

TULALIP LANDFILL FIVE-YEAR REVIEW REPORT

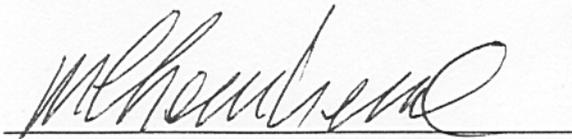
First Five Year Review Report
for
Tulalip Landfill Superfund Site
Marysville, Washington

April 2003

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Date:

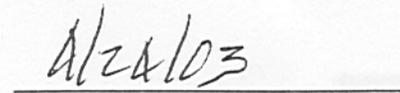


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LIST OF ACRONYMS

<u>Acronym</u>	<u>Definition</u>
ARARs	applicable or relevant and appropriate requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	contaminants of concern
cy	cubic yard
EPA	United States Environmental Protection Agency
FCOR	Final Closeout Report
FS	feasibility study
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	operations and maintenance
PRPs	potentially responsible parties
PSAPCA	Puget Sound Air Pollution Control Agency
RAOs	remedial action objectives
RI	remedial investigation
ROD	Record of Decision
RPM	Remedial Project Manager
USFWS	United States Fish and Wildlife Service
WMI	Waste Management, Inc.

EXECUTIVE SUMMARY

The United States Environmental Protection Agency (EPA) and the Tulalip Tribes have determined that the constructed remedy at the Tulalip Landfill Superfund Site continues to be protective of human health and the environment. This five-year review assessment found that the remedy was constructed in accordance with the Record of Decision and that the remedy is functioning as designed. All environmental threats at the site have been addressed through the containment of contaminated soil and groundwater with the construction of a cover system over the landfill. Institutional controls are effectively controlling access and development in the capped landfill areas.

The 147-acre landfill is located on North Ebey Island within the Tulalip Tribes Indian Reservation in Marysville, Washington. The landfill was operated from 1964 until 1979 during which approximately four million tons of commercial and industrial waste was deposited in the landfill. Because contaminated leachate was seeping out into the nearby wetlands causing concerns for human health and the environment, the site was added to the National Priorities List (NPL) in April 1995. Workers constructed a seven layer cover system over the landfill from June 1998 through September 2000 which has successfully eliminated the seeps. Monitoring of the site will continue indefinitely. On September 18, 2002, EPA finalized the deletion of the Tulalip Landfill Superfund Site from the NPL.

Five-Year Review Summary Form				
SITE IDENTIFICATION				
Site Name (from WasteLAN): Tulalip Landfill				
EPA ID (from WasteLAN): WAD980639256				
Region: 10	State: WA	City/County: Tulalip Landfill		
SITE STATUS				
NPL Status:	Final	Deleted <u>XX</u>	Other (specify)	
Remediation Status (choose all that apply)	Under Construction	Operating	Complete <u>XX</u>	
Multiple OUs?* YES <u>XX</u> NO	Construction Completion date: 02/20/2001			
Has site been put into reuse?	YES		NO <u>XX</u>	
REVIEW STATUS				
Lead Agency:	EPA <u>XX</u>	State	Tribe	Other Federal Agency
Author name: Loren McPhillips				
Author Title: Remedial Project Manager			Author Affiliation: U.S. EPA, Region 10	
Review Period:** <u>06/18/1998</u> to <u>06/18/2003</u>				
Date(s) of site inspection: <u>01/28/2003</u>				
Type of Review:	Post-SARA <u>XX</u>	Pre-SARA	NPL- Removal only	
	Non-NPL Remedial Action Site		NPL State/Tribe-lead	
	Regional Discretion			
Review Number:	1(first) <u>XX</u>	2 (second)	3 (third)	Other (Specify)
Triggering Action:	<u>XX</u> Actual RA onsite Construction Actual RA Start at OU # _____ Previous Five-Year Report Construction Completion Other (specify)			
Triggering Action Date (from WasteLAN): <u>06/18/1998</u>				
Due Date (five years after triggering action date): <u>06/18/2003</u>				
* ["OU" refers to operable unit.]				
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]				

Five-Year Review Summary Form (cont)

Issues:

No significant issues were identified regarding the constructed remedial actions at the site.

A few burrowing animals have left minor tunnels in the bermed surface areas (surface water speed bumps) on the capped area.

Invasive weeds continue to be a concern on the capped area but they are under control through routine mowing.

One warning sign was missing along the perimeter edge (NW Corner) that will be replaced soon.

Recommendations and Follow-up Actions:

On-source Operable Unit

On-going O/M activities need to be continued. Routine mowing has help to control weeds and burrowing animals.

The site needs to be frequently (1-2 months) inspected for burrowing animals during the non-mowing season. As necessary, minor repairs need to made to areas with tunnels or damage.

Off-source Operable Unit

The missing warning sign will be replaced by summer 2003.

Protectiveness Statement(s):

The remedies for both operable units are protective of human health and the environment. All threats at the site have been addressed through containment of contaminated soil and groundwater with the completion of the cover system and the placement of warning/fish advisory signs along the perimeter edge. Institutional controls are effective in controlling access and development to the capped landfill areas.

