesthetic appeal.

SUMMARY

Alternatives 4 through 7 appear to successfully satisfy criteria one through seven listed above. They are protective of human health and the environment and they will greatly reduce or eliminate the production of landfill leachate in the future. All the alternatives will eliminate leachate seepage to surface water adjacent to the landfill via the installation of perimeter leachate collection systems. Leachate releases to surface water currently pose the greatest risk to human health and the environment near the Green II Landfill.

Alternatives 4 through 6 represent acceptable, traditional landfill capping technologies. Alternative 7 employs the innovative component of phytoremediation, which is expected to meet the performance standards of conventional caps. Alternatives 4 through 7 will all achieve long-term effectiveness and permanence at the Site. For Alternative 7, its effectiveness will increase as the hybrid tree stand grows in size and age. Since all of these alternatives are designed to eliminate leachate seepage from the landfill Site and greatly reduce and/or eliminate the current in-situ production of leachate, this remedy will effectively reduce the mobility of contaminants at the landfill Site.

In addition to intercepting and removing water from the waste mass, the tree component of Alternative 7 is also expected to increase oxygen levels and microbial activity in the waste mass, thus increasing the rate of waste degradation and decreasing toxicity level and volume of wastes in the process. Although the establishment of a high density of trees (Alternative 7) will take longer to be effective than the placement of a more conventional landfill cap (Alternatives 4 through 6), the tree planting is expected to be easier to implement than capping, with fewer slope stability issues. A phytoremediation remedy is projected to be modestly less costly and is

anticipated to be at least as acceptable to the community as the traditional capping options.

VI. OHIO EPA'S SELECTED REMEDY

The Ohio EPA's preferred alternative for the Green II Landfill Site in 1991 was Alternative 4 — A Multilayered Cover. Ohio EPA continues to believe that this alternative is well-suited to the Site and satisfies criteria one through eight listed above. However, Ohio EPA recognizes that these criteria can also be satisfactorily met by the most recent alternative added in 1998: Alternative 7. Given the advantage of potentially achieving similar remedial goals with a less costly remedy, and the transformation and decomposition of contaminants naturally during the phytoremediation process, Ohio EPA's preferred alternative for the Green II Landfill Site has been amended to include Alternative 7 as the primary alternative. Because the USEPA and Ohio EPA consider the phytoremediation component of this alternative to be a promising, yet unproven "Innovative Technology", Ohio EPA proposes to retain Alternative 4 as a contingent phase of the remedy should Alternative 7 prove to be less effective than projected. That is, in the event that Alternative 7 does not meet the performance goals achievable through Alternative 4 within five years of its implementation, this Revised Preferred Plan calls for the implementation of Alternative 4.

The Elements of the Revised Preferred Plan are:

A. Primary Phase - Ground Water Monitoring Plan Development

1. Install two additional ground water monitoring wells along the perimeter of the Site and one piezometer through the bedrock knob.
2. Measure water levels in existing wells; Sample ground water monitoring wells.
3. Determine ground water flow direction(s) and if additional wells should be installed.
4. Develop and implement a ground water monitoring sampling and analysis plan. If ground water contamination is documented off-Site, the contingency phase of this remedy should be implemented.

B. Secondary Phase - Leachate Collection System

1. Install a series of leachate extraction points to begin the leachate de-inventorying process.
2. Plant a high density of select hybrid poplar and willow trees on the existing landfill cover (phytoremediation component) to supplement the de-inventorying of landfill leachate and prevent future leachate

production. Figure 3 illustrates the area where hybrid species of each tree will be placed and the relative planting density proposed.

3. Install a leachate collection system to prevent leachate from leaving the Site. The objective of the leachate collection system is to intercept the flow of all leachate emanating from the landfill to the maximum extent possible to protect human health and the environment.

The location of the leachate collection system will be dictated by natural Site conditions, which currently allow continuous leachate discharges to occur to a surface water stream along the southern edge of the landfill. Construction details of the leachate collection system will be contained in documents titled: "Leachate Management and Control Plan for the Green II Landfill." They will conform to current solid waste regulations and acceptable engineering standards for leachate collections systems at other solid waste facilities in Ohio.

