In response to the material and CQA concerns I raised in comments 1.6 and 1.7 of my September 18, 1990 letter, Metro's engineering addendum conceptually proposes to conduct a field and laboratory investigation to determine actual quantities and quality of low permeability soils in the existing interim landfill cover, and Metro's contract specifications defer placement and compaction specifications and CQA requirements for low permeable soil for Type "B" Cover until after the proposed investigation has been completed.

Since significant questions remain unanswered, I disapprove of using existing interim cover soil to construct the low permeable soil component of the Type "B" Cover, until Metro specifies material properties, placement and compaction methods, and CQA requirements acceptable to DEQ and designed to achieve an in-situ hydraulic conductivity of $\leq 1 \times 10^{-4}$ cm/sec.

2. Geonet Composite. Biaxial stresses induced by differential settlements could distort geonets sufficiently to impede their flow properties resulting in localized ponding. Overlying geotextiles could also tear or separate at seams, allowing cover soil migration into the underlying geonet resulting in eventual clogging.

   Therefore Metro should: (a) investigate how biaxial stresses induced by anticipated differential settlement will affect geonet performance; and (b) specify sufficient geotextile overlap to compensate for separation due to anticipated differential settlement.

3. Underdrain Collection Pipe. Details of the underdrain collection pipe on Sheet 13 of Metro's engineering drawings show no geotextile separating the drain rock from Type 1 Sand. Therefore, Metro shall either specify an appropriate geotextile filter to separate the drain rock and Type 1 Sand, or conduct an engineering analyses to show that grain size distributions of drain rock and Type 1 Sand are designed to prevent clogging of the drain rock and drain pipe.

4. Subsoil/Topsoil/ Vegetation Combination. HELP model evaluations of "good" and "fair" vegetated covers project similar infiltration rates which seems reasonable considering that a "good" vegetated cover results in greater evapotranspiration but less runoff than a "fair" vegetated cover. However, in order to provide better erosion control, Metro is required to achieve a "good" vegetated cover at the St. Johns Landfill.

   The subsoil (Type 1 Sand)/topsoil/vegetation combination is approved as detailed in Metro's engineering drawings, engineering addendum and contract specifications, provided that Metro complies with the following conditions:

(a) Metro shall establish and maintain a "good" vegetated cover consisting of a stable and consistent growth of persistent and self-sustaining grasses, that are compatible or non-competitive with surrounding native vegetation;

(b) The texture, thickness, hydraulic conductivity, pH, organic content, salinity and nutrient content of subsoils and topsoils shall be designed and adjusted based on appropriate soil analyses to provide an optimal growing medium for selected vegetation;

(c) Selected vegetation shall be hydroseeded during the appropriate season for optimum growth, and at a seed rate exceeding supplier specifications;

(d) Metro's contract specifications shall specify subsoil and topsoil properties (e.g. pH, carbon to nitrogen ratio, nutrient content, etc.) which must be met for subsoil and topsoil to be considered compatible with selected vegetation, and which can be used as a basis for evaluating fertilizer needs; and

(e) Division 2, Section 3.11 (Topsoil Placement) of Metro's contract specifications shall be modified to specify appropriate equipment and maximum weight allowable for compacting topsoil to a "uniform, dense state ready for hydroseeding operations."

5. Construction Quality Assurance. The Construction Quality Assurance (CQA) Plan described in Metro's Contract Specifications is hereby approved subject to compliance with the following conditions:

(a) Section 3.2.2 of the CQA plan must be completed and approved by DEQ before construction of low permeable soil for Type "B" Cover is authorized;

(b) CQA testing for evaluating the field density of low permeable soil for Type "A" Cover shall, in addition to density specified in Section 3.3.1 of the CQA plan, include measurement of moisture content and degree of saturation at a minimum of four tests per acre;

