

**Five-Year Review Report**

**Third Five-Year Review Report for the  
Martin Marietta Reduction Facility Superfund Site**

**The Dalles  
Wasco County, Oregon**

**Covering December 1999 to June 2005**

**PREPARED BY**

**Fredrick Moore  
Oregon Department of Environmental Quality  
Eastern Region Hazardous Waste Program  
Bend, Oregon**

Approved by:

Date:



Daniel D. Opalski, Director  
Office of Environmental Cleanup  
Environmental Protection Agency, Region 10

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**LIST OF ACRONYMS**

ACL	Alternate Concentration Limit
ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	United States Environmental Protection Agency
CDS	Cyanide Destruction System
CFR	Code of Federal Regulations
DEQ	Oregon Department of Environmental Quality
LCS	Leachate Collection System
MCL	Maximum Contaminant Level
MOA	Memorandum of Agreement
NCP	National Contingency Plan
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
O&M	Operations and Maintenance
OMI Report	Groundwater Operation and Maintenance Report
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RP	Responsible Party

## EXECUTIVE SUMMARY

The Martin Marietta Reduction Facility Superfund Site (Site) is located in The Dalles, Oregon just west of the Columbia River. The facility has historically been used for the production of aluminum. The aluminum production process generated spent potliner waste which contains cyanide, fluoride, and sulfate, which was disposed directly on the ground at the facility. The plant air pollution control system isolates fluoride that was sent to a series of four surface sludge impoundments. At the same time, a permitted landfill that received spent potliner waste was used at the facility. In 1991, the operating portions of the facility were sold to Northwest Aluminum Company, and the sections of the property that remained with Martin Marietta Corporation are now owned by the Lockheed Martin Corporation as a result of a corporate merger.

In 1987, the Site was added to the National Priorities List for environmental evaluation and response after cyanide compounds were detected in the groundwater. In 1988, a Record of Decision was signed documenting the approach that would be taken to clean up the Site. In 1989, Martin Marietta, the Environmental Protection Agency (EPA), and the Oregon Department of Environmental Quality (DEQ) entered into a Consent Decree which required Martin Marietta to implement the remedial action presented in the Record of Decision. Remediation at the facility consisted of excavating and consolidating spent potliner waste and contaminated soil into an existing unlined landfill, identified as the CERCLA landfill; capping the waste with a multi-media cover; constructing a leachate collection system around the landfill perimeter; pumping the liquid from the collection system into a large tank; treating the cyanide in a high temperature/pressure system called the Cyanide Destruction System; and discharging treated liquid through a permitted outfall to the Columbia River. Remediation also included placement of a soil cap over the surface sludge impoundments known as the Scrubber Sludge Ponds. Completion of the remedial action was certified in 1995 and the Site was taken off the National Priorities List in 1996. Ongoing operation and maintenance of the capped areas and treatment system is required, and long-term groundwater monitoring is necessary to measure performance. The protectiveness of the remedy is reviewed every five years, with the first report issued in December 1994 and the second report in December 1999. The permitted landfill, identified as the RCRA landfill, was handled separately by DEQ and went into post-closure status in 2000.

Historically, regulatory oversight at the Site has been performed by an EPA project manager with consultation provided by a DEQ project manager in the Cleanup Program. Regulatory oversight of the RCRA landfill has been the responsibility of a separate DEQ project manager in the Hazardous Waste Program. In order to simplify the oversight process and achieve more efficient use of state and federal resources, a Memorandum of Agreement between EPA and DEQ was signed in 2004 that transfers primary oversight responsibilities across the facility to one project manager under a single regulatory process. Under normal operations, primary oversight is provided by the DEQ Hazardous Waste Program using the RCRA post-closure permit process. The permit identifies the CERCLA areas as Solid Waste Management Units and incorporates by reference the requirements of the 1989 CERCLA Consent Decree. DEQ performs technical and regulatory reviews of CERCLA deliverables, develops the CERCLA five-year review report, and meets the requirements of any CERCLA significant or fundamental remedy change through the RCRA permit modification process. EPA remains the lead at the

Site according to the 1989 CERCLA Consent Decree, providing review and approval of final decisions at the Site.

After project management consolidation occurred, the level of regulatory oversight has still remained high because of innovative treatment technologies proposed and implemented at the facility by Arcadis, the Lockheed Martin contractor. Arcadis has been given temporary authorization to use biotreatment of cyanide in landfill leachate in place of the high temperature/pressure treatment in the Cyanide Destruction System. Biotreatment of the leachate involves a nutrient of sugar or glucose which is introduced as an application to the ground surface where it travels along the base of the CERCLA landfill into the leachate collection system, as a direct injection into the leachate collection system, and as a feed into the collection tank. Arcadis is also testing direct treatment of the cyanide source material in the RCRA landfill. Generally, Arcadis, as the Lockheed Martin contractor and operator at the regulated areas, provides good maintenance and oversight. This facility is a good example how post-closure care can be performed. Arcadis typically provides timely communication of activities and events which allows EPA and DEQ the opportunity to track and direct the various projects and issues.

The remedy continues to control direct and airborne contact with contaminants through the CERCLA landfill and Scrubber Sludge Ponds caps, which provide a primary barrier, and fencing, signage, and on-site institutional controls, which afford additional protection. However, more information is necessary to demonstrate that the remedy continues to minimize contaminant migration from the source areas such that the correct environmental standards are met in surface water and groundwater. First, the protocols that have been developed for treatment of landfill leachate using bioremediation need to be formally adopted and implemented to ensure that treated liquid consistently meets standards for discharge to the Columbia River. Other questions related to the long-term effectiveness of the new treatment technology also must be answered. At the same time, it is now understood that cleanup standards for contamination in groundwater should be set at drinking water levels rather than the alternate levels that were originally developed. A reasonable timeframe should be identified for meeting the correct standards in groundwater, and effective controls to prevent use of contaminated groundwater outside the facility should be described in the interim. Therefore, based on the review of information at the Site, EPA and DEQ have concluded that a protectiveness determination of the remedy at the Site cannot be made at this time until further information is obtained. Currently, Arcadis is processing a RCRA permit modification/CERCLA remedy change that should address these issues, at which time EPA and DEQ will make a protectiveness determination.

**FIVE-YEAR REVIEW SUMMARY FORM**

SITE IDENTIFICATION		
Site name (from WasteLAN): <b>Martin-Marietta Aluminum Co. (Lockheed Martin Co.)</b>		
EPA ID (from WasteLAN): <b>ORD 052 221 025</b>		
Region: <b>10</b>	State: <b>Oregon</b>	City/County: <b>The Dalles/Wasco</b>
SITE STATUS		
NPL status:	<input type="checkbox"/> Final	<input checked="" type="checkbox"/> Deleted <input type="checkbox"/> Other: _____
Remediation status (choose all that apply):	<input type="checkbox"/> Under Construction	<input checked="" type="checkbox"/> Operating <input checked="" type="checkbox"/> Complete
Multiple OUs?*	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Construction completion date: <u>02</u> / <u>10</u> / <u>1995</u>
Has site been put into reuse?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
REVIEW STATUS		
Lead agency:	<input checked="" type="checkbox"/> EPA <input type="checkbox"/> State <input type="checkbox"/> Tribe <input type="checkbox"/> Other Federal Agency _____	
Author name: <b>Fredrick Moore</b>		
Author title: <b>HW Permit Writer</b>	Author affiliation: <b>Oregon DEQ</b>	
Review period:** <u>12 / 01 / 1999</u> to <u>12 / 31 / 2004</u>		
Date(s) of site inspection: <b>March 25, 26 and 27, 2004 &amp; April 6 and 7, 2004</b>		
Type of review: Statutory Post-SARA <input checked="" type="checkbox"/> Pre-SARA <input type="checkbox"/> NPL-Removal Only <input type="checkbox"/> NPL State/Tribe-lead <input type="checkbox"/> Non-NPL Remedial Action Site <input type="checkbox"/> Regional Discretion <input type="checkbox"/>		
Review number:	<input type="checkbox"/> 1 (first) <input type="checkbox"/> 2 (second) <input checked="" type="checkbox"/> 3 (third)	Other (specify): _____
Triggering action: <input type="checkbox"/> Actual RA Onsite Construction at OU # _____ <input type="checkbox"/> Actual RA Start at OU# _____ <input type="checkbox"/> Construction Completion <input checked="" type="checkbox"/> Previous Five-Year Review Report <input type="checkbox"/> Other (specify) _____		
Triggering action date (from WasteLAN): _____/_____/_____		
Due date (five years after triggering action date): _____/_____/_____		

\* ["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'd.

### Issues:

1. Biotreatment; Surface Application of Nutrients: DEQ has submitted a comment to Arcadis wondering about the long term effects of putting molasses on the ground. In the near term molasses can be innocuous, what about the long term. Where does it eventually go and what does it do?
2. Batch Discharge: From the DEQ Notice of Noncompliance in March 2004, it was determined that Cyanide Destruction System tank discharges should be done in discrete batches with a sample confirming the leachate meets treatment standards. A draft batch protocol has been submitted and currently followed. It needs to be reviewed, commented, and made enforceable.
3. Cyanide Destruction System Treatment System: Arcadis has proposed that the high temperature high pressure equipment unit is no longer needed and should be dismantled. The exceedance discharge in Early 2004 brings into question whether this is prudent.
4. Groundwater Pathway at CERCLA landfill: Surface application treatment call into question whether all groundwater pathways end up in the leachate collection LCS system.
5. Fluoride Alternate Concentration Limit: Arcadis requested a new fluoride alternate concentration limit.

### Recommendations and Follow-up Actions:

The following recommendations and follow-up action numbers correspond to the issue numbers above.

1. After the pilot studies are completed, the RCRA permit will be modified to incorporate treatments that will become permanent. If this issue becomes part of a permit modification, this issue can be addressed then per the EPA/DEQ MOA. Resolve Fall 2005
2. Per the EPA/ DEQ MOA, the batch protocol should be finalized and via permit modification made enforceable. Resolve Fall 2005.
3. After the pilot studies are completed, the RCRA permit will be modified to incorporate treatments that will become permanent. If this issue becomes part of a permit modification, this issue can be addressed then per the EPA/DEQ MOA. Resolve Fall 2005.
4. After the pilot studies are completed, the RCRA permit will be modified to incorporate treatments that will become permanent. If this issue becomes part of a permit modification, this issue can be addressed then per the EPA/DEQ MOA. If not covered in a permit modification, then this issue can be addressed either during the RCRA permit five year review due this summer, or, in response to this five-year review report.. Resolve Fall 2005.
5. Additional groundwater monitoring and improved institutional controls are needed Resolve Fall 2005.

### Protectiveness Statement(s):

The remedy continues to control direct and airborne contact with contaminants through the CERCLA landfill and Scrubber Sludge Ponds caps, which provide a primary barrier, and fencing, signage, and on-site institutional controls, which afford additional protection. However, more information is necessary to demonstrate that the remedy continues to minimize contaminant migration from the source areas such that the correct environmental

*standards are met in surface water and groundwater. First, the protocols that have been developed for treatment of landfill leachate using bioremediation need to be formally adopted and implemented to ensure that treated liquid consistently meets standards for discharge to the Columbia River. Other questions related to the long-term effectiveness of the new treatment technology also must be answered. At the same time, it is now understood that cleanup standards for contamination in groundwater should be set at drinking water levels rather than the alternate levels that were originally developed. A reasonable timeframe should be identified for meeting the correct standards in groundwater, and effective controls to prevent use of contaminated groundwater outside the facility should be described in the interim.*

*A protectiveness determination of the remedy at the Site cannot be made at this time until further information is obtained. Further information will be obtained by taking the actions summarized in the paragraph above. It is expected that these actions will be completed as part of the RCRA permit modification/CERCLA remedy change process in the Fall 2005, at which time a protectiveness determination will be made.*

*Arcadis, on behalf of Lockheed Martin, is proceeding with technical reviews, testing, and pilot studies that may in the future even afford more protection of the environment. If successful, such changes will be implemented in accordance with CERCLA regulation, guidance, and policy, and, within the framework of the EPA/DEQ MOA, if effective.*

**Other Comments:**

*No further comments are provided at this time.*

## **Five-Year Review Report Martin Marietta Reduction Facility Superfund Site The Dalles, Oregon**

### **I. INTRODUCTION**

The purpose of the five-year review is to determine whether the remedy at this site is protective of human health and the environment. This report shall identify issues found during the review and identify recommendations to address them.

This is a sitewide statutory five-year review in accordance with 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 judgment 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.*

This requirement is further interpreted in the NCP. At 40 CFR §300.430(f)(4)(ii) it 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.*

Pursuant to a signed Memorandum of Agreement between EPA and DEQ is preparing this five year report for EPA review, approval, and use. This report covers the period between January 1, 1999 and December 31, 2004, except that there will be some references to documents after December 31, 2004. This reports documents the results of a file review, experiences, and inspections from DEQ.

EPA Region 10 conducted the first five year review report in December 1994 and the second review report December 1999. This report is the third five year report and the triggering date is December 1999. This 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 Martin Marietta Reduction Facility Superfund Site (Site) is located in The Dalles, Wasco County, Oregon, just west of the Columbia River and east of the Union Pacific Railroad tracks (Figure 1). Operations were begun at the Site by Harvey Aluminum Incorporated in 1958. Harvey Aluminum became a wholly owned subsidiary of Martin Marietta Corporation in 1970. Martin Marietta continued operations until 1984, when the plant was shut down. In September 1986, Martin Marietta leased a portion of the property to Northwest Aluminum Company. This company resumed primary aluminum operations in late 1986 and eventually bought the plant from Martin Marietta in October 1991. Some sections of the property remained with Martin Marietta and are now owned by Lockheed Martin Corporation as a result of a corporate merger that took place in March 1995.

In Spring 1983, cyanide compounds were detected in the groundwater. The Site was proposed for inclusion on the National Priorities List in October 1984. This is a list compiled by EPA of uncontrolled hazardous substance releases in the United States that are priorities for long-term remedial evaluation and response. In 1987 the Site was formally listed on the National Priorities List and was designated the Martin Marietta Reduction Facility Superfund Site.

In September 1985, Martin Marietta and EPA entered into a Consent Order to conduct a Remedial Investigation/Feasibility Study for the Site. A Remedial Investigation/Feasibility Study is performed to determine the nature of contamination at a site and identify options for cleaning up the area. The investigation concluded that thirteen source areas and a portion of the shallow groundwater zone had contaminant concentrations that exceeded government requirements or health-based standards.