4. Construct a pumping system and pipe network for the transport of leachate to the on-Site holding tank. This storage tank system will receive leachate from the pumped extraction points and leachate collection system.
5. Provide storage tank(s) capable of collecting 25,000 gallons of leachate per week. Stored leachate will then be pumped and transported by tanker truck from the storage tank to the Bremen POTW or another POTW facility outside of Hocking County. The treated discharge will be required to comply with POTW pretreatment regulations and any special conditions established regarding acceptance of the leachate.

C. Tertiary Phase - Institutional & Engineering Controls and Operations and Maintenance Plans

1. Install a wire perimeter fence around the landfill to limit access to the Site. This control measure should be implemented during the primary or secondary phase of the Preferred Plan if Site activities permit.
2. Provide special access to the existing oil well in the northwestern portion of the Site.
3. Place deed restrictions on the landfill property to ensure that no activities will be conducted on the property which will disturb the Phytoremediation Leachate Management Remedy.
4. Provide landfill gas management as necessary.
5. Install water balance measuring devices to allow on-Site data collection to take place.

6. Develop an Operations and Maintenance Plan for the Site to assure that all components of the remedy are operating effectively.

D. Quaternary Phase - Performance Standards Testing

Two performance standards will be used at the Green II Landfill Site to judge whether Alternative 7 is working properly:

1. Leachate releases shall cease from the Site following the completion of the Secondary Phase of this remedy (the installation of the Leachate Collection System.) This will be measured by inspection, sampling surface water adjacent to the Site, and performing ground water monitoring.
2. The phytoremediation component of the Leachate Collection Phase shall, within five years of project implementation, reduce the production and storage of leachate in the landfill to levels comparable to those modeled by an Alternative 4 scenario. If the landfill is producing and storing more leachate than what is modeled, the Site remedy will revert to Alternative 4 (or an equivalent cap) as described in the 1991 Preferred Plan.

VII. CONCLUSION

Ohio EPA has determined that the Innovative Phytoremediation Leachate Management System contains the most desirable balance of remedial technology characteristics compared to the conventional alternatives discussed in the FS Report. Based on information and research available at this time, the Ohio EPA believes that this preferred alternative achieves the protection of human health and the environment standard, minimizes short and long-term risks, is implementable, and cost effective. Because the preferred alternative contains an innovative technology, Ohio EPA has required the insertion of a timetable with measurable performance standards. The preferred alternative also includes an equally acceptable, traditional, remedial back-up plan if this remedy does not perform up to its projected level of effectiveness.

Based on new information or public comments, Ohio EPA may modify this preferred alternative or select another response action presented in the Revised Preferred Plan, FS Report and/or recent Phytoremediation Leachate Management System Proposal. The public, therefore, is encouraged to review and comment on all of the alternatives identified in this Revised Preferred Plan. The Environmental Assessment Report, FS Report and or the Leachate Management Proposal and Technical Memorandum should be consulted for more information on any of these alternatives.

STANDARD DEFINITIONS:

background levels: Levels at which substances are commonly found in the environment. These may have been deposited naturally, as in the case of arsenic and other heavy metals in soil, or through human intervention, such as lead in the soil due to automotive emissions.

leachate: Leachate consists of water that has filtered through wastes and contaminated soils, picking up contaminants as it moves.

parts per billion (ppb) / parts per million (ppm): Units used to express low concentrations of contaminants. For example, one drop in an Olympic sized swimming pool equals one ppb.

permeable: Allowing passage through a material, especially liquids.

volatile organic compounds (VOCs): An organic compound that evaporates readily at room temperature, i.e. solvents.

phytoremediation: An emerging technology which uses plants and their associated root system microorganisms to remove, degrade, or contain chemical contaminants located in the soil, sediments, ground water, surface water, or the atmosphere.

Info to possibly add to Declaration's selected remedy description.