(c) Page 02272-11 of Metro's contract specifications should include criteria which would require the contractor to perform additional interface friction angle tests (i.e. such as significant changes in the engineering properties of proposed subsoil or Type 1 Sand);

(d) Page 02272-14 of Metro's contract specifications should describe criteria which would require the contractor to perform additional geonet composite transmissivity tests (i.e. such as significant changes in the properties of proposed Type 1 Sand); and

(e) Page 02220-5 and 6 of Metro's contract specifications should specify a frequency for performing nutrient composition analyses on both existing and imported topsoils, and clarify how decisions about nutrient adjustment will be made so that cover soils will provide an optimal growth medium for the selected vegetation.

C. STORMWATER MANAGEMENT

Stormwater management plans and specifications are hereby approved as shown on Metro's engineering drawings and as detailed in Metro's contract specifications, provided that Metro abides by the following conditions:

1. Implemented drainage, grading and erosion control measures shall comply with the standards of Chapter 70 of the Uniform Building Code, and the conditions of the City of Portland's Erosion Control Plans Technical Guidance Handbook; and

2. The quality and quantity of stormwater discharges to the sloughs shall comply with:

   (a) Any future National Pollution Discharge Elimination System (NPDES) permit issued for the St. Johns Landfill (i.e. NPDES permit application regulations for stormwater discharges were published in the November 16, 1990 Federal Register);

   (b) Total Maximum Daily Load (TMDL) discharge allocations being established for the Columbia Slough by DEQ's Water Quality Division; and

   (c) Objectives and Policy 22 of the Smith and Bybee Lakes Management Plan.

D. LEACHATE MIGRATION CONTROL

Metro's plan to control water infiltration into the landfill by constructing the proposed final cover system design is expected to significantly reduce leachate generation and migration. In addition, Metro's November 6, 1990 response to DEQ comments proposes to further investigate and evaluate the need for additional leachate migration controls.

Metro has already conducted geophysical and water quality surveys around the landfill perimeter, and reported the results to DEQ in an October 1990 technical memoranda by Cornforth Consultants Inc. titled St. Johns Landfill Closure Leachate Migration, Perimeter Dike. However, as proposed by Metro and before a leachate migration control plan will be approved by DEQ, Metro shall:

Department of Environmental Science and Engineering

OREGON GRADUATE INSTITUTE
OF
SCIENCE & TECHNOLOGY

19600 N.W. von Neumann Drive
Beaverton, Oregon 97006-1999 USA
Phone 503/690-1196 FAX 503/690-1273

September 15, 1991

Mr. James Morgan
Planning and Development Project, METRO
2000 S.W. First Avenue
Portland, OR 97201

Dear Jim:

I wanted to thank you very much for the tour of the St. Johns Landfill you led for my Biogeochemistry class this summer. We all enjoyed the high quality information, as well as the perspective, which you provided for us.

As we discussed at the site, I had several concerns about the proposed closure plans. They include the following:

1. Water relations. The water-holding capacity of the thin layer of "soil" material seems very inadequate for establishing and maintaining adequate plant cover. Only 6" of soil, covering coarse sand, will provide relatively little storage in the root zone. This will require frequent irrigation during the summer months to maintain healthy cover.

In addition, the system will have relatively little retention during high intensity or extended rainy periods. It was unclear how the large volumes of leachate would be handled in this case.

2. Soil volume. A 1:1 mix of compost material and "topsoil" is proposed for use on the site. Unless the compost is extremely stable, I would imagine that 60 to 90% of the volume will be lost during the first 4 to 5 years. This will lower the depth of effective soil, decreasing water-holding capacity even further.

3. Quality of leachate from the cap. Adequate levels of the essential nutrients will have to be present in the soil solution for healthy plant growth on the site. Leachate waters may well contain relatively high levels of nutrients.

This is particularly true for nitrate and phosphate. Concerns with the quality of nearby Columbia Slough suggest that these leachate waters may exceed any standards set for the Slough.

