St. Johns Landfill

Closure Project

Annual Report to the Oregon Department of Environmental Quality

July 1, 1996 to June 30, 1997

METRO
Regional Services

600 NE Grand Ave.
Portland, OR 97232-2736

ST. JOHNS LANDFILL CLOSURE PROJECT

ANNUAL REPORT

TO THE

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY

July 1, l996 to June 30,1997

METRO
Regional Environmental Management
Engineering Division
600 NE Grand Ave
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TABLE OF CONTENTS

PAGE

ST. JOHNS LANDFILL CLOSURE PROJECT ANNUAL REPORT TO THE OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY

INTRODUCTION

During this reporting period, Metro substantially completed the 5-year construction of the final cover system, gas control, and stormwater control systems over about 226 acres of St. Johns Landfill. It submitted final construction certification for approval by the Oregon Department of Environmental Quality (DEQ). It began to prepare a formal plan for operation and maintenance of these environmental improvements and for environmental monitoring for submission to DEQ. Also, Metro continued to gather information to further evaluate the impact of St. Johns Landfill on the environment. Finally, Metro focused its attention on determining what improvements should be made to the perimeter dike between the solid waste and surface water. So far, Metro has spent 34 million dollars from the St. Johns Landfill Closure Account for cover system design and construction and for other landfill closure activities.

COVER SYSTEM CONSTRUCTION

The final section of the St. Johns Landfill cover system was substantially completed during the fall of 1996. This final section was constructed by L & H Grading, Inc. under contract to Metro. Metro submitted a construction certification report to DEQ, by letter dated March 17, 1997, DEQ stated that this report successfully fulfills the requirements of Oregon Administrative Rule 340-93-150.

The multi-layered cap covering the waste in St. Johns Landfill was outlined in Metro's 1989 closure plan. Its purpose was to serve as an essentially impermeable "roof" over the landfill, preventing rain from soaking into the solid waste. This prevents the formation of contaminated water called leachate. When leachate builds up in the waste, it tends to migrate more rapidly into the groundwater.

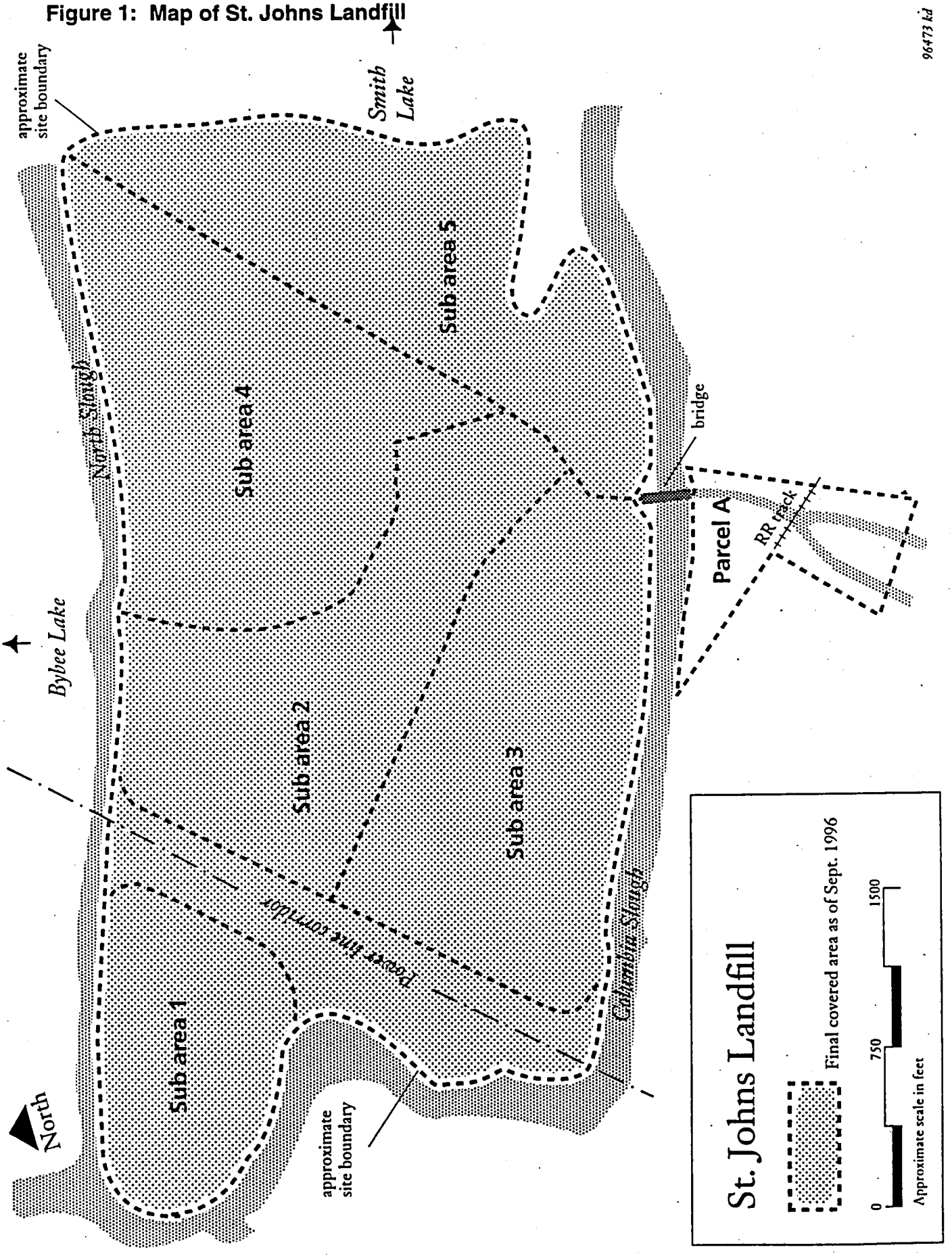
Construction of the cover consisted of the following steps:

- Building the landfill up to slopes so rainwater will rain off.
- Building a multi-layered, protective cap over the entire area so water cannot seep down into the waste.
- Installing an active gas collection system to collect, monitor, and properly burn gases produced by the decaying garbage.
- Building a stormwater collection system with ponds to trap sediment.

Metro staff developed plans and specifications for four successive construction contracts with technical assistance from Parametrix, Inc. and Cornforth Consultants. These were approved by DEQ. Construction Contractors were: L & H Grading, Inc. (2 contracts), Tri-State Construction, Inc. and John L. Jersey & Son, Inc. Construction management was by Metro staff assisted by Parametrix Inc. or EMCON.

Also, during this reporting period, Metro staff discovered a problem at the edge of the cover system of subarea 4 adjacent to the road overlooking North Slough (see fig. 1). After noticing signs of gas escape in this area Metro decided to extend the cover membrane into the road using a design approved by DEQ and used for subarea 5. L & H Grading, Inc. is constructing this extension and remedying defective construction by a previous contractor. A detail showing the design of this extension is included in the appendix.

Figure 1: Map of St. Johns Landfill



BARGE REMOVAL

Since the late 1970's, a wooden barge had been sunk in the North Slough arm of Columbia Slough adjacent to subarea one of St. Johns landfill. During the low water period, it nearly blocked the North Slough. Surface water, flowing through a narrow channel between the barge and St. Johns landfill, was eroding the protective dike. Removal of the barge would eliminate this problem. In conjunction with a modification of the water control structure at the end of North Slough (see 1996-97 Annual Report), it would also reduce low oxygen problems in North Slough caused by stagnant water conditions.

In cooperation with the City of Portland Metro was able to remove this barge using funds from a federal grant earmarked for Columbia Slough enhancement. Staton Construction Co. removed this barge and stabilized the dike with rock under contract to Metro. As directed by the Oregon Department of Fish and Wildlife several dead trees were sunk in the North Slough to replace any fish habitat lost by barge removal.

PERIMETER DIKE STABILIZATION

What is now St. Johns Landfill was originally a lake surrounded by a low permeability sandy-silt dike. Solid Waste was buried in this lake since 1940. As the mound of waste rose higher, fill was apparently used to build a dike on top of the natural dike in areas where its elevation was low. In 1980-81 a low permeability, silt engineered dike was built around the area now called subarea 4 and 5. This area was filled with solid waste between 1985 and 1991. Thanks to a valuable collection of historical aerial photos and many exploratory borings of the dike by Metro a great deal is known about its topography and characteristics. This information is presented in the Metro document **Controlling Seepage from St. Johns Landfill to surrounding Surface Water, May 1995.**

This dike, both natural and manmade, is an important environmental protective feature. It slows or prevents the movement of contaminants from the waste toward Columbia Slough and Smith Lake.

This silt dike is being eaten away by Columbia Slough, reducing the thickness of this protective layer. A combination of factors, believed to include high water levels at certain times each year, daily tidal currents, and burrowing animals, results in undercutting this dike. This natural process causes slope failures leading to slumps of silt and vegetation into the slough. High water events in 1996 and 1997 have aggravated this slope failure process. This process resulted in a significant slump about 30 feet wide at the tip of subarea one with another 70 feet showing a headscarp suggestive of upcoming failure.

By summer 1997, this dike erosion process exposed some solid waste (nearly all-plastic film). An investigation by Metro indicated that this waste appeared to be windblown waste that escaped the burial process years ago or incidental litter from cutting a perimeter road in l990. Metro energetically policed the area in August 1997 to remove this litter as well as the litter from past floods.

Metro is considering designs for an emergency repair of the slump of subarea one as well as various alternatives to slow or prevent this dike undercutting process. Based on advice from Cornforth Consultants, Metro is preparing designs for the emergency repair for submission to agencies having jurisdiction over repair work in the Slough. This design is based primarily on

rock. It is hoped that regulatory review will be completed in time to make the repair during the low water period of October 1997.

Metro is also considering a conceptual design proposed by George Kral, Forester for the City of Portland Bureau of Environmental Services. He proposed that Metro construct vegetated benches/terraces in Columbia Slough at the toe of the landfill dike. They would serve as man-made sandbars vegetated with willows and other water-loving plants.

