CITY OF PORTLAND
ENVIRONMENTAL SERVICES

1120 SW Fifth Avenue, Room 1000, Portland, Oregon 97204-1912 503-823-7740, FAX 503-823-6995 Dean Marriott, Director

Watershed Revegetation Program

Dennis O'Neil
Metro REM
601 NE Grand Avenue
Portland, OR 97232

December 18, 2000

Dear Dennis,

Attached please find a status report for landfill perimeter revegetation and a revised cost proposal for upcoming revegetation efforts. The status report includes a synopsis of all treatments and materials applied to the landfill through October 2000. This report also describes current vegetation condition at the landfill and recommendations for continued maintenance and enhancement of existing installations.

The cost proposal is identical to the current IGA cost schedule except that it adds $25,366 to the additional perimeter revegetation treatments table. This increase is based on recent monitoring data analysis which indicates a need to add more trees and shrubs in many areas around the landfill. For both our conveniences, I also added a table showing total proposed expenses and billing amounts by fiscal year for all of the current IGA's relating to the landfill.

As the enclosed status report indicates, we have expended a great deal of effort trying to re-establish native vegetation around the landfill and have encountered several challenges relating to the landfill's unique environment. Floods, droughts, poor soil conditions, choking masses of noxious non-native weeds and swarms of beaver, mice, nutria, and carp have all conspired to create a particularly limiting environment for the establishment of plants. Many of the installations we have tried have failed. Some have worked in some areas but not in others. A few have been generally successful throughout.

Over the years, in response to this trial and error process, we have developed a set of treatments and plant materials that I believe will allow us to restore a diverse green buffer of native plants and turn the perimeter of the landfill into the paradise it should be. Particularly hopeful are our installations of Oregon ash and red-osier dogwood. In combination, these species have rooting characteristics that hold promise for stabilizing large sections of the natural silt dike.

The recent engineered slope stabilization project cost nearly $550 per foot of bank. By contrast, all of the current and proposed riparian restoration efforts around the landfill have cost about $12 per foot of bank. Through our continued cooperative agreements, I am confident that we can find vegetation-based stabilization solutions for much of the perimeter that cost far less than the cost of engineered revetments and that will not require permitting from regulatory agencies. In the event that additional areas require engineered stabilization solutions, continued revegetation work now will provide two benefits. First, revegetation may reduce the area requiring stabilization. Second, it will be easier for Metro to demonstrate that they have exhausted all other methods of non-structural solutions.

While we are working to restore diverse native vegetation on BES properties across the Slough at Ramsey Lake, as well as on Metro Parks, the Port, and numerous other properties throughout the

watershed, it has been a great benefit to have REM as a partner. We truly appreciate your willingness to support the restoration of the perimeter of the Landfill. Please let me know if you need any additional information.

Respectfully yours,

George Kral
Forester

DRAFT DRAFT

January 16, 2001

George Kral, Forester
Watershed Revegetation Program
Bureau of Environmental Services
City of Portland
1120 SW Fifth Ave, Room 1000
Portland, OR 97232

Re: Revegetating the perimeter bank of St. Johns Landfill

Dear George:

Thank you for the project status report that accompanied your letter of December 18. It was concise and full of useful information both quantitative and qualitative.

As you point out in your letter, the revegetation of the St. Johns Landfill perimeter bank is very much a trial and error process. It turned out that weed control by manual cutting was much less effective that originally expected. Weed competition accounted for 20% of total mortality. Also, inundation by flooding caused 15 percent of total mortality. Presumably, flooding mortality is concentrated among the trees and shrubs planted on the lower part of the range of vegetated bank above elevation 12 feet MSL, or on the experimental sand benches. You point out that only certain species (among the variety of species planted) could be considered successfully established. Finally, you note that plant distribution has been highly variable. This suggests that currently unknown influences are at work.

Your letter states that you are confident that vegetation stabilization solutions can be found for much of the perimeter at a cost far less than the cost of engineered revetments. In my opinion, available information does not support your optimism.