I did not see these concerns adequately addressed in the materials I read. Until they are answered, I'm not sure that the investment in this closure plan will provide the long-term solutions needed to stabilize the site.

I'll be interested to learn how these issues are resolved. Thanks again for the excellent tour.

Sincerely,

Wesley M. Jarrell
Professor

METRO *Memorandum*

Planning and Development
2000 S.W. First Avenue
Portland, OR 97201-5398
(503) 221-1646

DATE: September 19, 1991

TO: Smith and Bybee Lakes Management Committee

FROM: Jim Morgan, Planning & Development JM

SUBJECT: Vegetative Cover on St.Johns Landfill

As a solid waste manager for the region and as Trust Fund Manager and staff responsible for the long-term management of the Smith and Bybee Lakes Management Area, which includes the St.Johns Landfill, METRO is responsible for closing the landfill in an environmentally sound manner and in conformance with the goals and objectives of the Smith and Bybee Lakes Management Plan.

One of the principal objectives in landfill closure is to minimize leachate generation and its movement into surrounding waters. The placement of the impermeable geomembrane cover will help achieve this objective. Final cover over the geomembrane is designed to protect the membrane while minimizing infiltration of precipitation. The final vegetation cover is the key component that will prevent erosion of the protective soil and sand layers over the geomembrane.

The current design outlines the placement of 6 in. of growth media over 18 in. of sand over the geomembrane. The growth media is required to be 50% "topsoil" of an unspecified composition and 50% yard debris compost. The sand layer will be coarse to fine sands dredged from the Columbia River. These sands will drain rapidly with little water or nutrient retention capacity, thus not fully serving as a growth medium.

The recommended plants to be hydroseeded on the final cover is sheep fescue and perennial rye grass. Selection of these plants was made to meet the short-term objectives of closure.

Recently, I have lead visits to the St. Johns Landfill and explained the final cover design to a number of soil and plant specialists. These include:

Peggy Olds, District Conservationist, Soil Conservation Service
Scott Lambert, Plant Material Specialist, Soil Conservation Service
Dr. Wes Jarrell, Soil Science Professor, Oregon Graduate Institute
Claire Billet, Plant Specialist, Andropogon Associates
Robin Sotir, Soil Bioengineer, Sotir & Associates

There is consensus among all specialists that:

1) without long-term addition of soil amendments and irrigation, it is unlikely that the grasses will provide adequate cover to prevent erosion;
2) the proposed plants will provide very little wildlife habitat value;
3) insufficient soil moisture will be available for sustaining the vegetation; and,
4) a relatively higher Operations & Maintenance cost is anticipated to repair eroded surfaces and to mow for preventing the encroachment of woody plants.

Since the METRO Solid Waste Department will soon be releasing Request for Bids for closure activities that include soil placement and seeding, the Management Committee should evaluate the adequacy of the proposed cover design for meeting the Management Plan objectives.

I am requesting that the Management Committee:

1. Recommend the types of final vegetative cover desirable to meet the goals and objectives of the Plan.

2. Determine the growth requirements (i.e. soil type and depth, water demands) for the desirable vegetation cover.

The use of the landfill area for solid waste purposes is a temporary landuse. Its long-term use and management is the responsibility of the Management Committee.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
W. 316 Boone Avenue
Suite 450
Spokane, Washington 99201

DATE: October 17, 1991

SUBJ: PM- Trip Report - Area I, Oregon: Assitance to the Portland Field Office, Seeding/Planting Recommendations for the St. Johns Landfill Closure; September 17, 1991

To: Roy M. Carlson, Jr., SRC, Portland
Jack P. Kanalz, STC, Portland

Purpose: To review the Plant Materials program in Multnomah County and to assist with seeding and planting recommendations for the planned closure of the St. Johns Landfill.

Participants: Scott Lambert, Peggy Olds, Jim Hecker and Jim Morgan, METRO planner.