Other Comments:

**Tulalip Landfill Superfund Site
Marysville, Washington
First Five-Year Review Report**

I. Introduction

The purpose of the Five-Year Review is to determine whether the remedy at the site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

The Agency is preparing this Five-Year Review report pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) § 121 and the National Contingency Plan (NCP). CERCLA § 121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Agency interpreted this requirement further in the NCP; 40 CFR § 300.430(f)(ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

EPA Region 10 conducted this Five-Year Review of the remedy implemented at the Tulalip Landfill Superfund Site (Site) located near Marysville, Washington on the Tulalip Indian Reservation. This review was conducted by the Remedial Project Manager (RPM) for the site from January 2003 through May 2003. This report documents the results of this review.

This is the first Five-Year Review for the Tulalip Landfill Superfund Site. The triggering action for this statutory review is the initiation of the remedial action on June 18, 1998. The Five-Year Review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

The following is a brief summary of site events:

SUMMARY OF SITE EVENTS	
Event	Date
Tulalip Landfill Operated	1964-1979
NPL Listing	April 25, 1995
Remedial Investigation/Feasibility Study Completed	March 1, 1996
Interim ROD Signature	March 1, 1996
Remedial Design Start	August 21, 1997
Consent Decree with Waste Management, Inc., and Tulalip Tribes	March 18, 1998
Remedial Design Completed	May 6, 1998
Remedial Action Start (Construction Start)	June 18, 1998
Final ROD	September 29, 1998
Remedial Action Report	February 22, 2001
Construction Complete (FCOR)	December 3, 2001
Deletion from NPL	September 18, 2002

III. Background

The Tulalip Landfill is located within the Tulalip Indian Reservation on approximately 147 acres of North Ebey Island in the Snohomish River delta, between Marysville and Everett, Washington. North Ebey Island is bordered by Ebey Slough to the north and Steamboat Slough to the south. The Seattle Disposal Company operated the landfill from 1964 until 1979, under a lease from the Tulalip Tribes. The landfill received primarily commercial and construction waste. Three to four million tons of waste is currently contained within the landfill which is also considered the source area.

The landfill was subsequently closed and a perimeter berm was constructed. The surface of the landfill was graded and cover soils were placed at thicknesses ranging from 1 to 12 feet. However, insufficient grading of this cover material resulted in poor drainage and allowed precipitation to collect and eventually infiltrate the landfill surface. As a result, a pool of contaminated groundwater (leachate) formed within the landfill.

Rainwater would soak into the landfill and force the highly contaminated leachate down into the groundwater and out of the landfill into the surrounding wetlands and tidal channels. As contaminants were discharged by these leachate seeps, they were received by the

surrounding wetland areas of Ebey Island (off-source area), which include approximately 160 acres of salt marsh and mudflats surrounding and west of the landfill.

EPA performed a background exceedance evaluation to compare concentrations of soil and sediment contamination in the off-source area with regional soil and sediment background concentrations. Contaminants in the off-source area found to exceed background concentrations include aluminum, arsenic, chromium, and manganese. Concentrations of metals in wetland soil were highest in the areas surrounding most of the leachate seeps adjacent to the landfill berm.

Most of the exceedances were found to be marginally above the background concentrations. However, regional sediment background concentrations of arsenic are relatively high and potentially pose unacceptable risks to human health. Regional soil background concentrations of chromium also potentially pose unacceptable risks to terrestrial ecological receptors.

IV. Remedial Actions

EPA proposed the site to the NPL on July 29, 1991, and added it to the final list on April 25, 1995. The site was divided into Operable Unit 1 (surrounding wetlands) and Operable Unit 2 (on-site or landfill area). In 1996 EPA signed the interim Record of Decision (ROD) for the Tulalip Landfill Source-area (the landfill). A presumptive remedy (landfill cover system) was selected which expedited the design and construction of the on-source remedy. In September 1998 EPA signed the *Final Record of Decision for the Tulalip Landfill Superfund Site On-source and Off-source Remedial Action*.

Remedial Action Objectives (RAOs)

The on-site RAOs are as follows:

1. Zone 1 leachate: Eliminate migration of leachate that exceeds surface water applicable or relevant and appropriate requirements (ARARs) from, through, and under the source area berm.
2. Soil/landfill contents/on-source surface water: Prevent direct contact with, and ingestion of, landfill contents, contaminated soils, and contaminated surface water on the landfill surface.
3. Minimize infiltration: Minimize infiltration into the landfill wastes and resulting contaminant leaching to ground water.
4. Zone 2 ground water: Minimize migration of contaminated ground water at levels exceeding surface water ARARs, and prevent use of contaminated ground water.
5. Storm water runoff and erosion: Prevent detrimental impact to adjacent off-source wetlands and surface water bodies due to storm water runoff from the landfill cap surface.

6. Landfill gas: Prevent inhalation and release of landfill gas exceeding ambient air standards established by the Puget Sound Air Pollution Control Authority (PSAPCA). Manage landfill gas to prevent stress on a cap system.
7. Wetlands: Minimize loss of off-source wetlands, and mitigate for any destruction of or damage to off-source wetlands from the remedial action.
8. Future land use: Provide final surface conditions suitable for all season subsistence (i.e., hunting and fishing), recreational, and light industrial and commercial use.