In September 1988, EPA signed a Record of Decision documenting the approach that would be taken to clean up the Site. A summary of the specific cleanup actions required in the Record of Decision are listed in Section II of this report. In 1989, Martin Marietta, EPA, and the State of Oregon Department of Environmental Quality (DEQ) entered into a Consent Decree which required Martin Marietta to implement the remedial action presented in the Record of Decision. At approximately the same time, DEQ instituted closure activities at an onsite RCRA landfill used for disposal of ongoing aluminum production waste (hazardous waste code K088).

Cleanup under the CERCLA Record of Decision began in August 1989 and completion was documented in the December 1994 Remedial Action Construction Report. An Explanation of Significant Differences was signed in 1994 that describes changes to the remedial action selected in the Record of Decision, including the decision to forego treatment of site groundwater, upgrade the landfill leachate processing system to accommodate unexpected volumes of collected liquid, and remove waste at disposal areas at the site recently taken out of facility operation. Completion of the remedial action was certified in February 1995. Subsequently, EPA and DEQ determined that no further cleanup under CERCLA was appropriate and that the selected remedy was protective of human health and the environment. This determination led to

the deletion of the Site from the National Priorities List in July 1996. However, under the 1989 Consent Decree, Lockheed Martin is still required to conduct operation and maintenance and long-term groundwater monitoring at the Site and a review of the protectiveness of the remedy must be performed every five years.

**Table 1 – Chronology of Lockheed Martin Events**

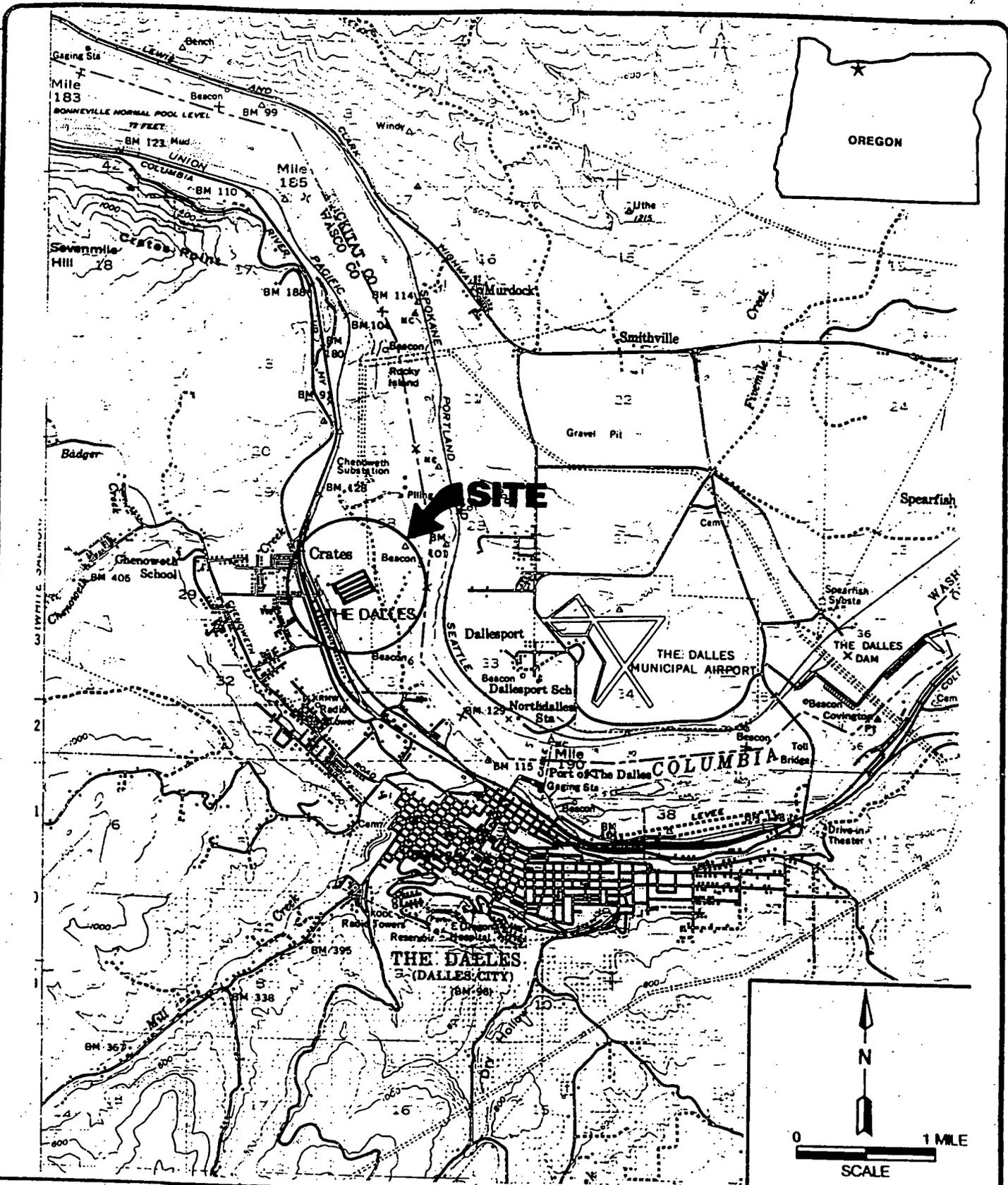
<b>Event</b>	<b>Date</b>
Aluminum production began at site by Harvey Aluminum	1958
Harvey Aluminum becomes subsidiary of Martin Marietta	1970
Spent potliner placed onsite at two locations, currently the site of the CERCLA and RCRA landfills.	1971 – 1984
Cyanide contamination found in soils and groundwater	Spring 1983
Site proposed for inclusion in the National Priorities List [NPL]	October 1984
CERCLA Consent Order issued.	1985
Martin Marietta listed on the NPL	1987
Final Remedial Investigation Report [RI] issued	March 1988
Record of Decision signed	September 1988
Consent Decree signed by Region 10, Oregon DEQ, and Martin Marietta	September 1989
Cleanup operations begin at site	August 1989
Construction activities completed	Fall 1990
Explanation of Significant Differences signed	September 1994
1 <sup>st</sup> Five Year Review Report	December 1994
EPA Region 10 certified completion of the remedial action	February 1995
Lockheed and Martin Marietta merge	March 1995
2 <sup>nd</sup> Five Year Review Report	December 1999

### **III. BACKGROUND**

#### **Physical Characteristics**

The Martin Marietta Reduction Facility Superfund Site contains four distinct land parcels (Figure 2). Three parcels are CERCLA units and the fourth is the RCRA landfill. All parcels are within the boundaries of the Northwest Aluminum industrial facility. The three CERCLA parcels are the CERCLA landfill (approximately 19.5 acres), the Scrubber Sludge Ponds unit (approximately 22.42 acres), and the Cyanide Destruction System which includes a high

DRAFTER:  
 APPROVED:  
 CHECKED:  
 CAD FILE:  
 FILE NO.:  
 PRCT. NO.:



SOURCE: USGS SURVEY MAP



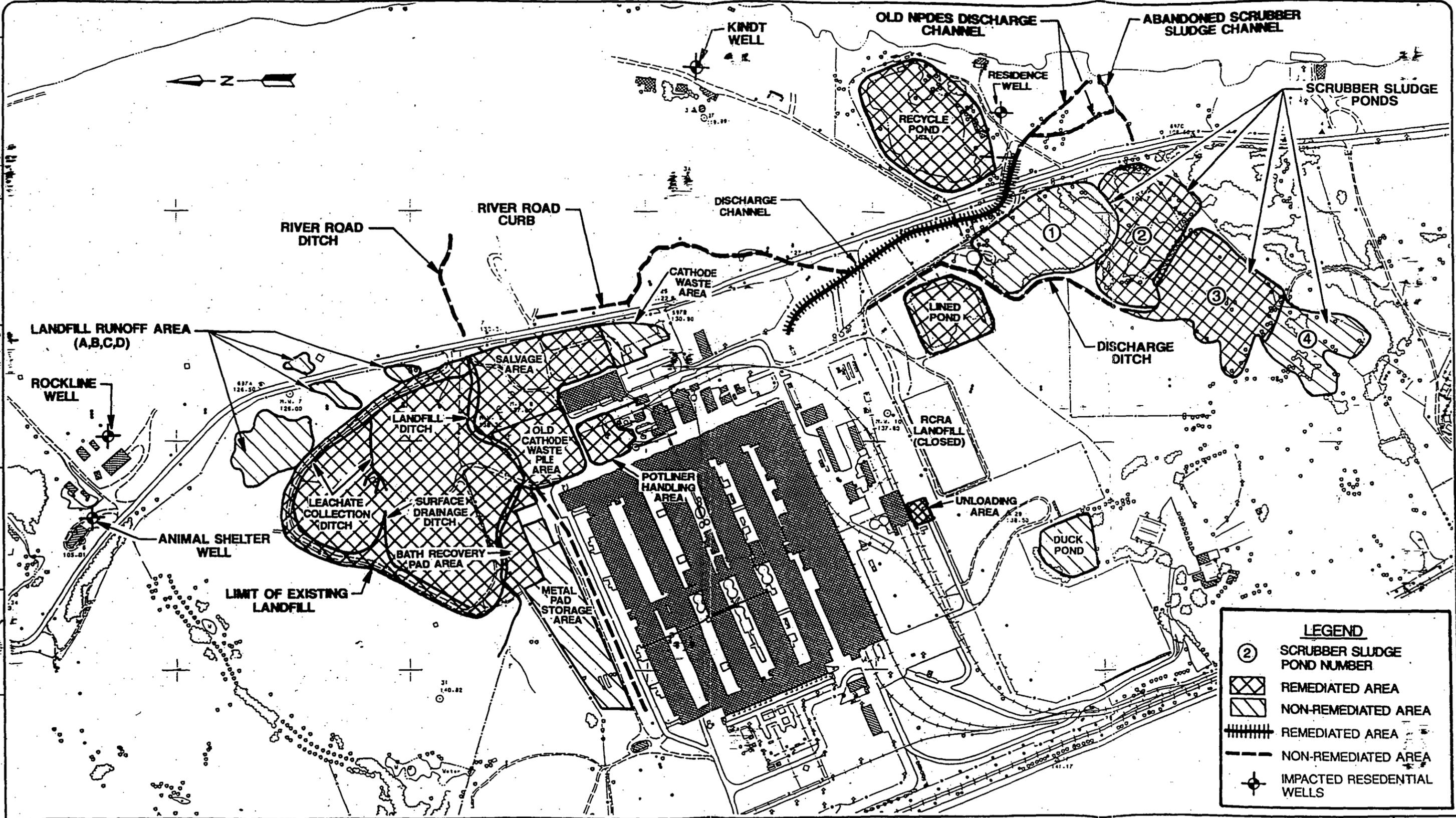
**SITE LOCATION MAP**  
 REMEDIAL ACTION CONSTRUCTION REPORT  
 MARTIN MARIETTA REDUCTION FACILITY  
 THE DALLES, OREGON

FIGURE

1

DWG. DATE

PAPER: 11-11-88  
INCR: 11-11-88  
COMPILER: 11-11-88  
CAD FILE: NON-CAD  
FILE NO.: 11-11-88  
PRCT. NO.: 11-11-88



LEGEND	
②	SCRUBBER SLUDGE POND NUMBER
	REMEDIATED AREA
	NON-REMEDIATED AREA
	REMEDIATED AREA
	NON-REMEDIATED AREA
	IMPACTED RESEDENTIAL WELLS

0 40 FEET  
APPROX. SCALE

**GERAGHTY & MILLER, INC.**  
Environmental Services

**SITE PLAN**  
REMEDIAL ACTION CONSTRUCTION REPORT  
MARTIN MARIETTA REDUCTION FACILITY  
THE DALLES, OREGON

pressure/high temperature treatment system plumbed to two nearby tanks; the largest having capacity of approximately 300,000 gallons (approximately .71 acres). The CERCLA landfill and Scrubber Sludge Ponds are fenced with locked gates and signage. The RCRA landfill is located just south of the Northwest Aluminum facility.

Adjacent to the Northwest Aluminum property is open land, The Port of Dalles commercial area, golf course, rodeo grounds, and a railroad right-of-way. The nearest surface water is the Columbia River, approximately 2,500 feet to the east and Chenoweth Creek approximately 900 feet to the north. The site is not within a 100-year floodplain.

### **Land and Resource Use**

The land in the immediate area is zoned for commercial use and industry.

Groundwater is first found in the S (shallow) aquifer at approximately 120 and 135 feet mean sea level. At the CERCLA landfill, the S aquifer generally flows towards the north. Below that is the A aquifer at 85 to 95 mean sea level. The third monitored aquifer is the B aquifer at 25 to 35 feet mean sea level. Since the remediation, the site and local entities have been put on The Dalles city waterline. The Dalles gets most of its water from a lower aquifer designated as The Dalles Conglomerate geologic unit.

### **History of Contamination**

The aluminum production process generates several byproducts. The reduction of alumina produces spent potliner or "cathode waste" which contains cyanide, fluoride, and sulfate. The plant air pollution control system isolates fluoride. During Martin Marietta facility operation, waste was stored, treated, and disposed on the property.

Cathode waste was staged in the Cathode Waste Management Areas just north of the plant building. These areas included the Old Cathode Waste Pile Area, the Potliner Handling Area, the Salvage Area, and the Bath Recovery Pad Area. Cathode waste was also deposited in the Unloading Area which was located on the opposite side of the plant building. A landfill located north of the Cathode Waste Management Areas was generally used to dispose of construction debris and cathode waste. This landfill is referred to as the "CERCLA landfill." Another landfill at the center of the Site contains only spent potliner. This landfill is referred to as the "RCRA landfill" and is an area handled by the State of Oregon hazardous waste regulations and permitting, historically separate from the CERCLA cleanup process.

The plant air pollution control system "scrubbed" particles from air emissions using water. The Discharge Channel was used to direct scrubber water from the plant to the Recycle Pond located at the south end of the property. This pond was constructed as a settling basin for the wastewater and was designed to recycle water back to the plant for re-use. The Scrubber Sludge Ponds

consisted of four natural ponds located near the Recycle Pond. These four ponds were used to hold sludge that was formed during operation of the scrubber system. The Lined Pond was built to supplement the capacity of the Scrubber Sludge Ponds.