The objectives of this construction are to:

1. Inhibit the current erosional environment eating away the protective dike around the landfill.
2. Promote a depositional environment along this dike.
3. Repair unstable, undercut areas.
4. Promote native vegetation along Columbia Slough to provide riparian habitat and increase shading. This shading would improve summer water quality by reducing algae growth and respiration.
5. Reduce contaminant migration into the Slough. Plants growing in these terraces may remediate contaminants formerly entering the slough through visible seeps and invisible seepage.

Metro proposes to construct three vegetated benches/terraces as a pilot project. One would be located at the head of the Blind Slough arm of Columbia Slough. The other two would be located in the main channel of Columbia Slough between the landfill bridge and the powerline corridor (fig. 1). The City of Portland would plant native vegetation on these benches under contract to Metro. Metro is preparing applications to agencies regulating work in the slough in anticipation of constructing both the emergency repair and these benches during the low water period of October 1997.

OPERATION AND MAINTENANCE PLAN AND MONITORING PLAN

Now that environmental improvements at St. Johns Landfill have been constructed and approved by DEQ, Metro is required by Oregon Administrative Rules to submit a plan for operation and maintenance and for long term monitoring to DEQ. The environmental improvements that require long-term operation and maintenance are the multi-layered cover system; gas recovery system; leachate and stormwater collection systems. The vegetation on the cover surface must be maintained in a manner which protects the integrity of the cover system and which minimizes erosion to surrounding surface water. The Operation and Maintenance Plan is being prepared by the operation and maintenance staff.

As stated in its 1989 closure plan, Metro's objective is to close the St. Johns Landfill using cost-effective methods to responsibly manage long term negative impacts on health, safety, and the environment. To reach this objective Metro needs to determine the level of present risk from the landfill and predict future risk. Then, the most cost-effective measures can be carried out to control significant present and future risk.

An effective monitoring program will provide the data needed to calculate risk. Over time, it will yield information about change in contaminant level and location. This can be used to construct mathematical models that predict future contaminant movement and to periodically compare the predictions against the actual data. Policy makers can develop effective control measures well in advance of predicted future risks.

Metro's monitoring program will have the following components:

- Groundwater quality monitoring in the vicinity of the St. Johns Landfill.
- Stormwater quality monitoring of the runoff of St Johns Landfill.
- Surface water quality monitoring within the Smith and Bybee Lakes Wildlife Area.
- Sediment quality monitoring within the Smith and Bybee Lakes Wildlife Area.
- Leachate Discharge Monitoring of effluent which enters the city sewer.

For surface water and sediment media the plan covers the entire Smith and Bybee Lakes Wildlife Area that includes the Columbia Slough.

The plan will present a regulatory framework, a rationale for monitoring strategies including current questions to be answered, and information about monitoring locations and parameters to be monitored.

Data collected according to this plan will be managed within Metro's Environmental Monitoring Information System (EMIS). This relational database has been customized to organize and help evaluate data. Uses of the data include statistics-based assessments of significant change in environmental quality, regulatory compliance checks, and inputs to mathematical models, and risk assessments.

Metro expects to send to DEQ in September 1997 drafts of the operation and maintenance plan and the monitoring plan.

HYDROGEOLOGY UPDATE

As stated in the previous section it is important to determine the level of both current and future risk from St. Johns Landfill to public health, safety, and the environment. One way that Metro and DEQ assess risk is to test for contaminants in environmental media such as groundwater and then determine whether the presence of such chemicals constitutes a significant risk. Metro's monitoring program gathers the information needed to perform this function.

Another method is to use information about the hydrogeology of the landfill site to construct computerized mathematical models. These models can be used as tools to predict the rate and direction at which various contaminants, both non-toxic and toxic, will travel in the groundwater through the soil around the solid waste. Models can be run repeatedly to test whether changes in the assumptions or data underlying the predictions will cause the prediction to change significantly. This is called sensitivity analysis. Models can also be used to help focus the monitoring effort.

In September l996, DEQ sent Metro a letter containing comments about three reports Metro submitted earlier. Included in this latter were comments about the 1995 report that presented the results of the 1995 modeling effort by a team lead by Dr. Shuguang Li of Portland State University. This report is summarized in the 1996 Annual Report.

The DEQ staff noted that the hydrogeology around St. Johns Landfill is complex. This leads to uncertainty about inputs to the model such as silt thickness and hydraulic conductivity. The staff said that there was a need to examine currently existing information about the hydrogeology of the site and its use in the modeling effort to date. There was also a need to

interpret the existing ground water quality data to estimate the current impact of the landfill on groundwater.

In response Metro selected a hydrogeology consultant, EMCON, and gave it the following goal:

> *Evaluate critical groundwater model input parameters and assumptions and verify predictions from PSU's 1995 groundwater model (especially in regards to the silt aquifer). Compare input parameters, assumptions and predictions with existing information from Metro and elsewhere (chemical data base and water elevation data). For example, provide recommendations for additional information and analysis needed to adequately predict the transport of a variety of contaminants and to quantify leachate pathways such as "infiltration/percolation", "groundwater", and "surface water" in the site conceptual model (see appendix) suitable for use in a future risk assessment.*

In February 1997, EMCON began its review of the existing information about site hydrogeology and its use in the model. Due to the large volume of information and the complexity of the site, effort was still in progress at the end of June 1997.