Final Remedy Selection

In September 1998 EPA signed the *Final Record of Decision for the Tulalip Landfill Superfund Site On-source and Off-source Remedial Action*. This Record of Decision documented the selection of the final remedy for both the on-source and off-source areas of the site as described below:

On-source Remedy

The interim on-source remedy presented in the March 1, 1996, Record of Decision was adopted as the final remedy for the on-source area. Major elements of the interim remedy included:

- Capping the landfill in accordance with the Washington State Minimum Functional Standards for landfill closure.
- Installing a landfill gas collection system. If necessary, an active gas treatment system could also be installed.
- Monitoring the leachate mound within the landfill, the perimeter leachate seeps, and landfill gas to ensure the selected remedy is adequately containing the landfill wastes.
- Initiating restrictions to protect the landfill cap.
- Providing for operation and maintenance (O&M) to ensure the integrity of the cap system.

The selected on-source remedy was expected to stem the migration of contaminants from the landfill into the surrounding estuary by minimizing the amount of rain water infiltrating the wastes, thereby minimizing the generation of new leachate.

Off-source Remedy

The remedy for the off-source area (wetlands) selected in the final ROD was designed to protect human health and the environment through the continued implementation of placing signs and institutional controls. The major element of the off-source remedy selected in this ROD was to:

- Place and maintain an adequate number of signs to prohibit access to contaminated wetland areas and the consumption of fish and shellfish from those areas.

Remedial Construction Activities

On May 6, 1998, the remedial design for the on-source cover system was approved by EPA in consultation with the Tulalip Tribes. Construction of the cover system began on June 18, 1998, and took slightly more than 2 years to complete. EPA then conducted a pre-final inspection on September 26, 2000, in conjunction with the Tribe, and developed a punch list of outstanding items. Those items were addressed in early October 2000, and the final walk-through was conducted on October 17, 2000. At that time, EPA in consultation with the Tribe, determined that the constructed remedy was operational and functional.

The following RA activities were performed by Waste Management, Inc. (WMI), according to design specifications set forth in the 1998 RD package:

- Regrading and preparing a crowned shaped sub-base over the entire site by excavating and relocating waste (approximately 440,000 cy) and importing a significant amount of clean fill (approximately 410,000 cy);
- Constructing a passive gas collection system in the waste so that a gas treatment system could easily be added later if necessary;
- Placing and compacting a 12" foundation layer (sand) over the sub-base and gas collection system (approximately 320,000 cy);
- Constructing a liner system (approximately 158 acres) over the foundation layer. The liner system includes a flexible membrane liner to minimize infiltration of water into the landfill, a geonet for drainage, and geotextile protective liner;
- Placing a 12" layer of topsoil (280,000 cy) over the liner system, construction of a surface water drainage system, and revegetating the landfill; and
- Constructing a locked gate entrance to restrict the access of unauthorized persons and equipment, and posting appropriate warning signs.

The certificate of completion was issued on February 20, 2001. Operation and maintenance will be conducted for a minimum of 30 years from that date, the first four years by WMI and the next 26 years by the Tulalip Tribe. The Remedial Action Report which was prepared by WMI, was approved on February 22, 2001.

Currently the Tribe does not have plans for any specific future use of the site. The Tribe has adopted an enforceable tribal ordinance and have placed signs prohibiting access to and the consumption of shellfish in the nearby wetlands. The Tribe has also adopted deed restrictions and signed a consent decree which prevents activities that may disturb the integrity of the cap.

Operation and Maintenance (O&M)

The O&M Plan was approved on June 6, 2001. O&M activities to be performed include monthly site inspections for the first year and then quarterly inspections thereafter. Items to be inspected include landfill grades (surveys), surface water control systems, erosion, vegetation, infiltration collection system, gas collection system, roads, piezometers, site security and signs.

Other activities include routine mowing, flushing the drainage pipes and repairing them as necessary, weed control, and rodent control. Monitoring will also be conducted quarterly for landfill gas and leachate seeps, and monthly for leachate levels. O&M activities will be conducted by WMI for the first 4 years and by the Tulalip Tribe for a minimum of the next 26 years. The visual inspection of the site for this Five-Year Review confirmed that the condition of the cap still provided the protectiveness required by the ROD.

V. Progress Since Last Five-year Review

This is the first Five-Year Review for the site.

VI. Five Year Review Process

The formal Five-Year Review site inspection was conducted on January 28, 2003. The EPA project manager coordinated with the involved parties and lead the site inspection. The team consisted of the EPA Project Manager, the Tulalip Tribes Environmental Officer, the potentially responsible parties' (PRPs) O&M Manager, and the PRPs Project Engineer. The EPA project manager also prepared this Five-Year Review Report.

Community Involvement

Generally, the construction of the on-site landfill cover system was not of great interest to the public. Most of the public interest was focused on the truck hauling routes to and from the site and keeping road surfaces clean. In response to citizen concerns, some of the truck traffic was rerouted away from certain areas. Other than through direct tribal contact, EPA has not received any feedback on this site.

A display add was place in the Everett Herald on March 1, 2003, requesting comments on the 5-year review. No comments were received. A notice to the community will be sent to those on the site mailing list indicating that this Five-Year Review has been completed and that the site is still protective.

Document Review

The Five-Year Review included the review of relevant documents including the Interim ROD, Final ROD, and quarterly Monitoring reports. A list of the documents reviewed is attached (Attachment 3).