A sediment transport study performed for BES by Professor Shu-Guang Li indicated that hydraulic conditions in the west half of the lower slough are different from other areas of the Columbia Slough system and even from Blind Slough. Tidal flushing dominates the lower slough and makes it hydraulically different from the upper slough. In the lower slough, by St Johns Landfill, tidal flushing causes the greatest impact on sediment transport during low water conditions. Tidal flushing has minimum impact on a dead end channel such as the Blind Slough arm. Therefore, successful bank stabilization by vegetation in other parts of the slough system and even in Blind Slough cannot be extrapolated to the bank of St. Johns Landfill which is subjected to the full force of scour caused by tidal flushing.

Year around vegetation does not exist below about elevation 12 feet MSL (City Datum) on the landfill dike. This lack of vegetation below elevation 12 is probably due to several

DRAFT

factors that include frequent periods of inundation, which average between 130 and 160 days per year. A canoe trip around the landfill during the fall low water period reveals exposed dense root mats of mature trees that have been unable to hold the silt below elevation 12 feet MSL.

Metro agreed to fund an experiment with bioengineering techniques during 1997-1998 to stabilize 300 lineal feet of bank. I am mot aware that you used these techniques to establish vegetation significantly below 12 feet MSL.

It is necessary for some dike repair work to extend down to at least elevation 1 foot MSL. Therefore, there would be 11 feet on the repaired dike face that lacked a suitable growth of vegetation. This is why the 2000 bank stabilization improvements were designed with a rock filter below elevation 12 that supports a vegetated riparian corridor above this elevation. Total construction cost is about $600 per lineal foot.

Total construction cost was about $390 per lineal foot for the experimental benches located at the toe of the landfill slope along the main channel of the Columbia Slough. These benches were placed on a mud bank whose existence indicates a hydraulically less active environment in the immediate vicinity. Aerial photos and a topographic map indicate that the sand fans east of the landfill bridge lie in a similar environment.

These benches and fans will yield valuable information to determine if they provide adequate slope stability over the long term. However, even if they do provide long term stability, they will be limited to some areas and must be used with caution. Fills placed into the slough channel constrict the channel and increase the velocity of the current. This increased current would present a risk of increased scour on the opposite shoreline. Such fills will also trigger the City's new cut/fill regulations designed to control flood hazard.

Your report suggests interplanting with successful species and also permanent wire protection for remaining and additional black cottonwood at strategic locations. I would support a contract amendment for an additional $25,366 if it carries out the following work scope:

1. Carry out interplanting of successful species in selected areas of the landfill perimeter bank where vegetation establishment has been demonstrated.
2. Carry out interplanting of black cottonwood at locations mutually agreed upon. Black cottonwood shall be at least 25% of total interplantings. All black cottonwood plants, existing and additional, shall receive permanent wire protection sufficient to prevent predation by beavers.
3. Carry out maintenance sufficient to reasonably ensure successful establishment

Please send me a draft amendment and I will initiate the internal Metro review process.

Sincerely,

DRAFT

Dennis O'Neil
Program Supervisor

Cc: Elaine Stewart, Metro
Nancy Hendrickson, City of Portland BES

REGIONAL SERVICES

600 NORTHEAST GRAND AVENUE | PORTLAND, OREGON 97232 2736
TEL 503 797 1700 | FAX 503 797 1797

METRO

January 23, 2001

George Kral, Forester
Watershed Revegetation Program
Bureau of Environmental Services
City of Portland
1120 SW Fifth Ave, Room 1000
Portland, OR 97232

Re: Revegetating the perimeter bank of St. Johns Landfill

Dear George:

Thank you for the project status report that accompanied your letter of December 18. It was concise and full of useful information both quantitative and qualitative.

As you point out in your letter, the revegetation of the St. Johns Landfill perimeter bank is very much a trial and error process. It turned out that weed control by manual cutting was much less effective than originally expected. Weed competition accounted for 20% of total mortality. Also, inundation by flooding caused 15 percent of total mortality. Presumably, flooding mortality is concentrated among the trees and shrubs planted on the lower part of the range of vegetated bank above the elevation of 12 feet MSL, or on the experimental sand benches. You point out that only certain species (among the variety of species planted) could be considered successfully established. Finally, you note that plant distribution has been highly variable. This suggests that currently unknown influences are at work.

Your letter states that you are confident that vegetation stabilization solutions can be found for much of the perimeter at a cost far less than the cost of engineered revetments. In my opinion, available information does not support your optimism.