Accomplishments: September 17 - at the Portland FO. We went to a landfill in Clark County, Washington to look at the portion of already closed and planted to a grass mixture. The area was seeded two to three years ago with creeping red fescue, hard fescue, perennial ryegrass and a bentgrass. The seeding is only fair, the plant vigor is not high, and appears to be adversely affected by dry conditions, droughty soil and aspect. Rattail fescue, annual brome, and hairy vetch have invaded this site, and are providing erosion control and groundcover.

We then went to the St. Johns Landfill site. The closure is to begin summer, 1992 and continue for five years. The area to be closed will be shaped and covered with a liner and filter, overlain with eighteen inches of sand and six inches of "topsoil". The topsoil may include composted yard debris. The engineer consultant's report for this site recommended that a mixture of Mecklenburg sheep fescue and Manhattan perennial ryegrass should be planted for erosion control and groundcover. The consultants and others are concerned with attracting rodents to the site if legumes and shrubs or trees are planted here, also concern for the trees and rodents damaging the underground liner. The topic of aboveground methane gas, etc. venting vs. underground venting was discussed. The advantage to the underground system would be that it is much easier to mow and maintain the seeding or landscaped area, and is aesthetically better.

Recommendations: 1) The seeding mixture used on the closure should also include the native plants that occur on similar

sites in Multnomah County. Include native grasses such as red fescue, a native bunchgrass. The seeding may also include perennial ryegrass, hard fescue, sheep fescue (Mecklenburg is not a recognized commercial cultivar), and legume like birdsfoot trefoil, or native trefoil (Lotus sp.). The total seeding rate, for hydroseeding on a critial area should not exceed 100 pounds/acre. 2) If any wetlands are to be planted, consider planting tufted hairgrass and shrubs like redosier dogwood, native willows, Oregon Ash, black cottonwood, osoberry, etc. 3) Consider planting trees and shrubs in clumps for diversity and aesthetics. Include plants like Oregon white oak, serviceberry, black hawthorn, Pacific serviceberry, oceanspray, vinemaple, redosier dogwood, osoberry, etc. 4) Topsoil depth should be a minimum of twelve inches over eighteen inches of sand.

Scott

SCOTT M. LAMBERT
Plant Materials Specialist

cc: G. Tibke, SRC
D. Greiner, AC, Albany
P. Olds, DC, Portland

Smith & Bybee Lakes Natural Area
Management Committee

coordinated by:
METRO
Planning & Development
2000 S.W. First Avenue
Portland, Oregon 97201
(503) 221-1646

October 24, 1991

Bob Martin, Director
METRO Solid Waste Department
2000 S.W. First Avenue
Portland, OR 97201

Dear Bob:

With the signing of the St. Johns Landfill Agreement and the adoption of the Smith and Bybee Lakes Management Plan, the St. Johns Landfill End Use Plan was superseded by the Management Plan. In the Management Plan, end uses suggested include wildlife habitat and minimal human access. Both the Plan and the Smith and Bybee Lakes Management Committee recognize that the landfill will be inaccessible to humans for the near future.

To integrate management of the landfill area upon closure into management of the lakes area is a responsibility of the Management Committee. The Management Committee needs to provide METRO's Solid Waste Department with landfill end use objectives so that the Department can proceed with closure activities that will minimize conflicts between closure design and end use objectives. The Committee recognizes that safe closure of the landfill is the highest priority, for which METRO is responsible. The Committee wishes to provide policy guidance where needed and not interfere with operations that have clearly established policies.

The Committee made the following resolutions in its October 17, 1991 meeting:

1. **The establishment and maintenance of a vegetative cover is a critical component to the successful closure of the landfill.** Vegetative cover is essential in protecting the integrity of the landfill cap. This resolution reiterates a landfill closure objective.