As a result of the waste disposal practices at the facility, soil and groundwater were contaminated with cyanide, fluoride, and sulfate. After cyanide compounds were detected in the groundwater, the Site was added to the National Priorities List in 1987 for environmental evaluation and response.

### **Operation and Maintenance Background**

Operation and maintenance activities from 1990 through December 1999 are discussed in the previous two five year review reports. Operation and maintenance activities from January 2000 to June 2005 are discussed at the end of Section IV of this report.

## **IV. REMEDIAL ACTIONS**

### **Remedy Selection**

Remedial objectives for the Site included both the control of sources of contamination as well as groundwater management for the protection of human health and the environment. Specific objectives in the 1988 Record of Decision for source control at the Site included:

- Minimization of the migration of contaminants from the source areas to the ground water system, surface water, or soils;
- Protection of human health and the environment from potential adverse effects caused by direct contact with contaminants; and
- Protection of human health and the environment from potential adverse effects due to exposure to airborne contaminants.

The selected remedy in the 1988 Record of Decision included the following components:

- Consolidate the residual cathode waste material and underlying fill material from the former Cathode Waste Management Areas into the existing Landfill;
- Consolidate the cathode waste material from the Unloading Area into the existing Landfill;

- Cap the existing Landfill in place with a multi-media cap meeting Resource Conservation and Recovery Act (RCRA) performance criteria;
- Place a soil cover over the Scrubber Sludge Ponds 2 and 3;
- Plug and abandon nearby production wells and connect users to the City of The Dalles water supply system;
- Collect and treat leachate generated from the Landfill, and perched water from east of River Road and from the former Cathode Waste Management Areas;
- Recover and treat contaminated groundwater from the Unloading Area;
- Prepare groundwater quality monitoring and contingency plans to perform additional recovery of ground water in the event that further contamination is detected above required limits;
- Implement institutional controls including deed restrictions and fencing, to assure that the remedial action will protect human health and the environment during and after implementation.

### **Remedy Implementation**

Cleanup at the Site began in August 1989 and completion was documented in the December 1994 Remedial Action Construction Report. Completion of the remedial action was certified in February 1995. Below is a description of the individual components of the cleanup.

#### Cathode Waste Management Areas/CERCLA Landfill

Cleanup of the Cathode Waste Management Areas involved the excavation of material down to basalt bedrock, consolidation of the material into the CERCLA landfill, and backfilling the excavated areas with silt. A multi-layer RCRA performance cover was placed over the waste consolidated in the CERCLA landfill and a Leachate Collection System was constructed around the perimeter. These activities were conducted from Fall 1989 through Spring 1991. Closure of the RCRA landfill was required by DEQ during this same time period.

Leachate is the liquid produced by waste in a landfill. Leachate from the CERCLA landfill is transferred from the Leachate Collection System to a 300,000 gallon above-ground storage tank followed by treatment for cyanide in the Cyanide Destruction System. Leachate from the RCRA landfill is also treated in this system. From the Cyanide Destruction System, liquid is discharged to the Northwest Aluminum wastewater system. Discharge of wastewater from the Northwest Aluminum facility is currently regulated under the State of Oregon clean water regulations and permitting. The permit allows a concentration of 0.1 mg/L of free cyanide to be discharged to the Columbia River. Leachate was first treated in the Cyanide Destruction System in May 1990

and a monthly Cyanide Destruction System Operation and Monitoring Report was submitted which included results from sampling for cyanide in the leachate entering and leaving the system.

The Record of Decision anticipated that leachate from the Landfill would gradually decrease to negligible levels within 5 years after construction of the Landfill cover due to the dry climate at the Site. The initial leachate volume decreased from approximately 1,750 gallons per day down to 570 gallons per day by Fall 1991. However, with the onset of wet weather, leachate levels began to rise again, to as much as 3,100 gallons per day. The source of the increased leachate flow was believed to be perched groundwater infiltrating through fractured basalt bedrock from south of the Landfill into the Leachate Collection System. Groundwater is water that moves deep below the ground surface. Perched groundwater is water that is located in shallow areas below the ground surface. The presence of ponded water collected during precipitation in the area southwest of the Landfill appeared to offer a continual source for recharge to the sub-surface.

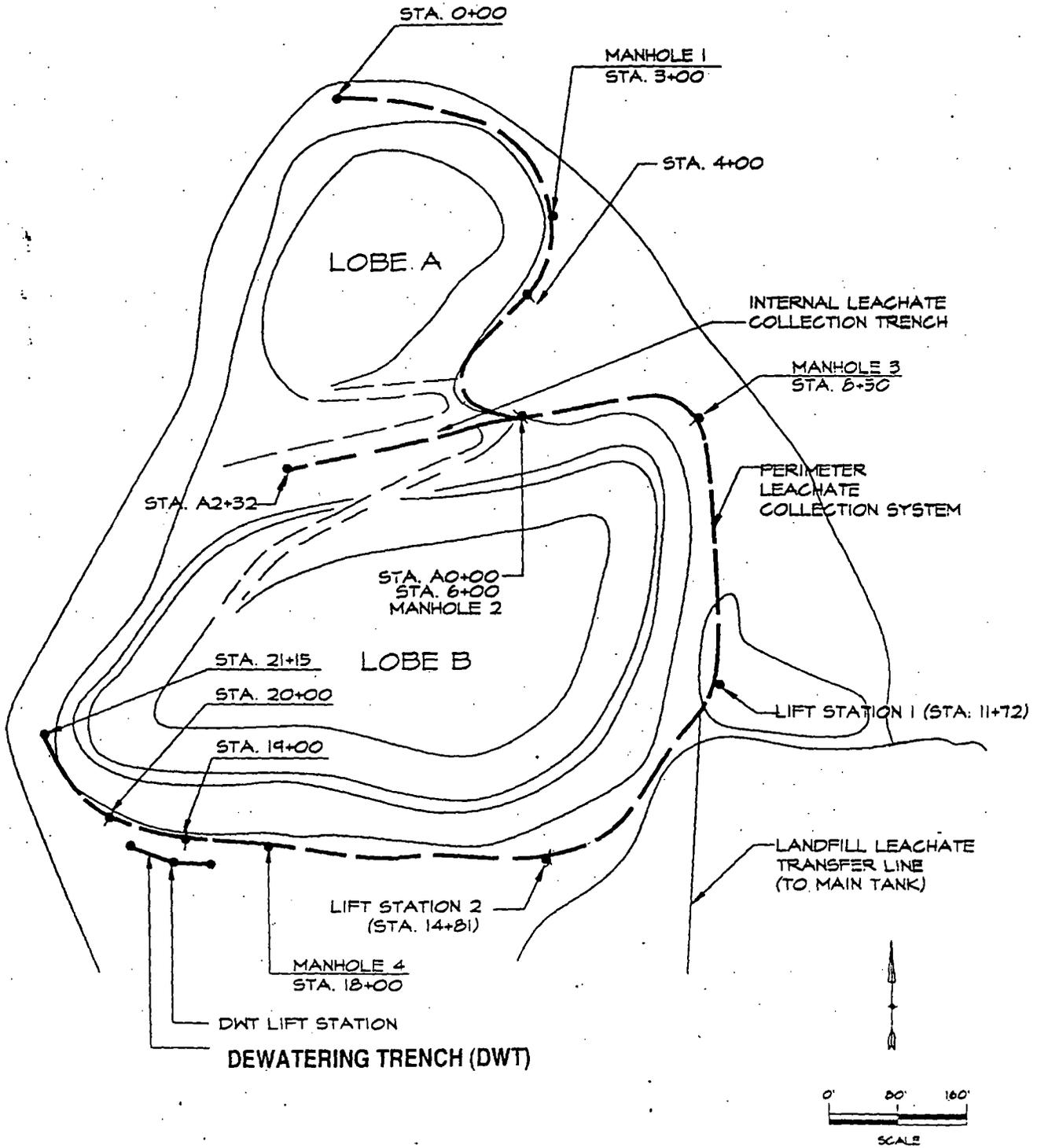
Based on the conclusion that the perched and ponded waters were the driving force behind the infiltration to the Leachate Collection System, several activities were undertaken by Martin Marietta from Fall 1992 through 1993 in response to the increased leachate flow. A De-watering Trench was constructed just outside the southwest corner of the Landfill to prevent perched water from flowing into the Leachate Collection System (Figure 3). As water collected in the trench, it was routinely discharged to the Northwest Aluminum stormwater system. South of the De-watering Trench, a surface water drainage system was installed to lower and divert ponded surface water around the Landfill. A study was also conducted, using a dye to investigate the flowpath of water entering the Leachate Collection System.

Construction of the De-watering Trench and surface water drainage system did not solve the problem. Because the volume of water entering the Leachate Collection System remained high, EPA recommended that the Cyanide Destruction System be upgraded so that it could handle the higher water volume. In November 1994, a new Cyanide Destruction System unit was installed upgrading the 2 gallon per minute system to a 13.5 gallon per minute system. The decision to upgrade the collection and treatment system to accommodate ongoing, high volumes of liquid from the CERLCLA Landfill was documented in the 1994 Explanation of Significant Differences to the 1988 Record of Decision.

#### Scrubber Sludge Ponds/Lined Pond/Recycle Pond & Discharge Channel

The soil cover over Scrubber Sludge Pond 2 and 3 was put in place during the initial phase of cleanup. This work included the placement a minimum of 2 feet of clean silt over the ponds and re-vegetation of the area. Scrubber Sludge Ponds 1 and 4 had been closed and capped before the Site was placed on the National Priorities List. Cleanup of the Lined Pond took place during Fall 1989. The pond liner with the sludge it contained was removed and placed in the Landfill. Work was performed in the Recycle Pond and the Discharge Channel during Fall 1991. The sludge from the Recycle Pond and the lower portion of the Discharge Channel was removed and placed in Scrubber Sludge Pond 3. Six inches of crushed rock was then placed over the

# PLOT PLAN OF CERCLA LANDFILL



excavated areas and Scrubber Sludge Pond 3 was re-covered and re-vegetated. At the end of the year, the Recycle Pond and Discharge Channel were returned to use as part of the Northwest Aluminum modified wastewater treatment system, now called the Storm Water Surge Pond. The decision to perform additional work at the Lined Pond, Discharge Channel, and Recycle Pond was documented in the 1994 Explanation of Significant Differences to the 1988 Record of Decision.

### Unloading Area

Cleanup of the Unloading Area involved the excavation of material down to basalt bedrock, consolidation of the material into the Landfill, and backfilling the excavated area with crushed rock. This cleanup took place during October 1989. Contaminated groundwater in the Unloading Area is discussed in the following section.

### Groundwater

The City of The Dalles water supply was extended to users of the Rockline, Klindt, and Animal Shelter wells during July and August 1990. Drinking water wells were then closed or "abandoned"; the Residence Well in September 1990, the Animal Shelter Well in November 1990, the Klindt Well in October 1992, and the Rockline well in April 1994.

Removal of perched water from east of River Road and from the former Cathode Waste Management Areas was completed by 1991. A small quantity of water was observed east of River Road (estimated to be less than 500 gallons) so this water was allowed to evaporate until it was gone by the end of summer 1991. Perched water from the former Cathode Waste Management Areas was treated in the Cyanide Destruction System.

Treatment of contaminated groundwater from the Unloading Area was required under the Record of Decision. However, it was anticipated that concentrations of fluoride would decrease after cathode waste was removed from the area. Consequently, EPA decided that groundwater in the Unloading Area would be evaluated under an Assessment Monitoring Program. This program required quarterly sampling at monitoring well MW-5S for five years (1989 - 1994). Results showed that the concentration of fluoride was decreasing quickly enough, so treatment of groundwater was not implemented. The decision to forego groundwater treatment at the Unloading Area was documented in the 1994 Explanation of Significant Differences to the 1988 Record of Decision.

Groundwater is sampled once each year to monitor for cyanide, fluoride, sulfate, pH, specific conductance, and temperature (Figure 4). Alternate Concentration Limits were established in the Record of Decision for fluoride at 9.7 mg/L and sulfate at 3,020 mg/L in S aquifer on the site, and free cyanide limits were established based on safe levels for adult consumption on the site at 0.770 mg/L. Maximum Contaminant Levels for drinking groundwater for cyanide, fluoride, and sulfate are 0.220 mg/L, 4.0 mg/L, and 250 mg/L respectively. A Groundwater Monitoring Contingency Plan was developed that lists steps to be taken if groundwater limits are exceeded at the Site. Groundwater monitoring reports are generated annually.