A sediment transport study performed for BES by Professor Shu-Guang Li indicated that hydraulic conditions in the west half of the lower slough are different from other areas of the Columbia Slough system and even from Blind Slough. Tidal flushing dominates the lower slough and makes it hydraulically different from the upper slough. In the lower slough, by St. Johns Landfill, tidal flushing causes the greatest impact on sediment transport during low water conditions. Tidal flushing has minimum impact on a dead-end channel such as the Blind Slough arm. Therefore, successful bank stabilization by vegetation in other parts of the slough system and even in Blind Slough cannot be extrapolated to the bank of St. Johns Landfill which is subjected to the full force of scour caused by tidal flushing.

Year around vegetation does not exist below about elevation 12 feet MSL (City Datum) on the landfill dike. This lack of vegetation below elevation 12 feet is probably due to several factors that include frequent periods of inundation, which average between 130 and 160 days per year. A canoe trip around the landfill during the fall low water period reveals exposed dense root mats of mature trees that have been unable to hold the silt below elevation 12 feet MSL.

Metro agreed to fund an experiment with bioengineering techniques during 1997-1998 to stabilize 300 lineal feet of bank. I am not aware that you used these techniques to establish vegetation significantly below 12 feet MSL.

It is necessary for some dike repair work to extend down to at least elevation one foot MSL. Therefore, there would be 11 feet on the repaired dike face that lacked a suitable growth of vegetation. This is why the 2000 bank stabilization improvements were designed with a rock filter below elevation 12 that supports a vegetated riparian corridor above this elevation. Total construction cost is about $600 per lineal foot.

Total construction cost was about $390 per lineal foot for the experimental benches located at the toe of the landfill slope along the main channel of the Columbia Slough. These benches were placed on a mud bank whose existence indicates a hydraulically less active environment in the immediate vicinity. Aerial photos and a topographic map indicate that the sand fans east of the landfill bridge lie in a similar environment.

These benches and fans will yield valuable information to determine if they provide adequate slope stability over the long term. However, even if they do provide long-term stability, they will be limited to some areas and must be used with caution. Fills placed into the slough channel constrict the channel and increase the velocity of the current. This increased current would present a risk of increased scour on the opposite shoreline. Such fills will also trigger the City's new cut/fill regulations designed to control flood hazard.

I am confused about the total number of acres planted to-date. The Treatment Accomplishment Record in the Project Status Report lists 14 acres at the top. However acres initially planted in the table itself total up to 19.1. Also, what is the percent survival of all tree and shrub cuttings or plants planted to-date?

Your report suggests interplanting with successful species and also permanent wire protection for remaining and additional black cottonwood at strategic locations. I could tentatively support an amendment to the Statement of Work item 10 for contract 922319 for an additional $25, 460 if it includes the following tasks:

1. Carry out intertplanting of successful species in mutually agreed upon areas of the landfill perimeter bank
2. Carry out interplanting of black cottonwood at locations mutually agreed upon. Black cottonwood shall be at least 20% of total interplantings. All black cottonwood plants,

existing and additional, shall receive permanent wire protection sufficient to prevent predation by beavers.

3. Until June 30, 2003 carry out maintenance of the above plants as specified in the City of Portland BES Watershed Revegetation Program, St. Johns Landfill Stabilization 2000 Maintenance Plan.

I invite you to summarize your findings and recommendations regarding the landfill perimeter at a meeting of interested parties scheduled for 2:00 pm, Friday, February 2, 2001 at the St. Johns Landfill Construction Trailer. We will be discussing management strategy for vegetation at St. Johns Landfill. It would be most appropriate to finalize a contract amendment such as the above after that meeting.