2. **A cost-effective strategy for establishing permanent native plant communities that provide wildlife habitat and scenic values should be developed for the landfill.**

These two resolutions are completely compatible. Using the following criteria, compatibility can be assured:

- o cost effectiveness - Cost assessment should consider long-term maintenance cost as well as establishment cost.

- o minimize maintenance - A stable, diverse natural plant community may require less maintenance than a mixed grass community and provide flexibility in meeting changing environmental conditions.

- o aesthetics - Scenic values can be enhanced on the landfill while reducing the need for fencing and screening.

- o habitat - Increasing habitat values on the landfill can provide food and habitat for indigenous wildlife for the Lakes Management Area.

The Management Committee will work in concert with the Solid Waste Department to expedite the safe closure of St. Johns Landfill and ensure the effective integration of the landfill area into the surrounding community. Please consider the need for developing a cover vegetation program for the St. Johns Landfill.

Sincerely,

Ruth McFarland, Chair
Smith and Bybee Lakes Management Committee

United States Department of Agriculture
Soil Conservation Service
2115 S. E. Morrison
Portland, OR 97224
231-2270

November 4, 1991

Jim Morgan
METRO
Planning and Development
2000 S. W. First Ave.
Portland, OR 97201-5398

Dear Jim,

Attached is the information and recommendations I have put together concerning your request for assistance with the St. John;s Landfill post-closure vegetation plan.

I have attempted to summarize the issues we discussed, offer technical comment on the first phase closure vegetation and soils plan and provide some recommendations for future action.

I am back in the office November 12th. Please feel free to give me a call if I can be of further assistance.

Sincerely,

Peggy

Peggy A. Olds
District Conservationist

cc: Scott Lambert, PM Spec. Spokane, WA
Jim Hecker, DC, Corvallis, OR

Jim Morgan, METRO
St. John's Landfill Post-Closure Vegetation Plan
East Multnomah SWCD
November 14, 1991

Background: Jim Morgan, Regional Planner for METRO, has requested SCS technical and planning assistance through the East Multnomah SWCD for developing a vegetation plan for the closure phase of the St. Johns Landfill. The 350-acre site is planned for multi-phase closure from 1992 through 1995.

Issues: Several important key planning issues have been discussed through site inspections and follow-up contacts with Mr. Morgan. These include (but are not limited to):

1. The depth and composition of the artificial "soil" planned for the site;

2. Soil erosion control, both temporary and permanent;

3. Water quality-related concerns: both surface run-off and sub-surface leachate;

4. Vegetation plan components, including identification of grasses, legumes, shrubs and trees;

5. The development and integration of this site's physical attributes and potential biological habitats with those of the adjacent Smith and Bybee Lakes and other regionally-significant natural areas;

6. Maximizing biodiversity where possible;

7. Budget constraints and contract time lines for completing the planned closure.

Other Factors: There are several other factors which may influence the choice of options for reclaiming this area. These include:

--location of methane gas collection facilities (above vs. below ground);
--fire control concerns;
--lack of irrigation water and possible electricity for running irrigation pumps;
--unknown composition and quality of composted yard debris;
--desire to use native species and the need for low maintenance plantings.

METRO OBJECTIVES: As described by Mr. Morgan, primary objectives are:

1. Soil erosion control
2. Increased biodiversity and integration of this area's habitats with Smith and Bybee Lakes Management Plan.

Technical Comment: Several elements of the closure plan deserve closer scrutiny. To achieve soil erosion control objective it is important to plan both the short-term and long-term soil conservation measures.

For short-term protection, all exposed soil areas should be mulched and/or grass seeded by September 15th of the year the disturbance occurs. This allows enough time for a grass cover to establish itself before critical rain periods begin. I have attached SCS Specification 340-Critical Area Treatment for your reference. Field experience suggests mulching an area is highly effective for temporary soil erosion control.

For longer term soil erosion control, planting a permanent vegetative cover is the key. Designing the proper vegetation mix will also accomplish the second objective, enhanced biodiversity.