**Table 2 – Groundwater Contaminant Limits**

Aquifer	Groundwater Contaminant Limits			
	Free Cyanide ( $\mu\text{g/L}$ )		Fluoride (mg/L)	Sulfate (mg/L)
	Onsite	Off-site		
S	770	220	9.7 (ACL)	3,020 (ACL)
A	770	220	4	250
B	770	220	4	250

### Institutional Controls

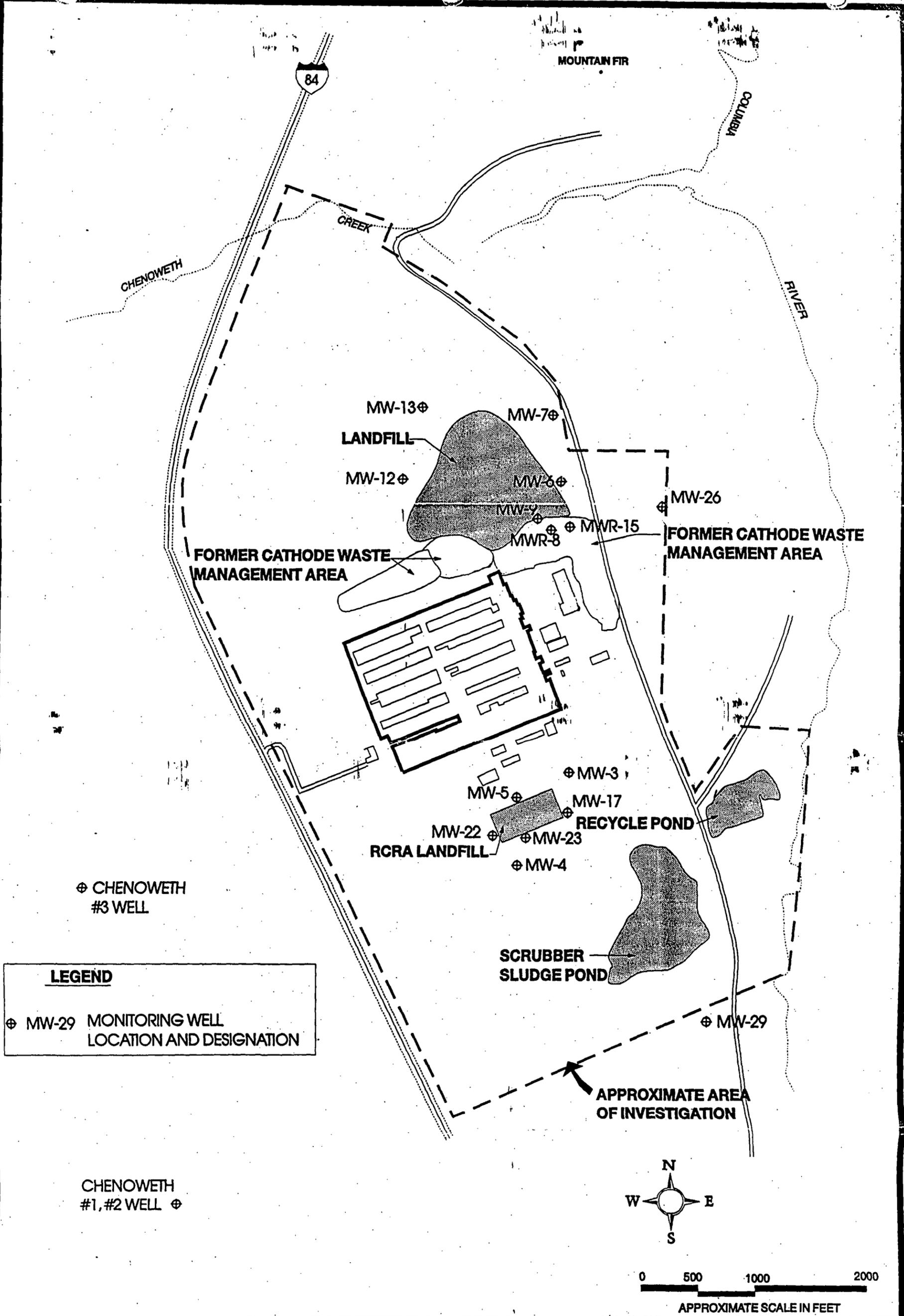
Controls at the Site were installed after cleanup was completed to restrict access to the capped CERCLA landfill and the covered Scrubber Sludge Ponds. Direct access was restricted by the installation of a six foot high chain-link fence with three strands of barbed wire at the top and security gates during the period July to October 1991. In addition, informational placards were posted.

Deed restrictions were implemented when the Martin Marietta property was sold to Northwest Aluminum in 1991. The deed restricts the installation of wells or use of groundwater in the upper aquifer on all property sold. Lockheed Martin retains ownership and control of 48.75 acres of the property consisting of all areas where remediated wastes were encapsulated, the closed RCRA landfill, and Cyanide Destruction System as well as an interconnecting roadway system to all retained property. In addition, Lockheed Martin retains ownership of all wells within the Northwest Aluminum property that monitor groundwater around the encapsulated waste.

### **Operation and Maintenance**

Since Fall 1990, this site has been in operation and maintenance, or otherwise known as post-closure care. Requirements for post-closure care are primarily found in Section 13 of the document Final Report Remedial Action Construction Report, Vol. I March 1992 (Revised 1994). The major components of the operation and maintenance for this site are:

- At least an annual inspection of the CERCLA landfill and Scrubber Sludge Ponds,
- Inspection and maintenance of the leachate collection system that collects then pumps the leachate to the Cyanide Destruction System tank,
- Inspection, operation, sampling and analysis, reporting, and maintenance of the Cyanide Destruction System which treats cyanide to 0.1 mg/L which then is discharged through the Northwest Aluminum permitted outfall to the Columbia River.



**TETRA TECH, INC.**  
 PASADENA, CALIFORNIA

**TARGET REMEDIATION AREAS AND MONITOR WELL LOCATIONS**

Former Martin Marietta Reduction Facility  
 The Dalles, Oregon

**FIGURE**

4

- Tangential to these activities, Lockheed Martin through their contractor Arcadis, also operates, maintains, samples and analyzes, and reports activities at the RCRA landfill in accordance with the DEQ issued hazardous waste post-closure permit.

Oregon DEQ conducted two RCRA and CERCLA inspections in 2002 and 2004. The 2002 inspection was conducted March 25, 26, and 27, 2002, and finalized April 2004. The 2004 inspection was conducted April 6 and 7, 2004 and has not been finalized as of February 25, 2005. Also in 2002 and 2004, DEQ hydrogeologist Marcy Kirk conducted two groundwater inspections which are known as Operation and Maintenance Inspection Reports. A 2002 Inspection Report, 2004 Draft Inspection Report, and 2002 Operation and Maintenance Inspection Report are included in Attachment 2. An overview of operation and maintenance and groundwater monitoring activities is provided below.

Only minor operation and maintenance items were noted at the CERCLA Landfill and Scrubber Sludge Ponds capped areas. Arcadis noticed a possible depression in the CERCLA landfill, and subsequently installed benchmarks for the purposes of surveying any movement in the landfill cover. The Bonneville Power Administration removed trees within the capped pond area that were encroaching on overhead powerlines after receiving regulatory approval for this activity. More significant issues arose related to CERCLA landfill leachate treatment and discharge. In February 2004, Arcadis notified DEQ that sampling results from the Cyanide Destruction System tank were above the discharge limit of 0.1 mg/L for free cyanide, indicating that treated leachate had been discharged to the Columbia River above the limit of 0.1 mg/L. In response to the exceedance, DEQ issued a Notice of Noncompliance with a No Penalty Justification due to the timely notification of the exceedance. In November 2004, tank sampling results were at 0.085 mg/L and 0.113 mg/L for free cyanide. The higher levels of measured cyanide levels occurred following the use of bioremediation to break down free cyanide in the landfill leachate collected in the tank rather than treating the liquid using the high temperature/pressure technology of the Cyanide Destruction System. Arcadis developed a Comprehensive Work Plan for Remediation Activities that included plans to improve the bioremediation treatment system, and continued to work with DEQ throughout the year to address deficiencies with the treatment system.

Important groundwater monitoring-related actions also occurred. In December 2000, Arcadis notified the regulatory agencies that four monitoring wells at the Scrubber Sludge Ponds, MW-18S, MW-19S, MW-21S, and MW-30S, were to be abandoned based on a previous determination that groundwater contamination was found to be consistently low in these wells. The monitoring well at the Scrubber Sludge Ponds that historically had the highest levels of contamination in the area, MW-29S, was retained for future sampling. In April 2001, Arcadis notified the regulatory agencies that the monitoring well measuring groundwater downgradient of the CERCLA landfill, MWR-8S, showed sampling results at 800 ug/L of free cyanide, above the on-site limit of 770 ug/L. In the event of an exceedance of groundwater contaminant limits, the CERCLA Ground Water Monitoring Contingency Plan requires groundwater sampling for eight months, followed by a statistical analysis of the data to determine if the results fall below the statistical confidence interval. Arcadis carried out these activities and submitted a report in August 2002 documenting that levels of free cyanide at MWR-8S are above the appropriate confidence interval. New monitoring wells, MW-38S, MW-39S, MW-40S, and MW-41S, were

recently installed downgradient of the CERCLA landfill as part of ongoing innovative treatment studies.

At the Scrubber Sludge Ponds, groundwater monitoring well MW-29S historically had the highest concentration of fluoride and among the highest of sulfate. Concentrations of fluoride and sulfate in the monitoring well are moderately above the MCLs, but below the Alternate Concentration Limits identified in the 1988 Record of Decision. Although the most recent groundwater sampling results at MW-29S show an increase in fluoride and sulfate levels, the overall sampling results show a downward trend over the last decade. At the Unloading Area, monitoring wells MW-36S and MW-37S are the farthest downgradient wells currently monitoring this area, with MW-37S slightly above Maximum Contaminant Level for fluoride, and where no clear trend in fluoride levels is observed. Contaminant levels are below the Alternate Concentration Limits in this location as well. At the CERCLA landfill, all contaminants are currently below MCLs in downgradient monitoring wells in this area, except in MW-15S and MWR-8S. Cyanide has been measured slightly above the MCL in MW-15S within the last decade, and cyanide measurements in MWR-8S were comparable to the levels in MW-15S during the same timeframe, although a sharp increase in cyanide above the MCL was observed in MWR-8S in 2001 before levels again began to decrease. Groundwater measured at the CERCLA landfill has been below the contaminant levels allowed on-site, except when free cyanide was measured at 800 ug/L in MWR-8S and contingency plan sampling was required. No clear trend in cyanide levels is apparent in these monitoring wells.

Operation, maintenance, and monitoring costs are at this time unknown. Lockheed Martin being the sole responsible party, bears the cost of OM&M. Lockheed Martin is a large national defense and technology corporation and Arcadis is a large international consulting company. At this time it appears that Lockheed Martin and Arcadis currently has, and will have in the foreseeable future, the financial and technical means to implement OM&M activities at this site.

## **V. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW**

The previous five-year review documented in the December 1999 report concluded that the Site remedy continued to be protective of human health and the environment. However, a few deficiencies were noted and corrective measures were required as described in Table 3. In 1999, EPA contacted the Oregon Water Resources Department Wasco County waterwaster and was informed that no new drinking water wells had been permitted downgradient of the facility. In 2001, Arcadis issued a letter demonstrating response to deficiencies with the fencing at the capped areas and groundwater monitoring at the Scrubber Sludge Ponds. A series of evaluation and correspondence took place concerning fluoride levels in the vicinity of the CERCLA landfill, however, this issue was not entirely resolved and will continue to be tracked as part of innovative treatment studies at the CERCLA landfill. Arcadis also added language to the facility survey plat at the Wasco County Courthouse to describe the RCRA and CERCLA units and explain the area should not be disturbed.

**Table 3 – 1999 Five-Year Review Report Deficiencies and Corrective Measures**

DEFICIENCY	CORRECTIVE MEASURE	ACTION TO BE TAKEN BY	OVERSIGHT AGENCY
1. Landfill and pond area fencing	Repair fence and close gaps under fence	Lockheed Martin	EPA/DEQ
2. Site deed restrictions	Attach site restrictions to survey plat	Lockheed Martin	EPA/DEQ
3. De-watering Trench fluoride levels	Identify probable source of fluoride and perform maintenance if necessary	Lockheed Martin	EPA
4. Pond area groundwater monitoring	Sample MW-29S every five years and abandoned wells 18S, 19S, 21S, and 30S	Lockheed Martin	EPA/DEQ
5. Off-site groundwater	Notify nearby properties of historical drinking water well closures	Lockheed Martin	EPA

During the current five-year period, the facility has undergone significant changes that will need to be further assessed in the next five year period. A chronological list of significant occurrences that took place between January 2000 and December 2004 is included in Attachment 2. An overview of significant changes that have occurred during the review period is provided below.

In early 2000, Lockheed Martin contracted with Arcadis to fulfill requirements included in orders, decrees, and permits. Arcadis has been given temporary authorization to use biotreatment of cyanide in landfill leachate in place of the high temperature/pressure treatment in the Cyanide Destruction System. Biotreatment of the leachate involves a nutrient of sugar or glucose which is introduced as an application to the ground surface where it travels along the base of the CERCLA landfill into the leachate collection system, as a direct injection into the leachate collection system, and as a feed into the collection tank. Arcadis is also testing direct treatment of the cyanide source material in the RCRA landfill.

Also in 2000, DEQ issued a RCRA hazardous waste permit for the facility. The permit covers the RCRA landfill and identifies the CERCLA areas as Solid Waste Management Units and incorporates by reference the requirements of the 1989 CERCLA Consent Decree. In 2004, EPA and DEQ signed a Memorandum of Agreement that transfers primary oversight responsibilities across the facility to one project manager under a single regulatory process. Under normal operations, primary oversight is provided by the DEQ Hazardous Waste Program using the RCRA post-closure permit process. DEQ performs technical and regulatory reviews of CERCLA deliverables, develops the CERCLA five-year review report, and meets the requirements of any CERCLA significant or fundamental remedy change through the RCRA permit modification process. EPA remains the lead at the Site according to the 1989 CERCLA Consent Decree, providing review and approval of final decisions at the Site.

## VI. FIVE-YEAR REVIEW PROCESS

Even though remedial action construction has been completed and the site has been taken off the National Priorities List, throughout the last five years there has been frequent communication between EPA, DEQ, Arcadis, Lockheed Martin, and Northwest Aluminum, and therefore there

has been a consistent evaluation of the effectiveness of the remedy. On the other hand, with the one exception of one citizen expressing concern in 2001, public or local government interest in this site has been negligible these last 14 years.

Given this, this five year report more provides a summary of the past five year events than an assessment of future needs. That is to say, this report will have recommendations based on the work that is ongoing at the site rather than any extra review or analysis solely in support of this five-year review.

### **Administrative Component**

The development of an EPA/DEQ Memorandum Of Agreement had been discussed for many months. From these discussions, it was proposed by DEQ that for a five year review, they would collect results from inspections and from work the DEQ Cleanup Section had been doing. In May 2004, the Memorandum Of Agreement was signed between EPA and DEQ which requires in part that DEQ would develop the five year review for EPA review and decision.

Fredrick Moore, DEQ hazardous waste permit writer and lead contact for DEQ for this site was the primary author of this report, with support from DEQ hydrogeologist Marcy Kirk. EPA reviewed and provided comments on a draft of this report.

### **Community Involvement**

As stated previously and reason given, no community involvement was identified as necessary for this five year report. A notice of the completed five-year review report will be published in the local newspaper.

### **Document and Data Review**

The DEQ administrative record for this facility, stored at the DEQ Eastern Region office in Bend was reviewed for this report. Most, if not all CERCLA documents, has been similarly sent to DEQ Bend and the EPA Region 10 office in Seattle.

Groundwater monitoring data has been sent to the Bend and Seattle offices. This data has been reviewed as part of the DEQ OMI reports. Summary of these reports can be found in attachment 2 of this report.

## **Groundwater Data Summary**

In general, the groundwater at the Lockheed Martin facility remains below, but fairly consistently present in, the contaminant limits established in the 1988 Record of Decision for constituents of concern.