ENVIRONMENTAL ASSESSMENT OF PARCEL A

From an examination of aerial photographs (Sweet-Edwards/EMCON, 1989, vol. 2) it appears that the 19-acre area called parcel A (see fig. 1) was filled during the 1930s, presumably with ash from the adjacent Portland solid waste incinerator and with unburnable waste. Since then, it was used for the gatehouse and entrance road for St. Johns landfill. Parcel A is owned by the City of Portland, with a portion leased by Metro.

There have been two investigations of parcel A. One was a 1992 investigation performed as part of a preliminary evaluation of a portion of parcel A ("triangle property") in connection with the proposed construction of stormwater treatment facilities. The other was a more extensive investigation funded jointly by Metro and the City of Portland. The report of this investigation was issued in 1997. Since the results of the two reports are similar, only the 1997 report will be summarized below.

Borings and test pits dug into Parcel A encountered solid waste fill down to various depths ranging from 8 to 29 feet below ground surface. Identifiable solid waste included rust colored ash material, metal, glass, wood, burned wood, rubber tires, ceramic fragments, a water heater tank, cardboard, and fecal material. The waste is bathed in groundwater as high as 5 feet below ground surface. The waste is covered with 1 - 2 feet of gravel, cobbles, boulders, sand, and silt. This information is consistent with the theory that parcel A received partially burned waste and ash from the incinerator as well as waste which the incinerator could not handle. Then a bridge was built and waste filling continued across the slough. The waste in parcel A did not receive a modern landfill cover designed to minimize entry of rainwater or floodwater from the adjacent slough.

The waste itself was tested for various contaminants, including hazardous contaminants. No chlorinated pesticides, phenols, chlorophenols, cresols, PCBs, or volatile organic compounds (59 tested) were detected in waste samples. Metal levels were well below levels which would define this waste as a hazardous waste based on TCLP test (measures leachability) results.

Two samples contained lead at 5% above the Oregon Industrial Maximum Allowable Soil Concentration.

Petroleum hydrocarbons were also detected in the waste. Both heavy oil and gasoline hydrocarbons were detected at levels that would require remediation if they were in soil affected by an underground storage tank. This contamination was detected in the triangle area of parcel A. It is not apparent whether these hydrocarbons are due to past activities on site or migrated from adjacent auto wrecking yards that are upgradient of the triangle area. Petroleum contamination appears limited to soils and waste with in the landfill and has not penetrated the underlying soil.

The waste is underlain by gray silt, sandy silt, clayey silt, and silty fine sand. Several borings into the underlying strata in the area near Columbia Blvd. a fine, well-graded sand layer was encountered beginning at about 18 feet. However, there is a layer of silt to silty sand between this sand and waste. A sample of gray, moist silt was tested by the triaxial permeability test. The result was 4.3 times ten to the minus eight, which is a very low permeability to groundwater. Based on a 1936 aerial photo and a boring there is a silt dike between the solid waste and Columbia Slough. In the Kleinfelder report, groundwater movement was estimated to be ten to the minus four to ten to the minus five feet per day, which is a very slow rate of movement.

The direction of groundwater movement in or near the waste is north toward Columbia Slough. By measuring groundwater levels in several wells, a gradient of 0.3 was estimated.

The groundwater in the waste and in this underlying material was also tested for various contaminants. None of 59 volatile organic compounds were detected in geoprobes that sampled groundwater in the underlying material and monitoring wells which sample groundwater in the waste and in the material below it. The Kleinfelder Report states that the measured absence of volatile organic compounds and PCBs in the native soil underlying the debris indicates a low potential for leaching toxic or carcinogenic compounds from the body of the landfill.

Metals were also sampled in these wells. The highest level of lead detected was 1.70 milligrams per liter, much higher than the cleanup standard for lead.

Conductivity, a measure of the concentration of electrically conducting salts, is much lower in a sample taken at 74 feet below ground surface than it is in samples taken nearer the surface. This suggests but does not prove that certain salts (such as sodium chloride) which tend to define the leading edge of a contaminant plume have migrated less than 45 feet below the deepest point (29 ft.) of the waste.

The Kleinfelder Report does not recommend additional site assessment because the waste appears to have minimal environmental impact. However, the report recommends that an attorney make a determination of the regulatory status of the site. Also, the report recommends containment of the exposed waste to reduce the potential risk to human health and the environment.

ENERGY RECOVERY FROM LANDFILL GAS

In April 1997 Metro entered into agreements with Portland LFG. Portland LFG is a joint venture of Palmer Capital Corp. and Ash Grove Cement Company. Under the terms of these agreements, Metro will continue to operate the gas collection system in substantially the same manner as it now does. Portland LFG will construct and operate the pipeline and compressor station to send the landfill gas to Ash Grove Cement Co. Construction is expected to begin in the fall of 1997.