After review of the information your provided regarding METRO's closure plan, I have some question about the adequacy of the recommended "topsoil" mixture. It appears that the imported topsoil will be 50% yard debris compost (July 1991 Improvements, pg 02220-6). There is little information regarding the mineral soil components to be added to the compost, nor its viability as a growing medium. A soil's ability to sustain vegetation depends on many factors such as permeability, the existence of soil micro-organisms, available water capacity, depth and nutrient availability.

To enhance vegetative diversity, it would be important to develop a soil medium that is capable of supporting grasses and shrub or tree species. In reviewing this project with Scott Lambert, SCS Plant Materials Specialist, a minimum topsoil depth of twelve inches is recommended (see attached).

I would assume this is a minimum level of mineral soil which must remain in place after soil loss factors, such as soil erosion, are taken into account. I believe it would be wise to also consider the effect of decomposition of the compost material over time. If 50% of the "soil" medium to be created will be composted yard debris, how much will remain after one year? five years? ten years? It would be prudent to place an additional 6-12" of the soil mixture on the site

to account for these types of losses and also allow for the site variations in aspect, slope, available water and landfill settling--all of which will affect plant growth.

The planned above-ground methane collection system may make it difficult to manage the area after closure is complete. If grasses alone were planted, the area may need to be periodically mowed to reduce fire hazard. This would be difficult to do with an above ground system. Also, permanent seedings need to be periodically maintained by fertilizing or reseeding. This maintenance would be difficult.

Recommendations:

1. Increase topsoil depth to a minimum of twelve inches of mineral soil mixed with appropriate amounts of compost material to assure a viable planting medium for a variety of vegetative species.

2. Explore the possibility of installing the gas collection system underground. Since this project is expected to have effects for many years to come, operation and maintenance costs for the vegetation plan on site may be reduced by this alternative.

3. Develop a vegetation plan which emphasizes wildlife habitat diversity and aesthetics where practical. Use native species (where possible and available in needed quantities) to reclaim the area.

   There are retention ponds and grass swales planned for water runoff control which should be planted with species that are more water-tolerant than those planted on a south-facing, upland slope.

4. Identify the wildlife habitat and diversity levels for this area and ways to incorporate the landfill's planned habitats with surrounding areas like Smith and Bybee Lakes.

5. Explore the possibility of using the Soil Conservation Service's plant materials trial program for testing and identifying the types of plant materials most suitable for the site and capable of creating the types of habitat diversity METRO would like to see.

METRO *Memorandum*

Planning and Development
2000 S.W. First Avenue
Portland, OR 97201-5398
(503) 221-1646

DATE: December 6, 1991

TO: Bob Martin, Jim Watkin, Dennis O'Neil, and Sam Chandler

FROM: Jim Morgan JM

SUB: Vegetation Plan and Soil Requirements at St. Johns Landfill

Considerable attention has been given to the final cover design at St. Johns Landfill recently. After visiting a number of closed landfills and conferring with soil and plant scientists with landfill restoration experience, it is clear that our present final cover design will not provide long-term protection of the polyethylene membrane cap. Recommendations are given below that will increase the long-term protection of the membrane cap.

1. **Increase the topsoil depth to yield a final mineral topsoil depth of 12 inches minimum.**
   The current vegetation cover plan for St. Johns Landfill is designed to provide short-term erosion protection of the thin topsoil layer. For long-term soil erosion control, planting a permanent vegetation cover on the landfill is needed. A minimum of 12 inches of mineral soil is necessary to sustain permanent vegetative growth, as recommended by Soil Conservation Service (see attached). This assume a minimum level remaining in place after soil loss factors, such as soil erosion, soil settling and compaction, and some degradation of the organic component. Leslie Sauer of Andropogon Associates recommends a minimum of 18 inches of mineral soil.