Monitoring well MW-29S monitors the Scrubber Sludge Ponds and is known as the Rodeo Well due to its close location to the rodeo fairground at the edge of the property boundary. Every five years it is sampled and the 2004 result is 6.22 mg/L. Given that fluoride levels have not diminished to below the drinking water standard of 4.0 mg/L, but is still below the alternate concentration limit of 9.7 mg/L, it is a recommendation of this report that monitoring at this well be annual.

## **CERCLA Leachate Data**

As has been pointed out in the previous five year reports, leachate generation has not diminished to de minimis flow levels. The source of the increased leachate flow was believed to be perched groundwater infiltrating through fractured basalt bedrock from south of the CERCLA landfill into the leachate collection system, which led to an upgrade to the collection and treatment system that was documented in a 1994 Explanation of Significant Differences to the 1988 Record of Decision. These last five years has shown there are still significant volumes of liquid collected at the CERCLA landfill. Depending on precipitation, the flows can vary from approximately 20,000 gallons per month to 180,000 gallons per month. The liquid still contains levels of total and free cyanide and fluoride. As Arcadis proceeds with their proposals of biotreatment, the issues of CERCLA landfill leachate will receive even more scrutiny.

## **Site Inspections**

As discussed in the "Progress Since the Last Five Year Review" section of this report, DEQ conducted an facility inspection and groundwater OMI inspection in 2002 and 2004.

## **Interviews**

As discussed, there has been consistent communication between the stakeholders and frequent activity at this facility. This has kept all interested parties in contact and informed. Therefore, no interviews took place specifically for this five-year review.

## VII. TECHNICAL ASSESSMENT

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

Qualified yes.

From DEQ's review of the documents and results of the site and groundwater inspections indicate the remedy is functioning as intended by the ROD and its later modifications. The landfill cap is in place and shows no sign of dilapidation, landfill leachate is captured and successfully treated and discharged through the Northwest Aluminum discharge permit. The Scrubber Sludge Ponds soil layer is intact and the unit is fenced and shows no signs of human trespass. Monitoring well MW-29S does, however, show a level of fluoride above the MCL of 4.0 mg/L but below the Alternate Concentration Limit of 9.7 mg/L.

From the inspections, the existing institutional controls are still in place. As discussed, the survey plat had additional language added to make it clear that these units contain hazardous constituents and must not be disturb.

Additionally, Arcadis, on behalf of Lockheed Martin, is proceeding with alternative treatment studies that could lead to lower level of cyanide that must be managed. Nutrients applied upgradient at the surface of the CERCLA landfill travel under the landfill into the leachate collection system and into the collection tank. It is not clear if all of the liquid is collected or if some flow paths may bypass the system.

Groundwater monitoring has continued at this site in general conformance with regulatory requirements and proper sampling, analysis, and reporting.

### **Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?**

No.

ACLs were adopted for fluoride and sulfate in groundwater where a Maximum Contaminant Level (MCL) is a relevant and appropriate requirement.

Arcadis discussed interest in a long-term plan for exclusive in situ treatment of cyanide without the need to collect landfill leachate in the tank. It was acknowledged that bioremediation would not treat fluoride, the other contaminant of concern in the leachate. In order to address fluoride in the leachate, Arcadis submitted a report in May 2004 that presented a technical justification for increasing the fluoride alternate concentration limit (ACL) from 9.7 mg/L to 20 mg/L. Concurrently, EPA recognized that the ACL process in Superfund cannot be used in place of an MCL. At the Former Martin Marietta Reduction Facility, the MCL for cyanide, fluoride, and sulfate are relevant and appropriate requirements for the upper aquifer, where the groundwater could potentially be used as a drinking water source. Therefore, it not appropriate to revisit the

technical basis for the fluoride ACL level as part of a proposal for an entirely in situ treatment of cyanide.

Any future remedy revision document at the Site must identify a plan to meet MCLs outside the waste management areas during a reasonable timeframe and describe controls restricting exposure to contamination in the interim, or demonstrate that MCLs should be waived in accordance with EPA guidance because they are technically impracticable to meet. Currently, groundwater monitoring at the site does not fully delineate areas of contamination above MCLs. Although fencing and deed restrictions are in place to restrict use of groundwater within the facility boundaries, there are no effective controls to prevent use of contaminated groundwater outside the facility. This discussion regarding groundwater protection goals does not preclude evaluation of an entirely in situ treatment of cyanide at the CERCLA landfill where fluoride levels are currently below MCLs in downgradient wells. The possible effect of discontinuing pumping of leachate on the levels of fluoride in groundwater is one of a number of technical questions that must be answered prior to consideration of an exclusively in situ method.

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

No.

One citizen in 2001 voiced concerns that were evaluated by Oregon DEQ. In consultation with Oregon Fish and Wildlife and from an inspection of the surrounding site, DEQ concluded that the CERCLA landfill was not releasing into Chenoweth Creek. Other than that, no evidence of release from the landfill and scrubber pond units has come to light. No evidence of plant stress, gas vapor, discolorations, worker sickness, or any other type of environmental indicator has been found.

**Technical Assessment Summary**

According to the experiences and reviews to date, data reviewed, and the site inspections, the remedy is functioning as intended by the ROD and its later modifications in that the landfill cap is intact, thus the majority of waste is still entombed. Leachate is still being captured and treated but has not diminished to the levels of low flow or either de minimis constituent levels. The success of the surface applications question if all flow paths end up in the LCS.

The Scrubber Sludge Ponds remains fenced and the soil cover intact therefore no surface exposure of hazardous constituents. However, there are still fluoride levels in monitoring well MW-29S suggestive that some amount of contamination may be releasing to the groundwater.

Groundwater at both the CERCLA landfill, Scrubber Sludge Ponds, and at monitoring well MW-5 which is located close to the old Unloading Area and RCRA landfill, show hazardous constituents below the limits established.

More information is necessary to demonstrate that the remedy continues to minimize contaminant migration from the source areas such that the correct environmental standards are met in surface water and groundwater. There are questions concerning the short-term implementation of the new landfill leachate treatment technology and the ability to consistently meet discharge limits, and questions related to the long-term effectiveness of the new treatment technology that must be answered. Also, it is now understood that standards for contamination in groundwater should be set at drinking water levels rather than the alternate levels that were originally developed.

## VIII. ISSUES

The following list describes a number of issues related to the innovative technology being used to treat landfill leachate at the site.

Biotreatment; Surface Application of Nutrients: DEQ has submitted a comment to Arcadis wondering about the long term effects of putting molasses on the ground. In the near term molasses can be innocuous, what about the long term. Where does it eventually go and what does it do?

Batch Discharge: From the DEQ Notice of Noncompliance in March 2004, it was determined that Cyanide Destruction System tank discharges should be done in discrete batches with a sample confirming the leachate meets treatment standards. A draft batch protocol has been submitted and currently followed. It needs to be reviewed, commented, and made enforceable.

Cyanide Destruction System Treatment: Arcadis has proposed that the high temperature high pressure equipment unit is no longer needed and should be dismantled. The exceedance discharge in Early 2004 brings into question whether this is prudent.

Groundwater Pathway at CERCLA landfill: Surface application treatment call into question whether all groundwater pathways end up in the leachate collection system.

In addition, Arcadis requested a new fluoride alternate concentration limit related to the innovative treatment studies. The sections below describe the current status at each waste management area and the environmental monitoring and evaluation needed to delineate areas of contaminated groundwater and control its use. Sampling requirements should be listed in a revised sampling and analysis plan in time for groundwater analysis in Spring 2006. At the same time, institutional controls downgradient of the facility should be implemented and findings recorded following annual site inspections. Trends in groundwater contamination and the effectiveness of institutional controls will be included for evaluation in five-year reviews of the remedy. Upon adoption of any modified remedy, relevant and appropriate groundwater standards and controls at all of the waste management areas would need to be documented in a RCRA Class 2 Permit Modification/Explanation of Significant Differences.

Scrubber Sludge Ponds: In order to demonstrate a downward trend of fluoride and sulfate, sampling at MW-29S should be increased from the current five-year frequency to an annual

event. Because this monitoring well is located at the facility boundary, groundwater monitoring would need to be supplemented with effective institutional controls outside the facility, such as an annual notice of groundwater quality to downgradient entities and a survey of properties to determine if drinking water wells have been installed.

Unloading Area/RCRA Landfill: Sampling of MW-3S and MW-4S should be resumed as an annual event in order to delineate groundwater above the MCL within the facility boundary during the interim timeframe when levels of contamination outside the waste management area remain above the MCL.

CERCLA Landfill: Sampling of the new monitoring wells, MW-38S, MW-39S, MW-40S, and MW-41S, recently installed downgradient of the CERCLA Landfill should continue in order to delineate groundwater above the MCL within the facility boundary during the interim timeframe when levels of contamination outside the waste management area remain above the MCL.

### IX. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Recommendations and follow-up actions are tabulated below. The EPA/ DEQ MOA directs that with Oregon DEQ being the lead at the site, CERCLA changes would be effected as a permit modification with subsequent EPA written approval of the changes placed in the CERCLA administrative record.

With most changes done by modification of the hazardous waste permit, there are three distinct opportunities to modify the permit. First, Lockheed Martin/Arcadis will likely be modifying the permit to institute new and permanent treatment strategies. When this happens, certain items can be discussed and included. Second, based on the final of this five year review report, DEQ can consider this new information and modify the permit on its own initiative.

**Table 4 – 2005 Five-Year Review Report Deficiencies and Follow-up Actions**

Issue	Recommendations/Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Yes/No)	
					Current	Future
1. Biotreatment; Surface Application of Nutrients	After the pilot studies are completed, the RCRA permit will be modified to incorporate treatments that will become permanent. If this issue becomes part of a permit modification, this issue can be addressed then per the EPA/DEQ MOA.	Lockheed Martin	DEQ	Fall 2005	No	Could, yes

2. Batch Discharge	Per the EPA/ DEQ MOA, the batch protocol should be finalized and via permit modification made enforceable.	Lockheed Martin	DEQ	Fall 2005	No	Yes
3. CDS Treatment System	After the pilot studies are completed, the RCRA permit will be modified to incorporate treatments that will become permanent. If this issue becomes part of a permit modification, this issue can be addressed then per the EPA/DEQ MOA.	Lockheed Martin	DEQ	Fall 2005	No	Could, yes
4. Groundwater Pathway at CERCLA Landfill	After the pilot studies are completed, the RCRA permit will be modified to incorporate treatments that will become permanent. If this issue becomes part of a permit modification, this issue can be addressed then per the EPA/DEQ MOA.  If not part of permit modification, this issue can be addressed in response to this Five Year Review Report , or, addressed during the RCRA five year review this summer.	Lockheed Martin	DEQ	Fall 2005	No	Could, yes
5. Fluoride ACL	Additional groundwater monitoring and improved institutional controls	Lockheed Martin	EPA	Fall 2005	No	Could, yes

## X. PROTECTIVENESS STATEMENT

The remedy continues to control direct and airborne contact with contaminants through the CERCLA landfill and Scrubber Sludge Ponds caps, which provide a primary barrier, and fencing, signage, and on-site institutional controls, which afford additional protection. However, more information is necessary to demonstrate that the remedy continues to minimize contaminant migration from the source areas such that the correct environmental standards are met in surface water and groundwater. First, the protocols that have been developed for treatment of landfill leachate using bioremediation need to be formally adopted and implemented to ensure that treated liquid consistently meets standards for discharge to the Columbia River.

Other questions related to the long-term effectiveness of the new treatment technology also must be answered. At the same time, it is now understood that cleanup standards for contamination in groundwater should be set at drinking water levels rather than the alternate levels that were originally developed. A reasonable timeframe should be identified for meeting the correct standards in groundwater, and effective controls to prevent use of contaminated groundwater outside the facility should be described in the interim.

A protectiveness determination of the remedy at the Site cannot be made at this time until further information is obtained. Further information will be obtained by taking the actions described in Section VIII and IX and summarized in the paragraph above. It is expected that these actions will be completed as part of the RCRA permit modification/CERCLA remedy changed process in the Fall 2005, at which time a protectiveness determination will be made.

Arcadis, on behalf of Lockheed Martin, is proceeding with technical reviews, testing, and pilot studies that may in the future even afford more protection of the environment. If successful, such changes will be implemented in accordance with CERCLA regulation, guidance, and policy, and, within the framework of the EPA/DEQ MOA, if effective.

## **XI. NEXT REVIEW**

The next five year review for the Lockheed Martin facility is required by June 2010.

Moore took pictures and notes. Fredrick Moore later talked with Steve Pribryl with the Oregon Department of Fish and Game and Mr. Pribryl stated that Chenowith Creek has historically been a creek of low aquatic activity. After a review with DEQ management, there did not seem anything suggesting that there was a release to Chenowith Creek and no further action was determined. DEQ discussed their decision with the citizen and no further complaints have been noted.

April 23: Diane DeLillio from Arcadis phone Marcy Kirk, the DEQ hydrogeologist, that CERCLA monitoring well MWR-8S latest sampling was reporting an exceedance of free cyanide above 770 µg/l at 800 µg/l. Arcadis was to proceed with resampling.

August 7: Arcadis sent a letter with further discussions of the elevated fluoride levels in the dewatering trench.

December 8: EPA sent a letter with DEQ comments further addressing the elevated fluoride conditions at the dewatering trench.

December 12: Arcadis sent a letter to EPA Region 10 discussing the monthly sampling initiated at CERCLA monitoring well MW-8S. Letter proposes monthly sampling through May 2002 and then submit a statistical analysis to determine if the ACL is exceeded.

## 2002

January 22: Arcadis and DEQ discussed placing benchmarks on top of the CERCLA landfill. Arcadis thought there may have been the start of a depression. By putting benchmarks and then survey them, any subsidence could be measure.

March 18: DEQ sent a letter to Arcadis stating that Section 13 of Final Report Remedial Action Construction Report contains the majority of the post-closure requirements for the site. These conditions would be inspected for at the upcoming March 26 and 27 inspections.

March 20: Arcadis applied molasses at the SW corner of the RCRA landfill hoping the molasses as a nutrient would seep under the landfill, enhance biotreatment, and lower the free cyanide levels as it is collected in the LCS and pumped to the CDS tank. Arcadis did not notify either EPA or DEQ of this activity until some time much later.

March 26 and 27: DEQ conducted an inspection with Fredrick Moore and Marcy Kirk of site components regulated under RCRA and CERCLA, including an inspection of groundwater monitoring.

April 10: EPA issued a letter concurred with the sampling approach for CERCLA monitoring well MWR-8S.