Ash Grove Cement is expected to use most or all of the gas produced at St. Johns Landfill as a source of heat for its production process. Gas not used will continue to be flared at the landfill.

The project will have significant environmental benefits. Over the life of the project, the gas produced could replace an average of about 1.1 million cubic feet of natural gas used as fuel by Ash Grove Cement Co. This project could reduce carbon dioxide emissions in the Portland airshed by 23,300 metric tons per year. this is about the same impact on greenhouse gas emissions as removing 3,300 automobiles from the road or planting 7,100 acres of trees.

The estimated annual payment to Metro will be about $150,000 during the first year and decline to about $50,000 in the final year of the agreement due to the decline in quantity of landfill gas. Metro staff recommends that all revenues be credited to the St. Johns landfill Closure Account to help offset the cost of future operation, maintenance, and monitoring.

MANAGEMENT OF VEGETATION ON THE ST. JOHNS LANDFILL COVER

Vegetation on the St. Johns Landfill cover system serves several purposes. One purpose is to prevent erosion of soil into surrounding surface water and maintain cover system integrity. Another purpose is to provide open meadow habitat.

Under authority of the Solid Waste closure Permit, DEQ reviewed and approved the improved cover system design and the contract plans and specifications governing construction. Schedule E, conditions 2 and 3 of the amended Closure Permit state:

> *The permittee shall maintain the final surface contours of the disposal site so that rainfall is shed without creating either erosion or ponded water and so that all waste remains covered with soil. the permittee shall refill with approved soil, grade, and seed all areas that have settled or where water ponds and all areas where the cover soil has been damaged by cracking or erosion. Areas where vegetation has not been fully established shall be fertilized, re-seeded, and maintained."*
>
> *The permittee shall establish and maintain suitable vegetation over the closed areas of the disposal site consistent with the proposed final use.*

Another DEQ permit relevant to the vegetative cover is the NPDES general storm water discharge permit for all landfills including St. Johns Landfill. This permit requires the permittee to develop and follow a stormwater pollution control plan and to monitor stormwater for substances.

The 1990 City of Portland Natural Resources Management Plan for Smith and Bybee Lakes also regulates St. Johns landfill. Plan language most relevant to vegetation on St. Johns Landfill is shown below.

> *"The primary use of the landfill site (north of the slough) shall be open meadow habitat, which is complimentary to the wetland habitat in the balance of the Smith-Bybee area" (policy 14).*
>
> *"... develop and manage as a complementary habitat such as a meadow habitat for ground nesting or raptor nesting areas"; "Take active steps to reduce or eliminate... escape and establishment of invasive non-native vegetation"; Employ management practices that have the least negative impact practicable on adjoining resource areas."* (page 64)

In October 1991, the Smith and Bybee Lakes Management Committee said: 1. the establishment and maintenance of a vegetative cover is a critical component to the successful closure of the landfill; 2. a cost-effective strategy for establishing permanent native plant communities that provide wildlife habitat and scenic values should be developed for the landfill.

The policies governing vegetation restoration and enhancement at St. Johns landfill can be summarized as the following goals in order of decreasing priority:

1. Prevent significant risk to the landfill cover integrity and function (i.e. long term barrier to rain water) and prevent/control erosion so that no significant erosion occurs.
2. Develop and use an integrated pest management plan that balances environmental, economic, and sociological impacts and reduces reliance on pesticides.
3. Reduce or eliminate the escape/establishment of invasive, non-native vegetation.
4. Follow a cost-effective strategy to establish permanent native plant communities that provide wildlife habitat and scenic values.

Since 1992, vegetation consultants to Metro have conducted experiments designed to determine conditions that favor the establishment of native vegetation-and disfavor non-native vegetation. The 1997 Metro document titled **Native vegetation for St. Johns Landfill** summarizes these efforts and their results.

Table 1 also gives a briefer summary. This table is from a draft report entitled **Establishment of Native Vegetation at St. Johns Landfill: Proposed Phase 1 Work Guidelines and Cost Estimates.**

The table indicates that, so far, three site preparation methods have been successful in producing homogeneous, seed producing stands of native grass. Non-native rye and other grasses from the seed bank in the recycled cover soil have been disfavored by cooking them under a clear plastic solar blanket, by repeatedly tilling the soil, and by spraying a test plot with the herbicide glyphosate (Roundup). All three methods have advantages and disadvantages.

Metro is also experimenting with pasturing sheep on the landfill to disfavor non-native grasses. The flock intensively grazes certain areas to inhibit the rye grass from setting seed. The sheep are pastured on the landfill cover from early April to June. The sheep effectively "mow" the vegetation beginning much earlier in the spring than is feasible (due to soft soil) by mechanical equipment.