Sincerely,

Dennis O'Neil
Program Supervisor

DO:clk
cc: Elaine Stewart, Smith-Bybee Wildlife Refuge Manager, Metro
Nancy Hendrickson, City of Portland BES
Lynn Barlow, City of Portland BES

S:\SHARE\ONE\LETTERS\KRAL01161.DOC

ST. JOHNS LANDFILL — ACCOUNTING STATUS REPORT: DECEMBER 2000

agreement/IGA no., explanation	dates of agreement	acres	BES Paid to Date	METRO Cost Share	METRO Paid to Date	METRO amt outstanding	Add'l Amounts Proposed	invoice #	invoice date	chk #	chk date
PERIMETER		14									
905373	12/96 - 12/00		$35,000	$77,740							
Amendment #2 (2/5/98)	extends #905373 to 12/03				$37,340			240067	04/30/98	10591	05/22/98
					$1,000			240013		222102	01/10/97
905373 for FY 98/99					$20,700			240087	05/05/99	23679	05/28/99
					$7,800			300027	06/05/00	37425	06/23/00
TOTAL					*$66,840*	*$18,900*					
SLOPE STABILIZATION 2000		1.8									
installation 99/01				$23,177	$23,177			300012	05/01/00		
maintenance 00/01				$1,549		$1,549					
TOTAL					*$23,177*						
ENGINEERED SLOPES 2001		1									
IGA	8/4/00 - 12/31/03			$67,519		$42,154	$25,366				
TOTAL					*$0*						
GRAND TOTAL			$35,000		$90,017	$54,603	$25,366				
BES + Metro combined total Funding to date:				$125,017							
METRO outstanding, incl. Add'l. Proposed amt:				$79,969							

(per Tasks explained in Amendment No. 2 to original IGA)

FY COSTS	96/97	97/98	98/99	99/00	00/01	01/02	02/03	contingency	total 96-03
	$1,000	$37,340	$20,700	$7,800	$2,800	$2,300	$2,800	$3,000	$77,740
					$1,549				
					00/01	01/02	02/03	03/04	total 00-04
					$60,809	$3,248	$1,731	$1,731	$67,519
FY totals outstanding:					$65,158	$5,548	$4,531	$1,731	

	2000/2001	2001/2002	2002/2003	2003/2004	TOTAL
IGA 2000	$ 60,808.99	$ 3,248.10	$ 1,731.20	$ 1,731.20	$ 67,519.49
IGA 1999	$ 1,549.08	$ -	$ -	$ -	$ 1,549.08
IGA 1996	$ 2,800.00	$ 2,300.00	$ 2,800.00	$ -	$ 7,900.00
TOTAL	$ 65,158.07	$ 5,548.10	$ 4,531.20	$ 1,731.20	$ 76,968.57

as of 12/20/2000

PROJECT STATUS REPORT

Site(s): St. John's Landfill
Date: December 2000
Landowner: METRO Regional Environmental Management

Contact: Dennis O'Neil, St. John's Landfill Supervisor
METRO REM

Totals To Date:	
Acres Planted:	14
Feet of Bank Planted:	10,200
Trees Planted:	30,449
Shrubs Planted:	2,709
Pole Cuttings Planted:	26,500
Pounds Seed Sown	170

INTRODUCTON

The Watershed Revegetation Program (WRP) in the Bureau of Environmental Services, City of Portland began revegetating the perimeter of Metro St. John's Landfill in 1996 along the Columbia, Blind, and North sloughs. All plantings, interplantings, and treatments since 1996 are recorded in this report. This report also lists future plantings, interplantings, and maintenance prescribed under existing agreements.

Because of its proximity to and inclusion in the Smith and Bybee Lakes Natural Area, the Landfill is an integral ecological component of the Lower Columbia Slough ecosystem. In accordance with the 1996 and 1999 IGAs, WRP has planted and maintained trees, shrubs, and pole cuttings and seeded native grasses along the landfill perimeter as described in the "Plantings" and "Treatments" tables below and the statistics given at the beginning of this report. These plantings include the "Slope Stabilization" project.

HISTORIC SITE CONDITIONS

Historic and remnant habitats in this area of the Lower Columbia Slough generally consist of a mixed deciduous forest of Oregon ash, black cottonwood, and pacific willow. Other dominant species are *Cornus sericea*, *Sambucus racemosa* and species of willow, with accompanying understory shrubs and herbaceous species of *Symphoricarpos alba*, *Spiraea douglasii*, *Carex aperta*, and *Eleocharis palustris*. Prior to the area's development as a landfill, these species occupied the natural silt levee that now serves as a dike keeping solid wastes and contaminated water from contact with surrounding water bodies.