April 26: Arcadis sent a letter to DEQ stating that a pilot tank test showed a promising alternative treatment for free cyanide using nutrients. It was proposed to use this treatment in the larger 300,000 CDS tank..

May: The CDS cyanide treatment unit was turned off due to the current success of the nutrient/biotreatment being used.

May 20: Arcadis sent a letter to EPA and DEQ requesting to set benchmarks on CERCLA landfill.

June 25: EPA, DEQ, and Arcadis signed an approval and change to the Consent Decree for the benchmarks installation.

July 2: DEQ transmitted to Arcadis the 2002 OMI report.

July 29: Arcadis and DEQ attended a meeting in Bend to discuss the molasses/nutrient treatment at the CERCLA landfill and discussed where to go from there.

August 23: Arcadis sent an email stating that the benchmarks were set at the CERCLA landfill.

September: EPA begins work in earnest on a draft MOA between EPA Region 10 and DEQ. The idea for this MOA had been informally discussed previously.

October 9: Arcadis submitted a request for another surface application at the CERCLA landfill. Request contained more technical information.

November 4: DEQ approved another surface application, this time being corn syrup, for the CERCLA landfill.

### 2003

April 28: EPA, DEQ, and Arcadis met in Bend, Oregon, to discuss further steps for treatment at both the CERCLA and RCRA landfill.

May 29: Arcadis requested an additional one-time surface application of nutrients (molasses) at the CERCLA landfill.

June 4: Arcadis submitted a letter containing information as a follow-up from the April 28 letter.

June 25: DEQ issued a letter approving the 5/29 request for a one-time surface application.

June 26: DEQ issued a letter to Arcadis discussing monitoring well elevations. The letter suggests that DEQ will suggest that the CERCLA monitoring wells be re-surveyed as part of the five year review. (The CERCLA monitoring wells were re-surveyed before this five year report).

July 2: DEQ transmitted to Arcadis the 2003 OMI report.

July 16: Arcadis submitted a request to EPA and DEQ to modify the fluoride and sulfate alternate concentration limits.

August 23: DEQ responded in writing to the ACL request raising further issues to address.

October: Through conversation Arcadis informed DEQ that molasses was applied in the dewatering trench. Later sampling showed anomalous elevated levels of chloride, fluoride, sulfate and elevated pH.

October 21: Arcadis sent a letter to EPA and DEQ stating that the Bonneville Power Administration wants to cut down some trees within the fenced Scrubber Ponds because they were encroaching overhead powerlines.

November 14: Arcadis sent a letter stating that two benchmarks were placed at the top of the CERCLA landfill lobes to monitor any possible subsidence.

December 4: DEQ issued a letter approving the Bonneville Power Administration's proposal to cut the trees at the Scrubber Ponds.

#### 2004

February 11: By email, Arcadis notified DEQ that sampling at the CDS tank was in exceedance. This sampling indicated that leachate had been discharged in possible violation of the Consent Decree (and thus the hazardous waste permit, too) and with the Northwest Aluminum NPDES permit.

February 12: DEQ issued a warning letter to Northwest Aluminum that corrective action must be initiated so that the exceedance does not happen again.

February 12: Arcadis submitted a velo-bound document titled Comprehensive Work Plan for Remediation Activities. This work plan proposed further remediation activities at both the RCRA and CERCLA landfills. At the CERCLA landfill, it was proposed that routine surface applications continue, nutrients would be directly fed into the trenched leachate collection system [LCS] that services the CERCLA landfill, eventual termination of the post-closure period for the Scrubber Ponds, CERCLA monitoring well modifications [i.e., add more monitoring wells], and decommission the CDS cyanide treatment unit.

February 19: In accordance with the Consent Decree, Arcadis notified EPA and DEQ of the new Lockheed Martin contacts.

March 8: DEQ issued a Notice of Noncompliance to Lockheed Martin in relation to the discharge exceedance and also required corrective action be taken for future discharges.

March 9: DEQ proposed that Notice of Noncompliance deserved a No Penalty Justification due to the timely notification of the exceedance, willingness to perform corrective action, and no damage to the environment.

March 24: DEQ issued comments on the Comprehensive Work Plan.

April 8: DEQ Enforcement Section agreed to the No Penalty Justification.

April 6 and 7: Fredrick Moore with DEQ inspected the facility for both RCRA and CERCLA compliance. Marcy Kirk conducted an OMI inspection.

April 14: Lockheed Martin responded in writing to the Notice of Noncompliance discussing the corrective action to be taken.

May 17: Arcadis sent a letter to EPA with an explanation of the high fluoride levels found in the dewatering trench. Though not a critical environmental issue, this review has been on-going since the 2<sup>nd</sup> Five Year Review Report.

May 18: DEQ met with Arcadis and Lockheed Martin in Portland to discuss the Notice of Noncompliance activities, ACL proposal, and the Comprehensive Work Plan proposal.

May 27: EPA and DEQ finalize the Memorandum of Agreement listing DEQ as lead in review of CERCLA activities with the responsibility of preparing CERCLA documents and preparing the 3<sup>rd</sup> Five Year Review Report. This MOA is fairly unique for RP-lead Superfund sites.

June 1: Arcadis responded to DEQ on the DEQ comments on the Comprehensive Work Plan.

June 14: Arcadis sent a letter to DEQ detailing a "redundant systems" analysis to avoid the type of exceedance that caused the Notice of Noncompliance.

July 2: Arcadis submitted a request to change some of the piping at the CDS tank to increase flow during discharge.

July 8: DEQ approved the piping change.

July 26: Arcadis requested a hazardous waste temporary authorization request to place another surface application of molasses, install four new CERCLA monitoring wells, and to install an inline nutrient feed as described in the Comprehensive Work Plan. From a previous meeting, it was decided to do these pilot studies and if to be implemented on an ongoing basis, then the hazardous waste permit would be modified as outlined in the EPA/DEQ MOA.

August 2: DEQ received the temporary authorization public notice mailing from Arcadis sent in accordance with 40 CFR 270.42(e).

August 5: Arcadis submitted a work plan for the installation of the four new CERCLA monitoring wells.

August 6: DEQ approved the temporary authorization request.

August 24: DEQ provided comments for the monitoring well work plan.

August 26: The final work plan for monitoring well installation was submitted by Arcadis.

September 20: EPA Region 10 RCRA section sent a letter to Lockheed Martin that the facility was now a high priority in the National Corrective Action Prioritization System [NCAPS].

November 15: Arcadis notified DEQ by email that sample results for free cyanide in the CDS tank came up 85 and 113. The limit is 100 µg/l. Arcadis requested how should these two numbers be evaluated. This also lead to a further discussion on how better to effect batch processing.

November 30: By email, DEQ sent comments regarding procedures on how to discharge from the CDS tank in a batch mode.

December 1: In consultation with the DEQ Water Program, DEQ Hazardous Waste Program issued a letter to Arcadis requesting information regarding the batch discharge at the CDS tank.

December 20: Arcadis responded to the DEQ November 30 comments.

## BIANNUAL INSPECTION REPORTS

2002 Inspection Report		
Item	Current Status	Follow-up Action
1. <u>Survey Plat</u> : It was noted that on the survey plat located at Wasco County Courthouse that the RCRA and CERCLA units are shown, but no written declaration of what these units are and that they should not be disturbed could be seen	Arcadis, on behalf of Lockheed Martin, added language to the survey. Language can be found in DEQ document no. 1105.	DEQ to conduct informal inspection at County Courthouse to see how the new language looks.
2. <u>Perimeter Fence</u> : It was noted that there was some gaps and burrowing underneath from ground squirrels at the CERCLA landfill perimeter fence.	From visits and 2004 inspection, all gaps have been repaired and no burrowing noted.	None needed, except to inspect every two years.
3. <u>Seeping in Lift Station #2</u> : When looking down this lift station, it was noted that liquid was seeping in from some of the higher joints that form the lift station.	Arcadis offered the opinion that the liquid is likely from the runoff from the HDPE liner of the CERCLA cap. It is DEQ staff opinion that this is likely, and not an environmental issue because what goes into the lift station then goes to the CDS tank.	It is understood from the date of this report that Arcadis has asked DEQ to fix the seeping. This request will likely be accepted and should be inspected later for effectiveness.
4. <u>Signage</u> : It was noted in the exit interview that maybe more signage could be used at the landfill and Scrubber Ponds fences.	From 2004 inspection, the signage appears adequate.	No follow-up action required.
5. <u>CDS Tank Sediment</u> : It was commented from DEQ that the sediment in the CDS tank is considered K088 hazardous waste and therefore the time of storage in the tank in accordance with 40 CFR 268.50 may be an issue.	In preparation for biological treatment in the CDS tank in lieu of the high temperature/pressure treatment, the tank was cleaned and the sediment sent to a hazardous waste disposal facility.	No follow-up action required.

2004 Inspection Report		
Item	Current Status	Follow-up Action
1. <u>CERCLA Financial Assurance</u> : It was noted that in accordance with Condition XIX of the Consent Decree, there should be financial assurance for the CERCLA remedy, ostensibly for post-closure care.	DEQ, Arcadis, and Lockheed Martin are reviewing this somewhat confused issue. It is DEQ staff opinion that the CERCLA post-closure care likely does not have financial assurance.	DEQ to determine whether CERCLA remedial action has financial assurance. If not, then direct Lockheed Martin to obtain the adequate financial assurance.
2. <u>Animal Burrowing at Scrubber Ponds</u> : A burrowing hole at the Scrubber Ponds was noted which CERCLA post-closure requirements state should be backfilled.	Arcadis repaired the burrow and will inspect and repair in the future.	No follow-up needed.

<b>2004 Inspection Report</b>		
<b>Item</b>	<b>Current Status</b>	<b>Follow-up Action</b>
3. <u>CERCLA CDS Tank May Not Meet All RCRA Tank Standards:</u> DEQ notes in the draft report that the CERCLA tank may not meet all RCRA tank standards which is a technical ARAR. For example, the CDS tank does not have a high-level alarm	The CDS tank has worked well these past years and DEQ does not note any technical malfunction to immediately address.	DEQ should address this issue in a later inspection and make recommendations.
4. <u>Bonneville Power Administration Maintenance:</u> BPA cut trees at the Scrubber Ponds with potential soil cover damage.	During the inspection it was noted that BPA did a good job and no damage to the soil cover noted.	No follow-up is needed.

extra MK



# Oregon

Theodore R. Kulongoski, Governor

## Department of Environmental Quality

2146 NE 4th Street, Suite 104

Bend, OR 97701

(541) 388-6146

Eastern Region

Bend Office

Sent by Standard Mail

July 2, 2003

Ms. Melissa Kleven  
Task Manager  
ARCADIS Geraghty & Miller  
11411 NE 124<sup>th</sup> Street, Suite 270  
Kirkland, WA 98034

Re: Transmittal – OMI Report  
Lockheed Martin•The Dalles, OR  
ORD 052 221 025

Dear Ms. Kleven:

Enclosed is the Department's 2002 Operation and Maintenance Inspection Report for the Lockheed Martin facility in The Dalles. Please provide a written response to all itemized recommendations in the report by August 12, 2003.

If you have any questions, please call me at (541) 388-6146 ext 222.

Sincerely,

Marcy Kirk  
Hydrogeologist  
Eastern Region Hazardous Waste Program

cf: Linda Meyer: EPA Region 10  
Kathy Ivy: EPA Region 10

Enclosure

**2002 OPERATION AND MAINTENANCE  
INSPECTION REPORT**

**FOR**

**LOCKHEED MARTIN CORPORATION  
THE DALLES FACILITY**

**PERMIT ORD 052 221 025**

**INSPECTION DATES: March 25-27, 2002**

**Prepared By**

**Marcy Kirk  
Hydrogeologist  
Department of Environmental Quality  
Eastern Region Hazardous Waste Program**

**July 2, 2003**

## OPERATION AND MAINTENANCE INSPECTION

Lockheed Martin Corporation  
6801 Rockledge Drive  
Bethesda, MD 20817  
Attn: R. Helgerson

DEQ Permit No. ORD 052 221 025

Inspection Dates: March 25-27, 2002

### Department of Environmental Quality Inspectors:

Marcy Kirk	Hydrogeologist
David Cole	Groundwater Monitoring Specialist
Michael Tichenor	Water Quality Monitoring Specialist

### ARCADIS Representatives:

Melissa Kleven	Task Manager/Senior Engineer
Wayne Harmon	Site Manager

### Century West Representatives

Rick Wadsworth  
Joey Hammer

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## 1.0 INTRODUCTION

### 1.1 INSPECTION AUTHORITY AND OBJECTIVES

DEQ performed this inspection to determine Lockheed Martin Corporation's compliance with the requirements of Subtitle C of the Resource Conservation and Recovery Act of 1976 (RCRA) and Chapter 466 of the Oregon Revised Statutes (ORS 466), including those requirements incorporated in the conditions of the facility's RCRA Permit Number ORD 052 221 025 (Permit).

Subpart F of Part 264 of Title 40 of the Code of Federal Regulations (40 CFR 264), adopted as Oregon Rule, requires that RCRA Subtitle C land disposal facilities have in place a groundwater monitoring system that is capable of detecting releases from regulated units. The primary objective of this inspection was to verify Lockheed Martin's compliance with groundwater monitoring provisions of these requirements and to ensure that groundwater samples are properly collected in accordance with the Permit, and Sampling and Analysis Plan (ARCADIS, February 19, 2002). Specifically, objectives of this inspection and data review were conducted to (1) determine if individual wells continue to yield representative and reliable groundwater samples, and reliable hydrologic data, (2) identify flagrant violations in operation and maintenance programs, (3) determine the direction(s) of groundwater flow, (4) assess the viability of past decisions regarding the number and placement of monitoring wells, and (5) identify deficiencies in the operating record.

The Permit has recognized the CERCLA landfill and the Scrubber Sludge Pond as solid waste management units (SWMUs) and thereby enforces the current CERCLA operation and maintenance (O&M) requirements. The Groundwater Monitoring Plan (July 1989) and Sampling and Analysis Plan (February 2002) contain groundwater monitoring O&M requirements for the CERCLA Long-Term Groundwater Monitoring Program Phase III (LTGWMP). The objective of the LTGWMP is to "monitor variations in ground-water quality at the target remediation areas, and the effectiveness of the perched water recovery operation".