Table 1: St. Johns Landfill Native Grass Testplots 1992-1996

Location	Site Prep.	Date/Method	Species	App. Rate	Status
Mesic Plots: SA-1 4 Acres Total	None	9/92 — Track & Broadcast Hydroseed	cover crop + 4 grasses 7 forbs	Variable (mix)	abandoned: failure
Xeric Plots: SA-1 4.5 Acres Total	None	9/92 — Track & Broadcast Hydroseed	cover crop + 4 grasses 3 forbs	Variable (mix)	abandoned: failure
Plot 1A: SA-1 .5 Acre	Herbicide-Tillage	9/94 No-till drill	BRca & FEid	8.5#/Acre equal mix	abandoned: failure
Plot 1B: SA-1 .6 Acre	Herbicide-No Tillage	9/94 No-till drill	BRca & FEid	8.5#/Acre equal mix	seed production
Plot 2A: SA-1 .10 Acre	Solarization	9/94 No-till drill	BRca & FEid	8.5#/Acre equal mix	seed production
Plot 2B: SA-1 .25 Acre	Tillage Only	9/94 No-till drill	BRca & FEid	8.5#/Acre equal mix	uncertain
Plot 3A: SA-1 .6 Acre	Tillage Only	9/94 No-till drill	BRca & FEid	16.3#/Acre equal mix	seed production
Plot 3B: SA-1 .55 Acre	Acid pH	9/94 No-till drill	BRca & FEid	16.3#/Acre equal mix	abandoned: failure
Plot 4: SA-2 1.5 Acres	None	9/94 No-till drill	BRca & FEid	16.3#/Acre equal mix	abandoned: failure
Plot A: SA-4 1 Acre	None	9/95 — Track & Broadcast	ELgl	30#/Acre equal mix	Abandoned: depredation
Plot B: SA-5 1 Acre	Sterile Soil	9/96 — Track & Broadcast	BRca & ELgl	30#/Acre equal mix	uncertain
Plot C: SA-5a 6 Acres	Sterile Soil	9/96 — Track & Broadcast	BRca & ELgl	30#/Acre equal mix	uncertain

Species: BRca=Bromus carinatus/FEid=Festuca idahoensis/ELgl=Elymus glaucus

from: Wilson et al, Establishment of Native Vegetation on St. Johns Landfill : Proposed Phase 1 Work Guidelines and Cost Estimates, Draft, August 1997.

Acting on the advice of a vegetation consultant, Metro changed the construction specifications for the topsoil layer in the cover system to make the soil less fertile. The rational for this was that low fertility will discourage non-natives while encouraging the natives that grow slower and use nutrients more frugally. Spring wheat was planted as a temporary cover crop and fertilized with a quick acting fertilizer to encourage it to grow quickly, thus reducing the risk of erosion of the newly constructed cover.

In theory, there should be no conflict among the four goals listed above. So far, actual practice has shown that, in addition to the unpredictability of weather, conditions at this site are both unique and more complex than theory has allowed for. Conflict occurs among the goals, especially erosion prevention and establishment of native vegetation.

In July 1997, a team of vegetation specialists begins to develop and help carry out a comprehensive vegetation management plan covering a 5-year period. This plan, to be completed by August l998, is to be governed by the following goals and objectives.

GOALS

1. Establish a native-dominant vegetative cover that encourages wildlife use if it does not pose a significant risk to the integrity of the St. Johns Landfill cover system or encourage invasion by noxious weeds.
2. Establish this vegetative cover in phases over the next 30-years using methods which minimize risk to public health, safety, and the environment and which conform to the Metro Alternatives to Pesticides Policy.

OBJECTIVES

1. By the year 2007, establish native-dominant vegetation on 50 acres of the St. Johns Landfill cover system and on 6,000 lineal feet of its perimeter and develop methods which are reliable, environmentally protective, and cost effective enough to allow later development on larger spaces and to control invasive, non-native and noxious vegetation.
2. By the year 2007 develop a time schedule, methodology and cost estimate to establish native vegetation over the remaining cover system and perimeter.

FUTURE PLANS

1. By fall 1997 send to DEQ a plan to monitor environmental quality around St. Johns Landfill during the period after the cover cap is in place.
2. By fall l997 develop and sent to DEQ an operation and maintenance plan for the environmental improvements constructed at St. Johns Landfill.
3. During the summer of 1997, extend the membrane layer of the cover system into the perimeter road adjacent to subarea 4. In conjunction with this effort, repair defective construction (1993) discovered at the edge of the cover system at this location.
4. By fall 1997 submit to DEQ a review of existing information about the hydrogeology at St. Johns Landfill and an analysis of initial modeling efforts. Collect additional information as needed following initial comments by DEQ.
5. During 1997 develop an update to the 1995 document titled **Controlling Seepage from St. Johns Landfill to Surrounding Surface Water.**
6. During 1997, construct a pipeline and associated equipment to transfer landfill gas from St. Johns Landfill to Ash Grove Cement Company for the purpose of energy recovery.

7. During 1997 send to DEQ an application for renewal of the Solid waste Site Closure Permit for St. Johns Landfill.
8. Submit to DEQ a baseline risk assessment work plan 90 days after DEQ issues the final comments concerning the hydrogeology of St. Johns Landfill.
9. Implement Metro's environmental monitoring plan and use Metro's Environmental Monitoring Information System (EMIS) to develop the capability to identify significant changes in environmental quality.