• Data Review and Monitoring Results

Monitoring has been and will continue to be conducted quarterly for landfill gas and leachate seeps, and monthly for leachate levels. Detailed monitoring information can be found in the

quarterly "Post Closure Monitoring Reports," currently being submitted to EPA by WMI. A discussion of the existing sampling data is as follows:

- **Leachate Seep Discharge Rates**

The Record of Decision indicated that the selected remedy is expected to attain the surface water ARARs by stemming the flow of contaminants from the landfill. The remedy would cut off infiltration of rain water through the waste, thus minimizing the generation of new leachate. As the existing leachate mound within the waste dissipates, the perimeter seeps were expected to cease to flow within approximately two years.

During the Remedial Investigation in 1994, eleven seeps were identified. These seeps were sampled and measured six times over the course of a year. Individual seep flow rates averaged between 4.5 gallons/minute (gal/min) to approximately 0.1 gal/min. Generally flow rates were highest during the winter and spring. Historically, the average total site flow rate was approximately 7-8 gal/min. Recent data collected from the same locations (after construction of the cover system), indicated most of the time the old seeps had no flow. One old seep occasionally had a flow of less than 0.1 gal/min but no concentrations above detection limits for the contaminants of concern. This results represents about a 98-99 % reduction in total site flow rates of the seeps.

- **Leachate Levels**

The Record of Decision indicated that, "by minimizing infiltration of rain water into the landfill, the height of the leachate mound in Zone 1 will fall." During the feasibility study (FS), it was estimated that the leachate seeps would be significantly reduced if the leachate mound dropped 2 feet. Five piezometers were installed to monitor the height of the leachate mound.

The initial data looks acceptable and meets the goals set in the ROD. All of the piezometers have displayed a reduction in leachate levels with the site average dropping an approximately 4.9 feet from November 2000 to December 2002.

Leachate Level Elevations		
Location	Elevation November 2000 (feet)	Elevation December 2002 (feet)
Piezometer 1	22.04	19.91
Piezometer 2	28.36	22.79
Piezometer 3	16.06	12.08
Piezometer 4	16.34	13.51
Piezometer 5	23.52	13.41

- **Landfill Gas Monitoring**

As expected for this landfill, the results of the initial monitoring for landfill gas indicates that landfill gas production is extremely low. The Tulalip Tribe has also taken gas samples, which support the existing data. Flow rates and emissions were well within the acceptable local limits. Based on this existing information, an active gas treatment system is not currently being required.

- **Landfill Observations**

In addition to monitoring as described above, WMI contractors are also conducting periodic site inspections. Separately, EPA and Tulalip Tribes have also conducted site visits and inspections. All parties agree that the seeps have been virtually eliminated. Wetlands that were stressed have grown back to the edge of the landfill perimeter wall and now appear to be healthy. Certain areas that were very soft and un-walkable, are now firmer indicating that the seeps are under control.

Site Inspection

A site inspection was conducted on January 28, 2003. The inspection team consisted of the EPA Project Manager, the Tulalip Tribes Environmental Officer, the PRPs O&M Manager, and the PRPs Project Engineer. The Site Inspection Checklist is attached as Appendix 4. This inspection was utilized to assess the protectiveness of the remedy for the First Five-Year Review.

No significant issues were identified regarding the constructed remedial actions at the site. Some O&M issues were noted with regards to the cover system (landfill cap). A burrowing animal has dug a couple of shallow tunnels in two of the surface berms (mounded rows of soil built on the landfill surface to control surface water runoff during rain events) on the capped area. Invasive weeds continue to be a concern on the capped area but they are under control through routine mowing. One warning sign was missing along the perimeter edge (NW Corner) that will be later this summer. These minor items in no way compromised the integrity of the cap or its function.

VII. Technical Assessment

The technical assessment is based on three questions.

Question A: Is the remedy functioning as intended by the decision documents?

The review of the documents and the results of the site inspection indicates that the remedy is functioning as intended by the ROD. Capping the landfill has reduced the continued leaching of contaminants of concern (COCs) from the wastes and the seeps have been virtually eliminated. The capping of the contaminated wastes has achieved the remedial objectives to minimize the migration of contaminants to groundwater and prevent direct contact with contaminants in the landfill.

The cover system is being maintained for cap integrity. However, there was some evidence of minor problems with burrowing animal(s) that will need to be watched. No

deep-rooted plants have established themselves on the cap. Institutional controls have been put into place. Access to the landfill is controlled by a security gate and institutional controls. During the site visit, nothing was observed that would suggest that the institutional controls were ineffective or had been violated.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

There are no changes in the conditions of the site since the construction completion that would affect the protectiveness of the remedy.

- Are there any Changes in Standards and To Be Considered?
There have been no changes that would impact the remedy. Implementation of the remedy was based upon a presumptive remedy. The discharge (seeps) to the wetlands has been eliminated. In addition, the ROD specifically indicates that no groundwater monitoring for contamination is required.
- Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics
There have been no changes that would impact the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The United States Fish and Wildlife Service (USFWS) has express concern that osprey in the greater Everett Harbor area have historically had a high incidence of deformities in baby chicks. However, no deformities were noted among the young ospreys in a recent 2002 survey. Monitoring has demonstrated that the remediated landfill represents only a minor source of contamination to the highly industrialized Everett Harbor. EPA welcomes the opportunity to discuss ways to evaluate the perceived osprey problem on a larger harbor-wide basis with the USFWS. No other information has become available that suggest that the remedy is not protective of human health and the environment.

Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the Final ROD and the constructed remedy is protective of human health and the environment. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. There are no changes in standards or toxicity factors for the COCs that would affect the protectiveness of the remedy. There is no other information that has surfaced that would impact the protectiveness of the remedy.

A discussion of the on-site RAOs and how the remedy meets the RAOs is as follows:

1. Zone 1 leachate: Eliminate migration of leachate that exceeds surface water ARARs from, through, and under the source area berm.

- As discussed the seeps that exceed surface water ARARs have been eliminated. The landfill cap is functioning as designed.

2. Soil/landfill contents/on-source surface water: Prevent direct contact with, and ingestion of, landfill contents, contaminated soils, and contaminated surface water on the landfill surface.

- The landfill cover system prevents direct contact with the contamination and landfill contents.

3. Minimize infiltration: Minimize infiltration into the landfill wastes and resulting contaminant leaching to ground water.

- The landfill cover system minimizes infiltration into the landfill waste.

4. Zone 2 ground water: Minimize migration of contaminated ground water at levels exceeding surface water ARARs, and prevent use of contaminated ground water.

- The landfill cover system minimizes migration of contaminated ground water and tribal real estate title encumbrances prevent the use of contaminated ground water.

5. Storm water runoff and erosion: Prevent detrimental impact to adjacent off-source wetlands and surface water bodies due to storm water runoff from the landfill cap surface.

- The landfill cover system prevents detrimental impacts to wetlands due to storm water, by directing the storm water into a surface water collection system. That system conveys the water off the site through energy dissipaters into natural existing channels in the wetlands.

6. Landfill gas: Prevent inhalation and release of landfill gas exceeding ambient air standards established by PSAPCA. Manage landfill gas to prevent stress on a cap system.

- Landfill gas is well within acceptable standards established by the local air pollution control agency. The gas collection system is designed to minimize stress on the cover system. An active gas treatment system is not necessary.

7. Wetlands: Minimize loss of off-source wetlands, and mitigate for any destruction of or damage to off-source wetlands from the remedial action.

- The design and construction minimized the loss of off-source wetlands.

8. Future land use: Provide final surface conditions suitable for all season subsistence (i.e., hunting and fishing), recreational, and light industrial and commercial use.

- The final surface of the cover system is a vegetative layer (grass and clover) that meets the future land use requirements as documented in the, "Routine Use of the Tulalip Landfill (February 2002)."

Additional RAOs for the off-source area were achieved through a combination of the selected remedy for the on-source area (landfill cover system) and the off-source area (signs and institutional controls). Completion of the construction of the landfill cover system and a return of a healthy wetland community adjacent to the landfill provides assurance that the site no longer poses significant threats to human health or the environment. The only remaining activity to be performed is routine O&M that will be conducted by WMI and the Tulalip Tribe for a minimum of 30 years.

VIII. Issues

No significant issues were identified regarding the constructed remedial actions at the site. The following items were identified as minor issues during the site inspection:

- A few burrowing animals have left minor tunnels in the bermed surface areas on the capped area.
- Invasive weeds continue to be a concern on the capped area but they are under control through routine mowing.
- One warning sign was missing along the perimeter edge (NW Corner) that will be replaced soon.

Issues	Affects Protectiveness	
	Yes	No
Burrowing animals have left minor tunnels in the surface berms on the capped landfill area.		X
Invasive weeds continue to be a problem.		X
One warning sign was missing along the perimeter edge (NW Corner).	X	

IX. Recommendations and Follow-up Actions

The following actions were identified during the site inspection. Most actions will be addressed during routine maintenance activities.

- On-going O&M activities need to be continued. Routine mowing has help to control weeds and burrowing animals.
- The site needs to be frequently (1-2 months) inspected for burrowing animals during the non-mowing season. As necessary, minor repairs need to made to areas with tunnels or damage.
- The missing warning sign will be replaced by summer 2003.

Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Y/N)	
				Current	Future
Continue on-going O&M activities (Routine mowing).	WMI and Tulalip Tribes	EPA	Ongoing Activity	N	Y
Inspected for burrowing animals.	WMI and Tulalip Tribes	EPA	Ongoing Activity	N	Y
Replace the missing warning sign	Tulalip Tribes	EPA	Summer 2003	Y	N

X. Protectiveness Statement

The remedies for both operable units are protective of human health and the environment. All threats at the site have been addressed through containment of contaminated soil and groundwater with the completion of the cover system and the placement of warning/fish advisory signs along the perimeter edge. Institutional controls are effective in controlling access and development to the capped landfill areas.

XI. Next Review

The next Five-Year Review for the Tulalip Landfill Superfund Site is required by May 2008, five years from the date of this review.