## 2.0 INSPECTION

### 2.1 PRE-INSPECTION MEETING

A pre-inspection meeting occurred on March 25, 2002 with DEQ, and Lockheed Martin's contractors, ARCADIS and Century West. DEQ discussed the objectives of the inspection, including adherence to the Permit and Sampling and Analysis Plan during groundwater sampling activities, and collection of split samples for analysis by the DEQ Laboratory. ARCADIS conducted a health and safety briefing for groundwater sampling activities. Figure 1 presents a site location map.

### 2.2 FIELD OBSERVATIONS

In general, the Century West field crew did an excellent job of correctly implementing field procedures. DEQ Lab's memorandum (Appendix A) contains a detailed description and evaluation of field procedures observed during this O&M Inspection by DEQ laboratory personnel, including sampling methods, sample preservation and handling, and chain-of-custody procedures.

compliance with the Permit, RCRA regulations, and to determine if representative samples are being collected.

### 3.0 EVALUATION OF GROUNDWATER QUALITY DATA

This section presents and discusses the analytical results of the March and September 2002 Semi-Annual RCRA Groundwater Monitoring events, as well as the March 2002 Annual CERCLA Long-Term Groundwater Monitoring Program, Phase III.

Appendix B presents ARCADIS's RCRA groundwater monitoring reports for the March 2002 and September 2002 sampling events. Appendix C presents ARCADIS's CERCLA groundwater monitoring report for 2002. Copies of the chain of custody, field information forms, and laboratory reports from these reports are available in DEQ's Bend office. Appendix D presents analytical results and report on DEQ's split samples.

Pursuant to Condition IV.B.5. of the Permit, ARCADIS samples 7 monitoring wells for their RCRA Compliance Monitoring Program. Nine monitoring wells are sampled for their CERCLA Long-Term Groundwater Monitoring Program. RCRA compliance monitoring wells are listed in Table 1 and located on Figure 2. CERCLA monitoring wells are listed in Table 1 and located on Figure 3.

#### 3.1 RCRA GROUNDWATER MONITORING PROGRAM.

Table 2 presents a summary of analytical results from the March 2002 RCRA groundwater monitoring event. Free cyanide [also referred to as weak dissociable acid (WAD) cyanide] concentrations ranged from 10.1 ug/l to 360 ug/l. The groundwater protection standard for free cyanide is 770 ug/l. Fluoride concentrations ranged from 0.266 mg/l to 11.5 mg/l. The groundwater protection standard for fluoride is 9.7 mg/l. Section 3.1.1 discusses the exceedance of the fluoride standard at well MW-5S. Sulfate concentrations ranged from 58.1 mg/l to 204 mg/l. The groundwater protection standard for sulfate is 3020 mg/l.

Table 3 presents a summary of analytical results from the September 2002 RCRA groundwater monitoring event. Free cyanide data were all qualified as not detected due to contamination of the rinseate blank sample with free cyanide. Century West collected the rinseate blank from the water level probe. Fluoride concentrations ranged from 0.258 mg/l to 7.28 mg/l. Sulfate concentrations ranged from 23.7 mg/l to 179 mg/l.

Figures 4 and 5 present graphs of historic cyanide and fluoride concentrations in older RCRA monitoring wells.

- Although the RCRA landfill has not had a release to groundwater, the CERCLA Remedial Investigation identified the alumina unloading area, near the NE corner of the RCRA landfill, as a source of cyanide and fluoride in well MW-5S. Remediation of the unloading area occurred by excavation in 1989. Fluoride and cyanide concentrations in well MW-5S have declined since this time. Fluoride concentrations in well MW-5S have been generally just below the Alternate Concentration Limit (ACL) of 9.7 mg/l since 1998.
- Cyanide concentrations in the other older RCRA monitoring wells have also generally declined with time. Cyanide concentrations in well MW-22s are elevated relative to wells MW-17s and MW-23s, perhaps due to MW-22s being closer to the alumina unloading area.

and B aquifers. From a review of previous reports, it is unclear why there is a dearth of wells in the S aquifer surrounding the landfill. The 2002 Annual CERCLA report states that "the purpose of the March 2002 sampling under the LTGWMP was to monitor groundwater quality in the vicinity of the CERCLA landfill site", and does not distinguish between the two monitoring objectives.

As discussed in Section 4.2, it is difficult to determine with any degree of certainty, which direction groundwater flow in the S aquifer from the CERCLA landfill, due to lack of monitoring points. Consequently, potential contaminant pathways from the landfill in the S aquifer are not monitored. It therefore appears that insufficient monitoring exists to determine the protectiveness and effectiveness of the remedy.

### **3.2.1 Well MWR-8S Assessment Monitoring**

Laboratory analysis detected free cyanide at monitoring well MWR-8S above the ARAR of 770 ug/l in March 2001. In accordance with the Groundwater Monitoring Contingency Plan, assessment monitoring of Well MWR-8S was conducted. Monthly assessment monitoring of MWR-8S began in April 2001 and was completed in May 2002 (Table 5). Monitoring extended beyond the required eight-month assessment period because analytical results were quite variable (e.g., changes in methods and laboratories).

A statistical analysis of the assessment monitoring results determined that the ARAR for free cyanide lies above the confidence interval. Based on these results, the well returned to routine long-term monitoring.

## **3.3 DEQ SPLIT SAMPLE COMPARISON**

DEQ collected split samples at four monitoring wells during the March 2002 sampling event. Table 6 presents a summary of sample results by DEQ's laboratory.

Appendix D presents a comparison between DEQ and CWM's analytical results for detected constituents in wells sampled during the March 2002 event. Conclusions from DEQ's comparison of split sample results between laboratories are that dissolved sulfate and total cyanide results compared quite well; however, 60% of the dissolved fluoride results and 80% of the WAD cyanide results failed the inter-laboratory split comparison. These failure rates increase to 80% for dissolved fluoride and 100% for WAD cyanide if the transfer blank is not considered.

As detailed in Appendix D, the discrepancy for the dissolved fluoride results may be that Lockheed Martin's laboratory, North Creek Analytical (NCA), used a different analytical method than DEQ and the preliminary distillation step was not performed by NCA. The differences between the two laboratory's WAD cyanide results cannot be as confidently assigned. DEQ concluded that the differences probably resulted from problems in the field or laboratory procedures. One possibility for the observed discrepancies between the WAD cyanide results could have been the photodegradation of ferrocyanide to more easily dissociable cyanide forms in the samples received by NCA. This could have occurred either prior to or after receipt at the laboratory.

ARCADIS provided comments on DEQ's laboratory's analysis of the split sampling event. DEQ responded to these comments. Both of these documents are included in Appendix E.

## 4.0 EVALUATION OF GROUNDWATER ELEVATION DATA

### 4.1 RCRA LANDFILL

Appendix B presents groundwater elevation data, contour maps, and hydrographs for the RCRA site. Several apparent well elevation errors exist in the hydrographs and database that produced the hydrographs. DEQ and ARCADIS have been engaged in finding a resolution to this problem (see Appendix E). It has been agreed that the December 2000 well survey results will be used for historical and future groundwater elevation calculations.

A pronounced seasonality exists in groundwater elevations, with higher water levels in the winter. Groundwater gradients are variable in magnitude and direction around the landfill, probably due to the fractured nature of the aquifer and vertically variable positions of the well screens. Water levels may also be affected by seasonal pumping of water from the alumina unloading building sump which is 20 to 25 feet below land surface. Well MW-5S, the upgradient and closest well to this sump, often has a lower water level than well MW-17S in the winter.

RCRA monitoring wells are in the first water bearing zone, the S aquifer. The CERCLA Remedial Investigation (RI) report states that the S aquifer discharges to the Columbia River and to the lower A aquifer. ARCADIS incorrectly stated in both 2002 Semi-Annual RCRA reports that, "The S aquifer does not appear to be hydraulically connected to the Columbia River due to its higher stratigraphic position above the river level." ARCADIS stated in an email message that this statement is a carry over from past reports and will be removed.

### 4.2 CERCLA SITE

Appendix C presents groundwater elevation data, maps, and hydrographs for the CERCLA monitoring wells in the S, A, and B aquifers. CERCLA and the original RCRA monitoring wells were installed during the CERCLA Remedial Investigation. The CERCLA wells have not been re-surveyed, as the RCRA wells have. Based on the elevation changes at the RCRA monitoring wells, it is reasonable to assume that the elevations of CERCLA wells may be incorrect (see Appendix E).

#### 4.2.1 S Aquifer

The S aquifer is the first aquifer encountered beneath the CERCLA site. The five monitoring wells in the S aquifer are located near the SE corner of the CERCLA landfill (Figure 3). Figure 4 in Appendix C presents a contour map of the S aquifer using these 5 wells. Water levels varied from 92.22 to 122.75 feet above MSL in March 2002, with the lowest water levels in the center of the monitoring well group at well MWR-8S.

The 2002 Annual CERCLA report states that groundwater "flow direction is consistent with historical measurements, with net flow to the east, toward the Columbia River". However, the elevation of groundwater in well MW-26S has changed, in relation to other S aquifer wells, since the RI was conducted. Hence, the groundwater flow direction has changed with time and there is little evidence to suggest that the net flow of groundwater is toward the Columbia River. With only five S aquifer wells clustered in one area of the CERCLA site, it is difficult to determine with any degree of certainty, which direction groundwater flows in the S aquifer in the vicinity of the CERCLA landfill.

5. Hazardous constituent concentrations were below groundwater protection standards in RCRA compliance monitoring wells, except for fluoride in well MW-5S.
6. Analytical results of verification sampling for fluoride at well MW-5S were below the groundwater protection standard, so compliance monitoring was resumed as usual.
7. Contaminant concentrations in CERCLA monitoring wells were below ARARs and ACLs, except WAD cyanide in well MWR-8S.
8. A statistical evaluation of assessment monitoring data for WAD cyanide at well MWR-8S concluded in the ARAR being below the confidence interval.
9. In general, contaminant concentrations in CERCLA monitoring wells have not significantly changed since the CERCLA remedy was implemented. This observation brings into question the effectiveness of the remedy.
10. A comparison of split sample results identified problems with the analytical results from dissolved fluoride and WAD cyanide. The cause of these discrepancies is unknown.
11. Several QA/QC issues occurred with ARCADIS' laboratory's cyanide analyses. ARCADIS had to qualify several sample results as estimated or not detected due to laboratory problems or blank contamination. ARCADIS does not know if the cyanide detected in rinseate blanks is from laboratory errors or field contamination.
12. Several apparent well elevation errors exist in the RCRA monitoring well hydrographs and database that produced the hydrographs. ARCADIS has initiated a resolution to this problem; however there may also be well elevation errors at the CERCLA monitoring wells.
13. Groundwater gradients in the S aquifer at the RCRA landfill are variable in magnitude and direction, probably due to the fractured nature of the aquifer and the vertically variable positions of well screens.
14. Insufficient wells exist in the S aquifer around the CERCLA landfill to determine the direction of groundwater flow.
15. The CERCLA landfill does not have an adequate monitoring well network in the S aquifer to detect a release from the landfill.

## 6.2 RECOMMENDATIONS

1. DEQ's laboratory recommends the following:
  - Install concrete filled steel protection posts around wells MWR-8s and MW-9s.
  - The contractor should perform spot checks of preserved samples' pH, and be prepared to adjust the samples' pH to required levels.
  - The contractor should adopt a more accurate method of water level measurements. The contractor uses a measuring point on the outer casing, rather than the industry standard method of a point on the inner casing. The contractor's method causes the measuring tape to make an angle away from the vertical, from the top of the inner casing's measuring access port, to the measuring point on the well's outer casing. This adds perhaps several hundredths of a foot to the overall depth measurement. One practical method of obtaining accurate depth measurements, using an outer casing measuring point, is the following: place a straightedge across the top of the outer casing, and read the tape at the bottom of the straightedge, directly above (vertically) the inner casing's measuring access port.
  - The contractor should have plans in place for regular checks of the meter's temperature probe, using an NIST traceable thermometer.
  - The contractor should have plans in place for regular checks of the meter's pH probe on a low ionic strength solution.

**Table 1**  
**Monitoring Wells**

Well	Program	Aquifer	Analytes	Frequency
MW-5S	RCRA and CERCLA	S	FCN, F, SO <sub>4</sub>	Semi-Annual
MW-17S	RCRA	S	FCN, F, SO <sub>4</sub>	Semi-Annual
Mw-22S	RCRA	S	FCN, F, SO <sub>4</sub>	Semi-Annual
MW-23S	RCRA	S	FCN, F, SO <sub>4</sub>	Semi-Annual
MW-35S	RCRA	S	FCN, F, SO <sub>4</sub>	Semi-Annual
MW-36S	RCRA	S	FCN, F, SO <sub>4</sub>	Semi-Annual
MW37S	RCRA	S	FCN, F, SO <sub>4</sub>	Semi-Annual
MW-3S	RCRA	S	GW Elevation Only	Semi-Annual
MW-4S	RCRA	S	GW Elevation Only	Semi-Annual
MWR-8S	CERCLA	S	TCN, FCN, F, SO <sub>4</sub>	Annual
MW-9S	CERCLA	S	TCN, FCN, F, SO <sub>4</sub>	Annual
MWR-15S	CERCLA	S	TCN, FCN, F, SO <sub>4</sub>	Annual
MW-26S	CERCLA	S	TCN, FCN, F, SO <sub>4</sub>	Annual
MWR-27S	CERCLA	S	TCN, FCN, F, SO <sub>4</sub>	Annual
MW-29S	CERCLA	S	TCN, FCN, F, SO <sub>4</sub>	Every 5 years
MW-6AA	CERCLA	A	TCN, FCN, F, SO <sub>4</sub>	Annual
MW-12A	CERCLA	A	TCN, FCN, F, SO <sub>4</sub>	Annual
MW-13A	CERCLA	A	TCN, FCN, F, SO <sub>4</sub>	Annual
MWR-7A	CERCLA	B	TCN, FCN, F, SO <sub>4</sub>	Annual

**Notes**

TCN = Total Cyanide

FCN = Free or Weak Acid Dissociable [WAD] Cyanide

F = Fluoride

SO<sub>4</sub> = Sulfate

All wells are also field monitored for temperature, pH, specific conductance, and groundwater elevation.