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Metro, Revised Closure and Financial Assurance Plan, St. Johns Landfill, September 1989.

Sweet-Edwards/EMCON, Inc. St. Johns Landfill Water Quality Impact Investigation and Environmental Options, 4 volumes, 1989.

Kleinfelder, Inc., Limited Environmental Site Assessment, Triangle Property (Parcel "A") and Skirt Property, N. Columbia Blvd., St. Johns Landfill Access Road, Portland, Oregon., January 1997

Parametrix Inc., Technical Memorandum, Phase II Environmental Sampling and Analytical Program (SAP) and Groundwater Quality Impacts Study, Proposed Ramsey Lake Constructed Wetland Treatment System, Triangle Property, Portland, Oregon., July 1992.

Metro, Controlling Seepage from the St. Johns Landfill to Surrounding Surface Water, May 1995.

Metro, Native Vegetation for St. Johns Landfill, 1997.

Wilson, M.L. Brophy, and L. Wilson, Establishment of Native Vegetation at St. Johns Landfill: Proposed Phase 1 Work Guidelines and Cost Estimates, Draft, August 1997.

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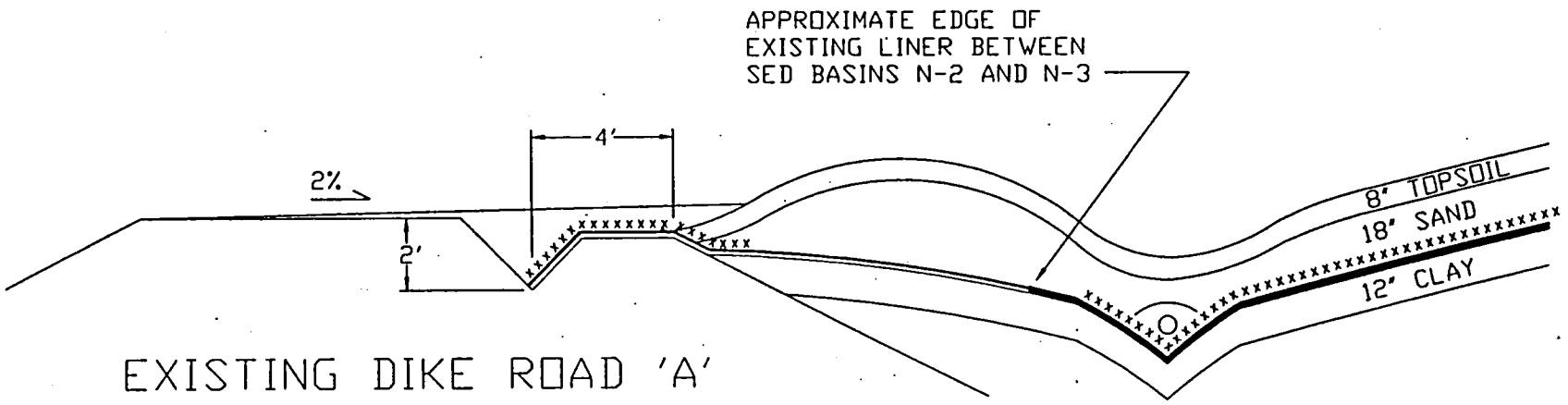
ST. JOHNS LANDFILL