Attachments

Attachment 1: Aerial Photograph of the Site

Attachment 2: Site Plan

Attachment 3: List of Documents Reviewed

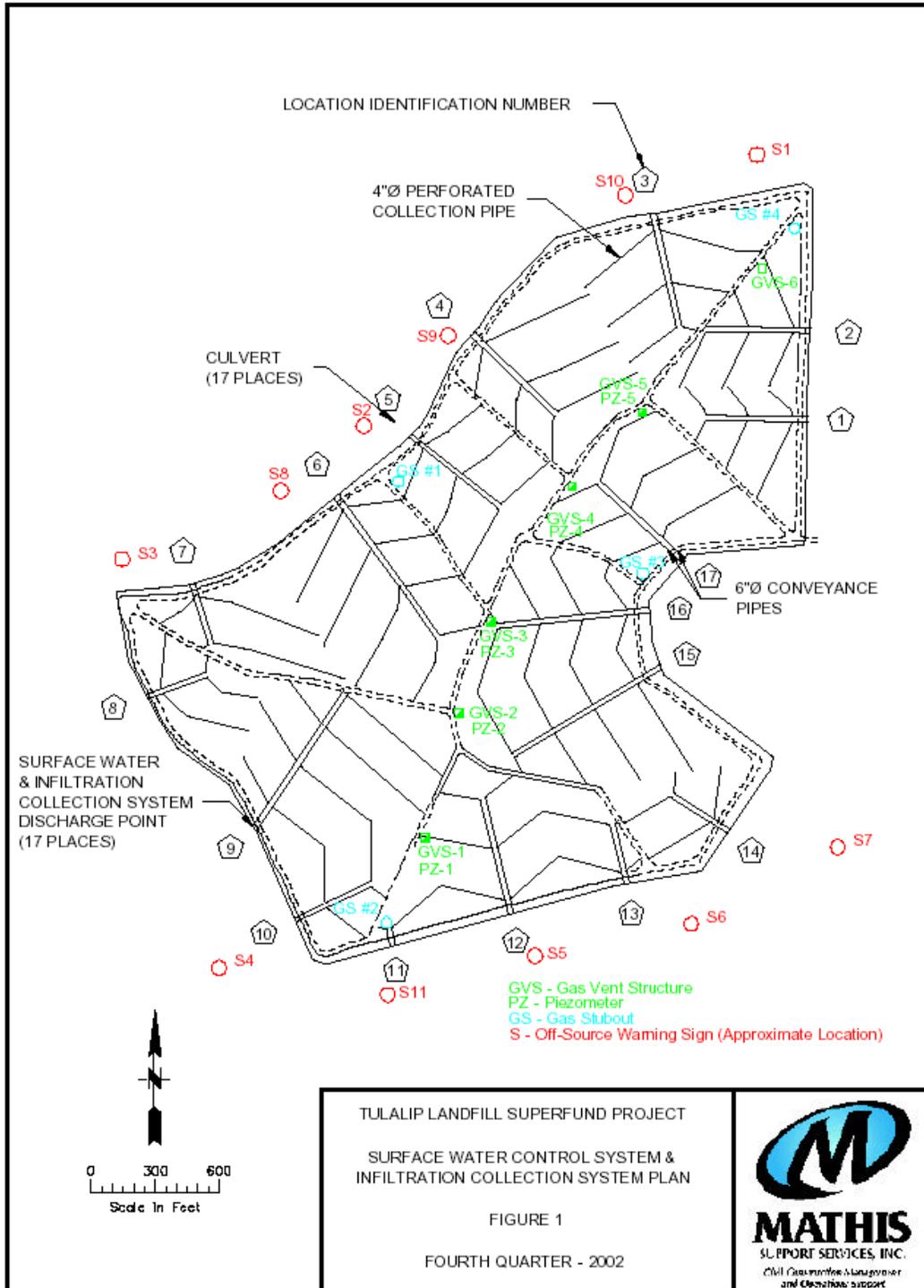
Attachment 4: Five-Year Review Site Inspection Checklist

Attachment 5: Missing Warning Sign

Attachment 1: Aerial Photograph of the Site (Nov. 2000)