Much of the original vegetation on the dike has been lost over the years due to physical removal and, increasingly, due to displacement by non-native weeds. In 1996, when the City first partnered with Metro to begin restoring native vegetation around the landfill, most of the dike was covered with a wall of Himalaya blackberry. Only a few scattered patches of ash remained, with a negligible number of native shrubs and essentially no native ground cover.

PROJECT HISTORY

In an attempt to be organic in restoring native vegetation, control of existing weeds was originally limited to manual cutting. Rather than releasing native plants, cutting the blackberry released a Pandora's box of other weeds, including morning glory, nightshade, reed canary grass, and poison hemlock, in addition to vigorously resprouting blackberry canes. Despite repeated attempts to cut back rapidly growing weeds, many planted trees and shrubs were out-competed, or were physically damaged in the process of cutting weeds. More recent efforts at weed control through careful hand-application

of low-toxicity herbicides have been vastly more effective in reducing competition and allowing planted trees and shrubs to survive and grow.

Severe high water, poor soil conditions, drought, and herbivorous animals have also contributed to substantial losses of stocking around the Landfill.

Although there have been numerous setbacks, discernable patterns of planting success have begun to emerge. Oregon ash has done well in most areas. This species has proven to be very tolerant of weed competition and high water levels, as well as resistant to most types of herbivory. The major downfall of this species is meadow voles, which prefer to gnaw the bark of ash over any other. Red osier dogwood from cuttings and rooted stock have proven very hardy under most conditions. Black hawthorn have grown well and are generally free from damage by most animal species except an occasional beaver clip. Snowberry, elderberry, alder, and a few conifers have persisted only above recent spring high water levels. Black cottonwood, which has shown promise to grow rapidly on many parts of the dike, has been almost completely exterminated by beaver. Several thousand have been planted, only a handful remain. Of the grasses and emergent vegetation re-introduced to stabilize the lowest slopes, *Carex aperta* and *C. obnupta* have excelled.

TREATMENT ACCOMPLISHMENT RECORD

Perimeter (incl. "Blind Slough") *Total Acres: 14*

Plant Date	*Planting Type*	*Acres*	*Plants/ Acre*	*Total Plants*	*Species Planted*
3/1/96	Initial	7.1	1345.6	5,969	*Abies grandis, Alnus rubra, Fraxinus latifolia, Populus trichocarpa, Salix sp., Thuja plicata, Cornus stolonifera*
12/18/96	Interplant	7	385.7	2,700	*Populus trichocarpa, Salix sp.*
3/7/97	Initial	1	1044	1,044	*Alnus rubra, Fraxinus latifolia, Populus trichocarpa, Salix sp.*
3/11/97	Initial	11	936.1	9,923	*Alnus rubra, Fraxinus latifolia, Populus trichocarpa, Salix* sp.
10/16/97	Interplant	2	210	420	*Crataegus douglasii*
2/11/98	Interplant	7	659.3	4,615	*Crataegus douglasii, Fraxinus latifolia, Populus trichocarpa, Pseudotsuga menziesii, Salix lasiandra, Thuja plicata, Salix fluvialis*
3/2000	Interplant	?	?	1,110	*Crataegus douglasii, Fraxinus latifolia, Populus trichocarpa, Alnus rubra, Rhamnus purshiana, Sambucus cerulea, Sambucus racemosa, Ribes sanguineum*
3/1/96	Interplant	0.1	500	50	*Cornus stolonifera*
4/1/97	Interplant	12	125.8	1,459	*Crataegus douglasii, Oemleria cerasiformis, Sambucus racemosa, Symphoricarpus albus,*
3/1/98	Interplant	1	300	300	*Cornus stoloniferous, Spiraea douglasii*
3/10/99	Interplant	9.5	94.74	2709	*Crataegus douglasii, Rosa pisocarpa, Sambucus racemosa, Sambucus cerulea*
10/14/99	Seeding	2	18.5 lbs/ac	37 lbs	*Agrostis exarata, Bromus carinatus, Elymus glaucus, Festuca occidentalis*
4/14/00	Seeding	6			*Agrostis exarata, Bromus carinatus, Elymus glaucus, Festuca occidentalis*