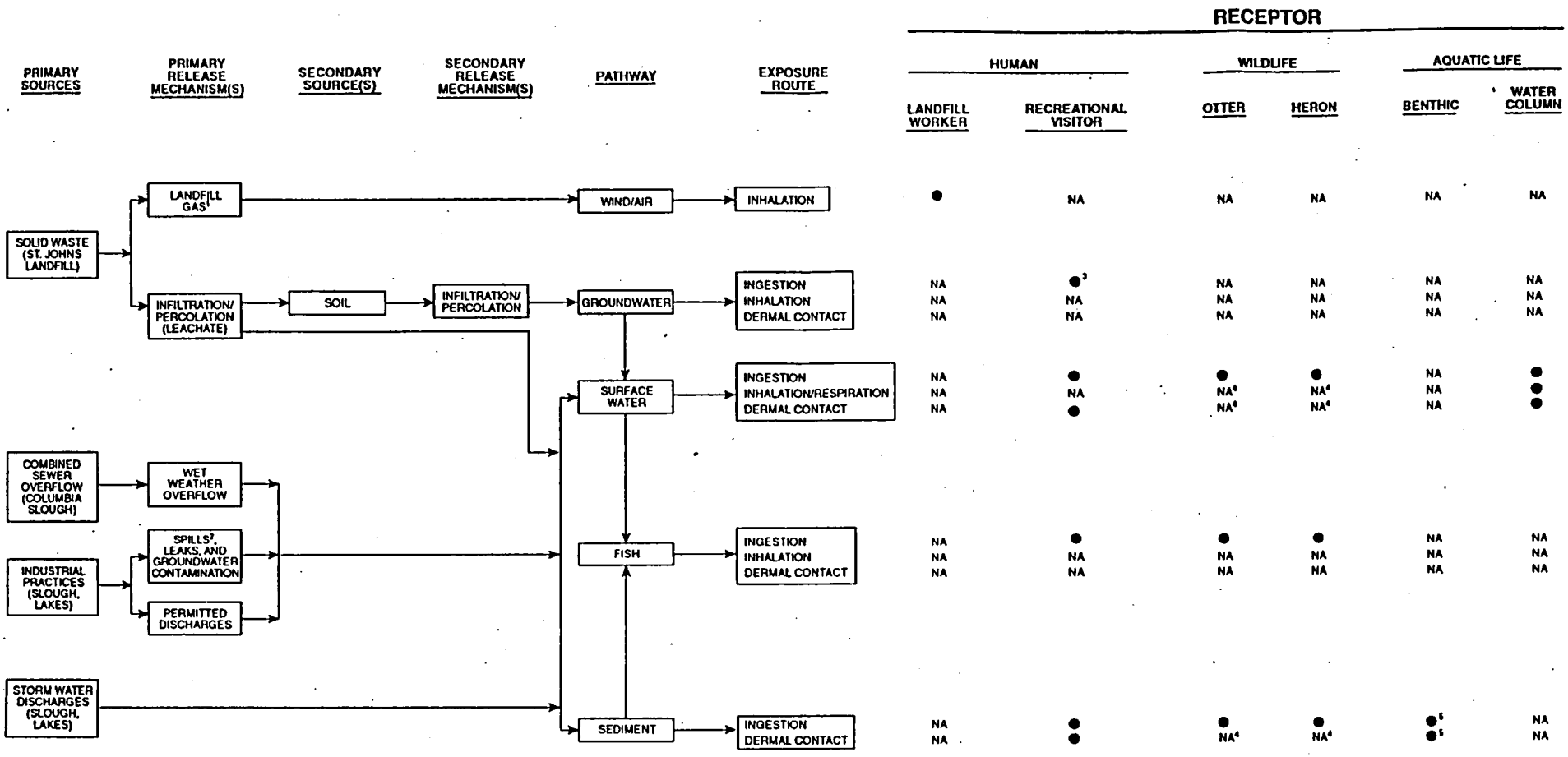
PERIMETER ROAD DETAIL



EXISTING DIKE ROAD 'A'
STA 47+00 TO EAST EDGE
OF SED BASIN N-2
(NO SCALE)

1. LOCATE EXISTING EDGE OF LINER
2. REMOVE AND STOCKPILE SAND AND TOPSOIL AS REQUIRED
3. EXCAVATE 2' DEEP ANCHOR TRENCH APPROX. 4' FROM EDGE OF ROAD
4. EXTEND LINER TO CENTER OF DITCH AS SHOWN
5. PROTECT EDGE OF LINER WITH 6' WIDE STRIP OF TYPE 3 GEOTEXTILE
6. REPLACE SAND AND TOPSOIL TO EDGE OF ROAD
7. PLACE CSBC OVER ROADWAY AS SHOWN WITH 1' MIN. COVER OVER LINER AND GEOTEXTILE

APPENDIX



NA Denotes Not Applicable

1 Landfill gas collection system to be completed within 1-2 years.

2 Includes identified DEQ Environmental Cleanup Division Sites

3 Only acute incidental ingestion exposures evaluated based on future use scenario (no current exposures).

4 Potential exposure pathways. Not evaluated due to greater significance of ingestion pathway and lack of exposure route-specific toxicity data.

5 Exposure route evaluated through estimation of sediment interstitial water concentrations.

● Exposure route evaluated in SLRA.

Figure 2-3.
Smith-Bybee Lakes Management Area Site Conceptual Model

from: Parametrix, Inc., Screening-Level Risk Assessment for the Smith-Bybee Natural Resources Management Area, May 1995.

M E M O R A N D U M

METRO

DATE: September 9, 1997

TO: Dennis O'Neil, St. Johns Landfill Closure Project Manager

FROM: Roosevelt Carter, Business & Regulatory Affairs

RE: Report to DEQ on the St. Johns Landfill Reserve Account

Financial activity in the St. Johns Landfill Reserve Account during FY 1996-97 was in compliance with established policies and other applicable requirements, including Metro ordinances, generally accepted accounting principles (GAAP), and Oregon budget law.

In accordance with the FY 1996-97 Approved Budget, no annual contribution was required to the St. Johns Landfill Closure Account. The fund/account structure established in FY 1989-90 (through adoption of Master Bond Ordinance #89-319) remains in place through FY 1996-97.

Following is a summary of unaudited revenues, expenditures, and ending balance as of June 30, 1997, in the St. Johns Closure Account.

Beginning Balance	$8,568,133
Interest Earnings (estimated)	471,247
Contribution from rates	0
Revenue: City of Portland Reimbursement	10,266
Natural Gas Sale	93,240
Total Resources	$9,142,886
Expenditures	($1,684,335)
Unappropriated ending balance	$7,458,551

RC\:AC:clk
cc: Jim Watkins, Engineering & Analysis Manager
Maria Roberts, Principal Administrative Services Analyst
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