Attachment 2: Site Plan



Attachment 3: List of Documents Reviewed

- Record of Decision, Tulalip Landfill Superfund Site Interim Remedial Action, Marysville, Washington, March 1996, U.S. Environmental Protection Agency Region 10.
- Final Record of Decision, Tulalip Landfill Superfund Site On-source and Off-source Remedial Action, Marysville, Washington, September 1998, U.S. Environmental Protection Agency Region 10.
- Tulalip Landfill Remedial Action Report, March 2001, Prepare for Washington Waste Hauling & Recycling, Inc. by SCS Engineers. (complete documentation of the remedial design and construction).
- Final Close Out Report Tulalip Landfill, Marysville, Washington, December 3, 2001, U.S. Environmental Protection Agency Region 10.
- Operations and Maintenance Services Monthly Inspection Report, Tulalip Landfill Superfund Site Marysville, Washington, January 2001, Prepared for Waste Management of Washington, Inc. by Mathis Support Services, Inc.
- Spring 2001 Quarter, Post Closure Monitoring Report Tulalip Landfill, July 6, 2001, Prepared for Washington Waste Hauling & Recycling, Inc. by SCS Engineers.
- Summer 2001 Quarter, Post Closure Monitoring Report Tulalip Landfill, November 2001, Prepared for Washington Waste Hauling & Recycling, Inc. by SCS Engineers.
- Fall 2001 Quarter, Post Closure Monitoring Report Tulalip Landfill, January 2002, Prepared for Washington Waste Hauling & Recycling, Inc. by SCS Engineers.
- First Quarter 2002, Post Closure Monitoring Report Tulalip Landfill, April 2002, Prepared for Washington Waste Hauling & Recycling, Inc. by SCS Engineers.
- Second Quarter 2002, Post Closure Monitoring Report Tulalip Landfill, July 2002, Prepared for Washington Waste Hauling & Recycling, Inc. by SCS Engineers.
- Third Quarter 2002, Post Closure Monitoring Report Tulalip Landfill, September 2002, Prepared for Washington Waste Hauling & Recycling, Inc. by SCS Engineers.
- Forth Quarter 2002, Post Closure Monitoring Report Tulalip Landfill, December 2002, Prepared for Washington Waste Hauling & Recycling, Inc. by SCS Engineers.
- Tulalip Landfill Superfund Project Operations and Maintenance Semi-Annual Report, January 2002 - June 2002, Mathis Support Services (CD)
- Tulalip Landfill Superfund Project Operations and Maintenance Semi-Annual Report, July 2002 - September 2002, Mathis Support Services (CD)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED						
1.						
	O&M manuals	x	Readily available	x	Up to date	N/A
	As-built drawings	x	Readily available	x	Up to date	N/A
	Maintenance logs	x	Readily available	x	Up to date	N/A
2.	Site Specific Health and Safety Plan	x	Readily available	x	Up to date	N/A
	Contingency plan/emergency response plan	x	Readily available	x	Up to date	N/A
3.	O&M and OSHA Training Records		Readily available		Up to date	x N/A
	Remarks:					
4.	Permits and Service Agreements					
	Air discharge permit		Readily available		Up to date	x N/A
	Effluent discharge		Readily available		Up to date	x N/A
	Waste Disposal, POTW		Readily available		Up to date	x N/A
	Other permits		Readily available		Up to date	x N/A
5.	Gas Generation Records	x	Readily available	x	Up to date	N/A
6.	Settlement Monument Records	x	Readily available	x	Up to date	N/A
7.	Groundwater Monitoring Records		Readily available		Up to date	x N/A
8.	Leachate Monitoring Records	x	Readily available	x	Up to date	N/A
9.	Discharge Compliance Records		Readily available		Up to date	x N/A
10	Daily Access/Security Logs		Readily available		Up to date	x N/A
.						

IV. O&M COSTS			
1.	O&M Organization		
		State in-house	Contractor for State
		PRP in-house	x Contractor for PRP
		Federal Facility in-house	Contractor for Federal Facility
		Other: Waste Management is responsible for the first 4-years of O&M, and the Tulalip Tribes for the next 26 years.	
2.	O&M Cost Records	x	Readily available
		x	Up to date
			Funding mechanism/agreement in place
			Funding breakdown attached
	Total annual funding by year for review period if available		
	Date	Total Cost	
	Year 1 (2001)	\$151,354.67	
		Breakdown attached	
3.	Unanticipated or Unusual High O&M Costs During Review Period: None		

V. ACCESS AND INSTITUTIONAL CONTROLS							
A.	Fencing						
	Fencing damaged		Location shown on site map	<input checked="" type="checkbox"/>	Gates Secured		N/A
	Remarks: No damage						
B.	Other Access Restrictions						
	Signs or other security measures						
	Remarks: In addition to locked gates, Authorized Personnel Only and No Trespassing signs are posted at all access points. Signs warning about the danger associated with the consumption of fish and shellfish from the adjacent wetlands are also prominently displayed around the site perimeter.						
C.	Institutional Controls						
1.	Implementation and Enforcement						
	Site conditions imply ICs not properly implemented		Yes	<input checked="" type="checkbox"/>	No		
	Site conditions imply ICs not being fully enforced		Yes	<input checked="" type="checkbox"/>	No		
	Type of monitoring:	Drive by.					
	Frequency:	Monthly					
	Responsible party/agency:	Tulalip Tribes					
	Contact:	Tom McKinsey, Tulalip Tribes:360-651-3279					
	Reporting is up-to-date	<input checked="" type="checkbox"/>	N/A		No		
	Reports are verified by the lead agency	<input checked="" type="checkbox"/>	N/A		No		
	Specific requirements in decision documents have been met	<input checked="" type="checkbox"/>	Yes		No		
	Violations have been reported	<input checked="" type="checkbox"/>	Yes		No		
	Minor vandalism to the old construction shed has occurred during a few weekends during the first year of O/M.						
2.	Adequacy	<input checked="" type="checkbox"/>	ICs are adequate		ICs are inadequate		
	Remarks: No persistent problems identified.						
D.	Other Site Conditions						
	Grass and weed are starting to grow on some of the roads.						