   The additional soil needed on the landfill may be obtained from a variety of sources. Dredged silt and sand can be mixed with yard debris compost or municipal sludge compost to yield a very good growth medium that will provide long-term protection of the membrane cap. By mixing soil components to yield a soil high in nutrient with high water retention capacity, the desired cover may be obtained in a more cost-effective manner than the purchase of comparable topsoils.

2. **Minimize the hydraulic conductivity gradient between the high-conductivity sand layer and the low-conductivity topsoil layer.**
   Placing the topsoil in direct contact over the sand layer will most likely result in saturated soil conditions over dry sand during winter and spring. Prolong saturated soil conditions will result in low soil oxygen levels and increase surface runoff rate (i.e.

erosion). A common phenomena has been observed where a soil with relatively low hydraulic conductivity overlays a sub-soil of high hydraulic conductivity with no gradation between the layers. The abrupt hydraulic jump acts as a barrier to water movement. This is less common under natural condition because the sequence in which soil material is deposited results in a gradation of differing soil materials. This abrupt change in the soil profile and the resulting saturation phenomena has been observed at other landfills, as reported by Leslie Sauer, and at local park installations, as observed by Jim Sjulin of Portland Parks.

To prevent this possible failure in soil and vegetation cover due to soil saturation, one of two options may be exercised: (1) add a pre-mixed soil and sand layer between the two separate layers or (2) incorporate three inches of topsoil into the sand before applying the remaining topsoil.

3. **Develop a vegetation cover plan.**
A long-term, cost-effective vegetation cover plan needs to be developed for the landfill. The current short-term soil/vegetation strategy will not provide long-term protection of the membrane cap without considerable maintenance cost. A soil/vegetation cover plan is needed that will be cost-effective, minimize maintenance, enhance site aesthetics, and provide wildlife habitat. An excellant example of a landfill vegetation cover plan is the Fresh Kills Landfill plan developed by Andropogon Associates (I have copies of this Plan).

4. **Prepare a feasibility study for leachate management that includes the use of leachate for irrigation on the landfill surface.**
A solid waste management objective is to minimize the movement of leachate from the landfill by reducing the groundwater levels in the landfill. To achieve this, METRO is placing a relatively-impervious membrane over the landfill. To reduce the groundwater mound within the landfill, leachate can be withdrawn from the landfill and used for irrigation of the landfill surface. This will (1) provide water and nutrients necessary for vegetative cover growth and (2) effectively treat the leachate without pumping it off-site.

To establish permanent vegetative cover on the landfill, irrigation and nutrient supplements will most likely be required. As observed by Leslie Sauer and cited in the attached article ("Tree Planting on Landfills"), vegetation production increases when leachate is used for irrigation. Leachate quality needs to be examined to design application rates that supply water and nutrient needs while avoiding phytotoxicity.

Treating the leachate on-site makes more environmental and economic sense. If leachate can be effectively treated by the soil and vegetation on the landfill surface, then not transporting it off-site for treatment avoids moving potential pollutants from one environment to another. Avoided cost of treatment at the wastewater treatment plant may be significant. A feasibility study, followed by a pilot/demonstration project, on a sub-area at the landfill would be a prudent approach.

RECOMMENDED ACTION

1. Determine the availability and cost of obtaining the appropriate topsoil needed to yield the recommended minimum on the landfill. This includes assessing the option of combining soil components, such as mixing silts with compost materials.

2. Contract a firm with restoration experience to develop a vegetation cover plan that includes a soil/plant ecosystem that will both (a) provide protection of the membrane cap and (b) establish plant communities that provide wildlife habitat and scenic values in a cost-effective manner. Any vegetation cover plan should be designed with flexibility, including recommendations for test plots to determine soil/plant suitability in areas of different slopes and aspects. Soil Conservation Service has offered to work with METRO in providing soil and plant expertise.

If there is any additional information you may need in evaluating soil/vegetation cover design for St. Johns Landfill, please do not hesitate to ask.