Two performance standards will be used at the Green II Landfill Site to determine whether the selected alternative is working properly:

1. Leachate releases shall cease from the Site following the completion of the Secondary Phase of this remedy (the installation of the Leachate Collection System.) This will be measured by inspection, sampling surface water adjacent to the Site, and performing ground water monitoring.
2. The phytoremediation component of the Leachate Collection Phase shall, within five years of project implementation, reduce the production and storage of leachate in the landfill to levels comparable to those modeled by an Alternative 4 scenario. If the landfill is producing and storing more leachate than what is modeled, the Site remedy will revert to Alternative 4 (or an equivalent cap) as described in the 1991 Preferred Plan.

Additionally, a pumping system and pipe network will be constructed for the transport of leachate to an on-Site holding tank. This storage tank system will receive leachate from the pumped extraction points and leachate collection system. The storage tank(s) will be capable of collecting 25,000 gallons of leachate per week. Stored leachate will then be pumped and transported by tanker truck from the storage tank to the Bremen POTW or another POTW facility outside of Hocking County. The treated discharge will be required to comply with POTW pretreatment regulations and any special conditions established regarding acceptance of the leachate.

The objective of the leachate collection system is to intercept the flow of all leachate emanating from the landfill to the maximum extent possible to protect human health and the environment. The location of the leachate collection system will be dictated by natural Site conditions, which currently allow continuous leachate discharges to occur to a surface water stream along the southern edge of the landfill. Construction details of the leachate collection system will be contained in documents titled: "Leachate Management and Control Plan for the Green II Landfill." They will conform to current solid waste regulations and acceptable engineering standards for leachate collections systems at other solid waste facilities in Ohio.

Introduction

The Ohio Environmental Protection Agency (Ohio EPA) has prepared this Revised Preferred Plan (January, 1999) to inform the public about its preferred remedy for the remediation of the Green II Landfill (the Site) in Hocking County, Ohio. Ohio EPA identified a Preferred Plan to clean up contamination at this Site previously, in June of 1991. The 1991 Preferred Plan Report summarized the landfill's history, the 1984 and 1986 Environmental Site Assessment Reports, and a 1990 Feasibility Study (FS). The 1991 Preferred Plan also summarized the clean-up alternatives presented in the FS Report. It consisted of a preliminary decision by Ohio EPA on a preferred alternative to clean up the Site, with the rationale for that preference.

Since the issuance of the above described 1991 Preferred Plan, no substantive clean-up work has been accomplished at the Green II Landfill Site. Several environmental problems persist, the foremost problem being the constant discharge of leachate to surface water. The lack of clean-up progress at the landfill can be attributed, in part, to the inability of Ohio EPA and the potentially responsible parties (PRPs) associated with the Site to reach an agreement to implement and fund the remediation plan. Since 1996, Ohio EPA has engaged the PRPs in discussions regarding clean up at the Site. These discussions have led to an additional FS-type study of leachate composition and leachate releases from the Site (October, 1997), and a new clean-up proposal entitled: "Leachate Management Proposal and Technical Memorandum for the Green II Landfill," (May, 1998).

Included in this Revised Preferred Plan (January, 1999) is a summary of all the environmental assessment work performed at the Green II Landfill Site from 1978 to 1998. Copies of assessment reports can be found in the Information Repository of the Hocking County District Library in Logan, Ohio. This Revised Preferred Plan also identifies a new alternative to address contamination at this Site. The new alternative proposes, as an innovative technology component, the use of hybrid tree species to consume landfill leachate, and incorporates the preferred remedy in the 1991 Preferred Plan as a contingency plan. Under this alternative the trees are expected to consume stored landfill leachate and eliminate future leachate releases from the Site via root uptake of subsurface soil moisture and evapotranspiration. This new alternative is the remedial option preferred by Ohio EPA today.

The Ohio EPA is giving notice to the public about the availability of this January 1999 Revised Preferred Plan, and other documents related to the Site, in order to give the public the opportunity for review. A public information session and hearing will be scheduled shortly in order to inform the public further and solicit their comments about the Revised Preferred Plan. Public notice is necessary in order to be consistent with the National Oil and Hazardous Substance Pollution Contingency Plan (NCP), 40 C.F.R. Part 300.