Treatment Date	*Treatment*	*Acres*
8/20/96	Manual cutting (site prep)	7
6/6/96	Manual cutting	4
8/6/96	Irrigation	7

8/8/96	Manual cutting	10
8/18/96	Irrigation	7
10/20/96	Manual cutting	10
11/12/96	Manual cutting (site prep)	3
3/7/97	Tubing	1
5/14/97	Mulching/scalping	9
5/21/97	Manual cutting	6
7/16/97	Manual cutting	6
8/20/97	Irrigation	4
9/17/97	Manual cutting	8
11/5/97	Manual cutting (site prep)	1.8
2/11/98	Tubing	7
2/18/98	Tubing	2
3/1/98	Staking	1
5/18/98	Manual cutting	1
5/21/98	Manual cutting	2
5/30/98	Mulching/scalping	2
8/7/98	Manual cutting	2
8/18/98	Irrigation	4
10/31/98	Manual cutting	10
4/12/99	Mulching/scalping	0.3
9/1/99	Herbicide application	4
9/28/99	Manual cutting	0.5
9/28/99	Mowing	2
2/24/00	Herbicide application	6
5/27/00	Mulching/scalping	2

Slope Stabilization *Total Acres: 1.8*

Plant Date	*Planting Type*	*Acres*	*Plants/ Acre*	*Total Plants*	*Species Planted*
? 2000	interplant	1	1,110	1,110	*Alnus rubra, Crataegus douglasii, Fraxinus latifolia, Populus trichocarpa, Rhamnus purshiana, Ribes sanguineum, Sambucus racemosa, Sambucus cerulea*
? 2000	Interplant Pole cuttings	1	26,500	26,500	*Cornus stolonifera, Salix sp.*

Treatment Date	*Treatment*	*Acres*
6/27/00	Mulching/scalping	13.6

East Side 1998 *Total Acres: 2*

Plant Date	*Planting type*	*Acres*	*Plants/ Acre*	*Total Plants*	*Species Planted*
2/18/98	Initial	2	902	1,804	*Acer macrophyllum, Crataegus douglasii, Fraxinus latifolia, Populus trichocarpa, Rhamnus purshiana, Salix lasiandra, Thuja plicata, Salix fluviatilis*

Engineered Slopes *Total Acres: 3.2*

Plant Date	*Planting type*	*Acres*	*Total pounds*	*Species Planted*
10/00	Initial	3.2	~25	450g *Helenium autumnale*, 900g *Bidens cernua*, 20 lbs *Tritecum* sp. 2 Agrostis exarata 1 Deschampsia caespitosa .75 Eleocharis palustris .75 Alopecurus geniculatus

CURRENT MONITORING RESULTS

Recent monitoring (November 2000) revealed an average of 483 planted trees and 216 shrubs per acre around the Landfill perimeter. *Cornus sericea* and *Fraxinus latifolia* are the woody species showing greatest survival. Red alder, Douglas-fir, and western redcedar, snowberry and red elderberry are doing well on the highest elevations above spring high water. Only a few widely scattered cottonwood remain. Remnant cottowoods are generally very large and healthy (probably beacons for hungry beaver).

Plant distribution is highly variable, with some clumps of dense stocking interspersed with large non-stocked or poorly stocked areas. Trees average between 3 and 4 feet in height, with some of the largest cottonwood and willow exceeding 15 feet. While most remaining plants are in fair to good condition, past and current animal damage was noted on nearly every monitoring plot.

Cause of mortality:	**Percent of total loss:**
Predation (beaver, nutria, mice)	20
Flooding	15
Poor soil conditions	5
Competition with weeds	20

RECOMMENDED TREATMENTS

- Implement actions described in existing IGA's
- Increase "Enhancement" section of new IGA to allow additional interplantings with successful species in selected areas around the perimeter.
- Consider permanent wire protection for remaining and additional planted black cottonwood at strategic locations around the perimeter.

Work remaining under the existing IGA's:

IGA	**Site**	**Work remaining**	**Acres**	**Through FY**
1996 IGA	Landfill perimeter	• Maintenance and monitoring	10	Dec. 2003
2000 IGA	Engineered Slopes	• Planting	1.2	2001
		• Additional perimeter revegetation	5	2001
		• Maintenance, Monitoring, and Reporting		2003