VI. LANDFILL COVERS			
A. Landfill Surface			
1. Settlement		Location shown on map	<input checked="" type="checkbox"/> Settlement not evident
Remarks: One panel (NE Corner) has slightly less than a 2% grade, but there is no evidence of differential settlement or ponding water. The panel still drains very well.			
2. Cracks		Location shown on map	<input checked="" type="checkbox"/> Cracking not evident
Remarks: No evidence of cracking was noted.			
3. Erosion		Location shown on map	<input checked="" type="checkbox"/> Erosion not evident
Remarks: No evidence of erosion was noted.			
4. Holes		Location shown on map	<input checked="" type="checkbox"/> Significant holes not evident
Remarks: Several small shallow holes from field- mice were seen (not a major problem) across the site. At one location though, there was burrowing around a clean out drain in one of the berms. That area needs to be fixed, but there is only minor damaged to the cover layer (no damage to the actual liner). There was no sign of the burrowing animal.			
5. Vegetative Cover (Grass and Clover)	<input checked="" type="checkbox"/>	Cover properly established	<input checked="" type="checkbox"/> No signs of stress
Remarks: Some areas were a little brown but we expect them to green up this spring. Very few weeds at the moment.			
6. Alternative Cover	Remarks: The sea wall and side stabilization walls look good. No evidence of settlement or sluffing was detected.		
7. Bulges		Location shown on map	<input checked="" type="checkbox"/> Bulges not evident
Remarks: No evidence of settlement was noted during the 9-month warranty inspection conducted in May 2002.			
8. Wet Areas/Water Damage		Location shown on map	<input checked="" type="checkbox"/> Water damage not evident
Remarks: No evidence of ponding or seeps. The site drains very well.			
9. Slope Instability		Location shown on map	<input checked="" type="checkbox"/> No Evidence of slope instability
Remarks: No evidence of slope instability.			

VI. LANDFILL COVERS (cont)			
B. Benches			
1.	Flows Bypass Bench (speed-bumps)		
		Location shown on map	x Okay
	Remarks: The benches on-site are generally in great shape.		
2.	Benched Breached		

		Location shown on map	x	Okay
	Remarks: No evidence of cracking was noted.			
3.	Bench Overtopped			
		Location shown on map	x	Okay
	Remarks: No evidence of erosion was noted.			
VI. LANDFILL COVERS (cont)				
C. Letdown Channels				
1.	Settlement			
		Location shown on map	x	Settlement not evident
	Remarks: The letdown channels are in good shape.			
2.	Material Degradation			
		Location shown on map	x	Degradation not evident
	Remarks:			
3.	Erosion			
		Location shown on map	x	Erosion not evident
	Remarks: No evidence of erosion was noted.			
4.	Undercutting			
		Location shown on map	x	Undercutting not evident
	Remarks:			
5.	Obstructions			
		Location shown on map	x	No obstructions
	Remarks:			
6.	Excessive Vegetative Growth			
	x	Vegetation doesn't obstruct flow	x	No excessive growth
	Remarks:			
VI. LANDFILL COVERS (cont)				
D. Cover Penetrations				
1.	Gas Vents (Passive)			
		Location shown on map	x	Good Condition
	Remarks: Vent are functioning properly and are routinely sampled.			
2.	Settlement Monuments			
	x	Located	x	Routinely surveyed
	Remarks: Monuments are tagged to the liner (sit on top of the liner).			

VI. LANDFILL COVERS (cont)				
E. Cover Drainage Layer				
1.	Outlet Pipes Inspected	<input checked="" type="checkbox"/>	Functioning	<input checked="" type="checkbox"/> Good Condition
	Remarks: Outlet pipes are all functional and working well.			
2.	Outlet Rock Inspected	<input checked="" type="checkbox"/>	Functioning	<input checked="" type="checkbox"/> Good Condition
	Remarks:			
VI. LANDFILL COVERS (cont)				
F. Perimeter Ditches/Off-Site Discharge				
1.	Siltation	<input type="checkbox"/>	Location shown on map	<input checked="" type="checkbox"/> Siltation not evident
	Remarks: Only minor amounts of historical siltation were observed. Very clear water was being discharged at all outlets. Some bacterial growth on screened pipe ends.			
2.	Vegetative Growth	<input type="checkbox"/>	Location shown on map	<input checked="" type="checkbox"/> Growth doesn't impede flow
	Remarks: Wetlands have grown back to the edge of the landfill. No signs of stress.			
3.	Erosion	<input type="checkbox"/>	Location shown on map	<input checked="" type="checkbox"/> Erosion not evident
	Remarks: No evidence of erosion was noted.			
4.	Discharge Structure	<input checked="" type="checkbox"/>	Functioning	<input checked="" type="checkbox"/> Good condition
	Remarks:			
VII. MONITORING				
A. Monitoring Data				
1.	Monitoring Data	<input checked="" type="checkbox"/>	Is routinely submitted on time	<input checked="" type="checkbox"/> Is of acceptable quality
	Remarks: Water elevations are collected monthly. Gas flow and concentrations are collected quarterly. Seeps are monitored quarterly. Quarterly reports are submitted to EPA for review.			
2.	Monitoring Data Suggests	<input checked="" type="checkbox"/>	Groundwater plume is effectively contained	Contaminant concentrations are declining

VIII. OVERALL OBSERVATIONS	
1.	Implementation of the Remedy
	Remarks: The cover system is presumptive remedy designed to minimize infiltration and eliminate the major seeps. Careful observation and monitoring has clearly indicated that the cover system is working as designed. The seeps have been eliminated and very few problems have been identified. The sea wall and side stabilization walls look good and there is no ponding of water.
2.	Adequacy of O/M
	Remarks: O/M has been adequate to maintain the long-term protectiveness of the remedy.
3.	Early Indicators of Potential Remedy Problems
	Remarks: The biggest problem at the site is with the control of weeds. Frequent mowing seems to be working. Burrowing animals may also become a nuisance if uncontrolled..
4.	Opportunities for Optimization
	Remarks: For the most part, site activities are already optimized. The frequency of some monitoring maybe reduced.