**Table 3** Semi-Annual Groundwater Monitoring Results  
 September 2002 Sampling  
 RCRA Landfill, The Dalles, Oregon

Well	Date Sampled	pH	Temperature (°C)	Conductivity (µmohs/cm)	Free Cyanide (µg/L)	Fluoride (free) (mg/L)	Sulfate (mg/L)
MW-5S	09/20/02	7.17	16.1	1,366	<67.6*	7.28	74.2
MW-17S	09/20/02	7.11	15.4	707	<7.00*	0.842	74.6
MW-22S	09/20/02	8.20	16.3	365	<103*	0.469	80.6
MW-23S	09/20/02	8.23	15.5	371	<10.7*	0.284	54.9
MW-35S	09/19/02	8.24	17.9	519	<5.30*	1.03	128
MW-36S	09/19/02	8.25	17.4	587	<5	0.258	179
MW-37S	09/19/02	6.90	19.3	411	<8.40*	4.12	23.7

°C            Degrees Centigrade  
 µmohs/cm    Micromhos per centimeter  
 µg/L        Micrograms per liter  
 mg/L        Milligrams per liter  
 \*            Reporting limit raised due to blank contamination

Higher result of the sample and sample duplicate is shown.

ARCADIS

**Table 5**

MWR-8S Assessment Monitoring Results - 2001 and 2002  
 LMC, The Dalles, CERCLA Landfill

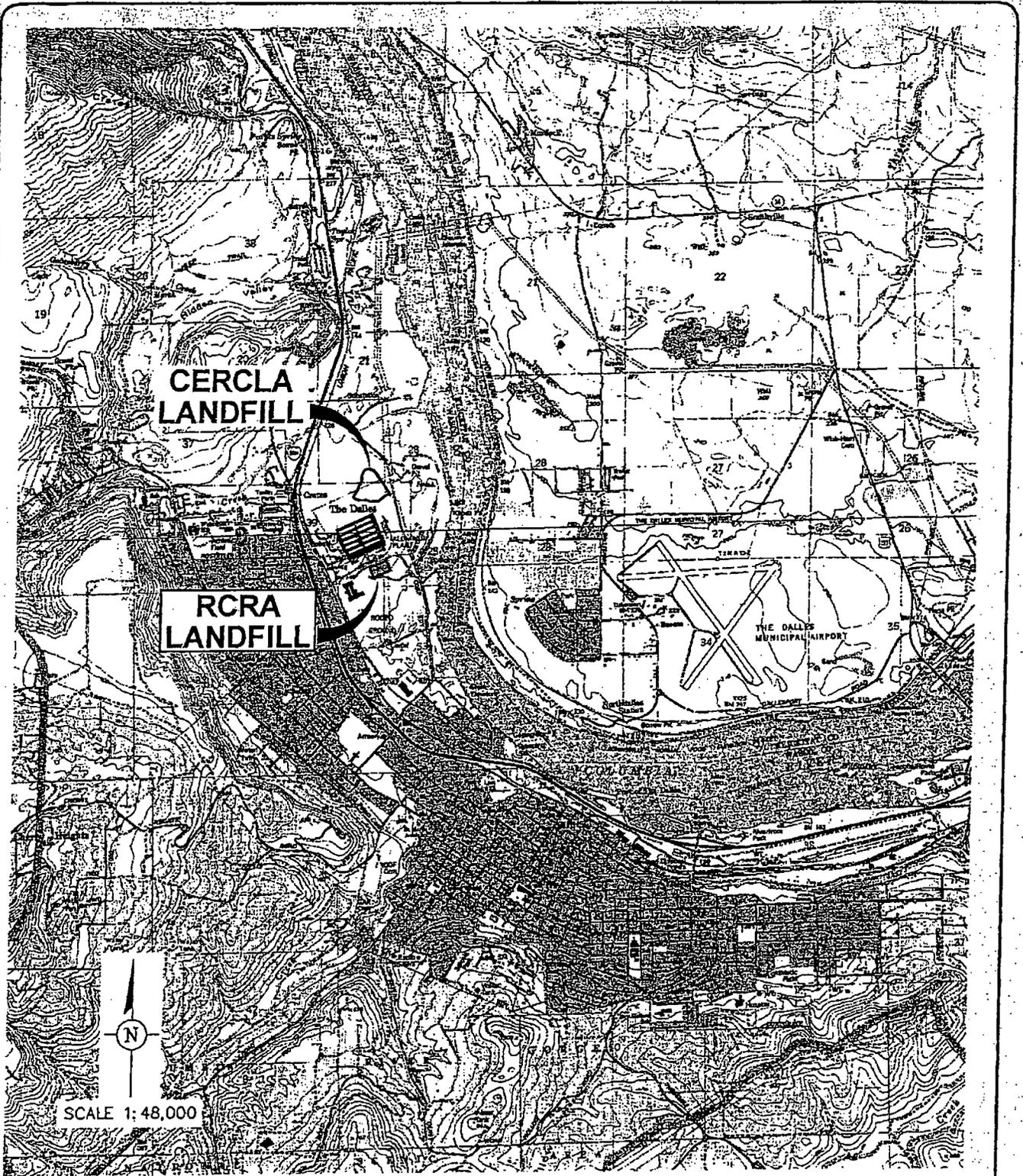
Sample Event Number (from initial)	Sample Date	Lab	Analytical Method	Free Cyanide (µg/L)	Qualifier	Natural Log of Free Cyanide Result.
5	18-Sep-2001	NCA	4500-CN-I / 335.4M	411	J	6.0186
7	14-Nov-2001	NCA	4500-CN-I / 335.4M	278	J	5.6276
9	15-Jan-2002	NCA	4500-CN-I / 335.4M	461	NQ	6.1334
11	26-Mar-2002	NCA	4500-CN-I / 335.4M	546	NQ	6.3026
13	24-May-2002	NCA	4500-CN-I / 335.4M	256	J	5.5452
ARAR				770		6.6464

Mean	6.1233
Standard Deviation	0.4211

Lower Confidence Interval (99% confidence)	5.7476
Upper Confidence Interval (99% confidence)	6.4989

ARAR    Applicable or Relevant and Appropriate Requirement  
 J        Estimated value.  
 µg/L    Micrograms per liter.  
 NQ      No qualifier.

C:\Data\CAD\LDD2 Projects\AGM - The Dalles - OR - RCRA Landfill\dwg\Site Location Map.dwg JUN 19 2002 00:27:25 (bCAD)



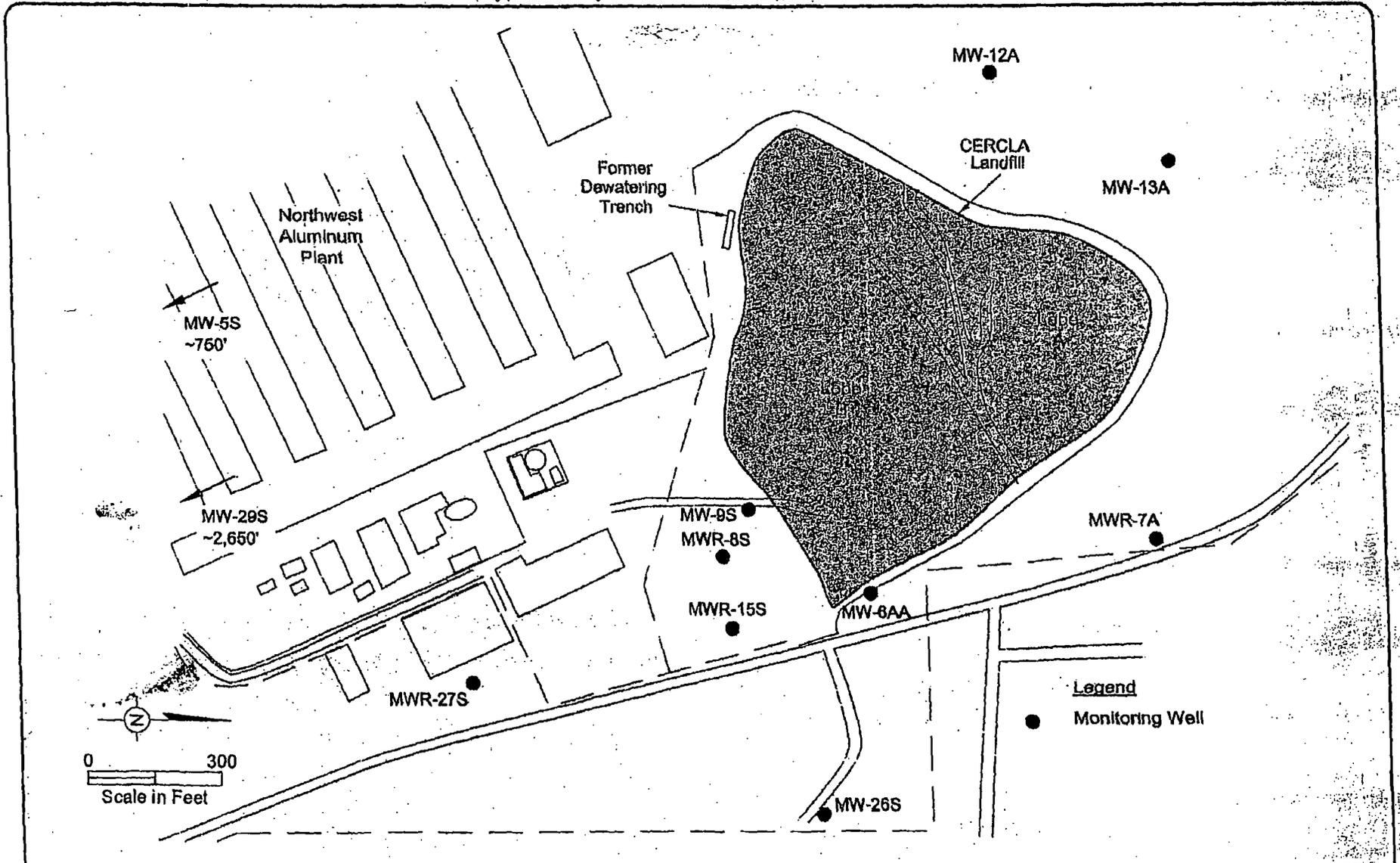
Source: USGS Quadrangle The Dalles North, Oregon and The Dalles South, Oregon



### Site Location Map

FIGURE

1



### CERCLA Monitoring Well Locations

CERCLA Landfill  
The Dalles, Oregon

FIGURE

3

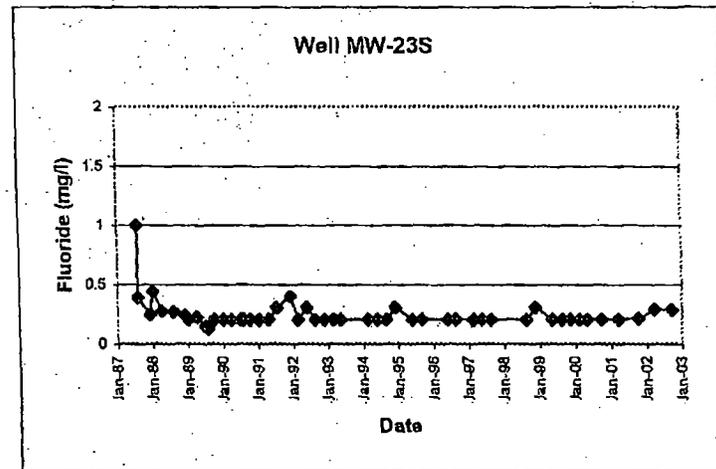
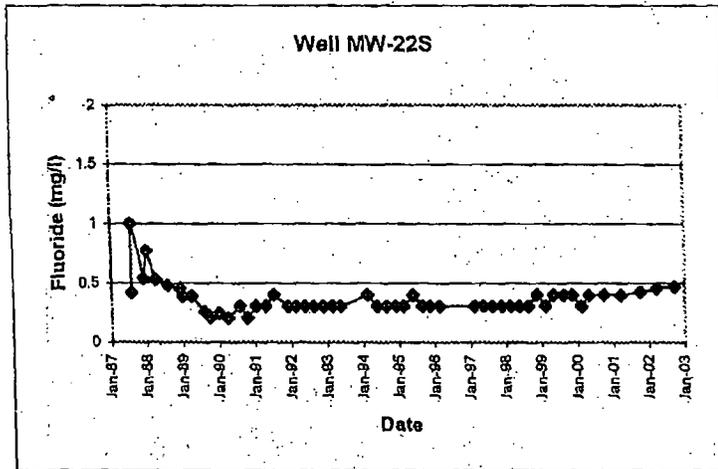
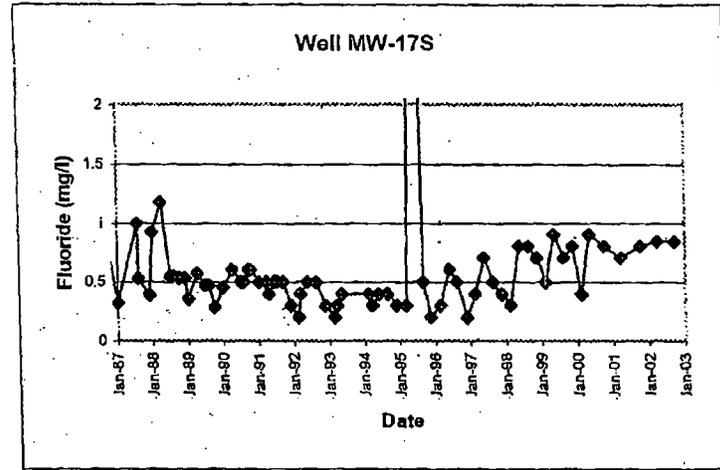
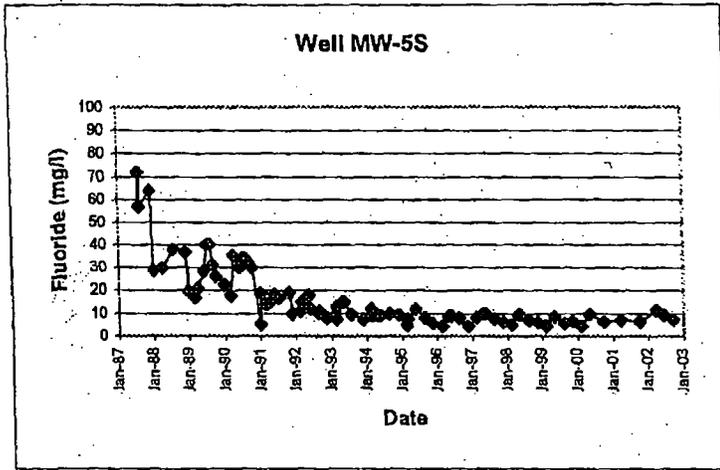
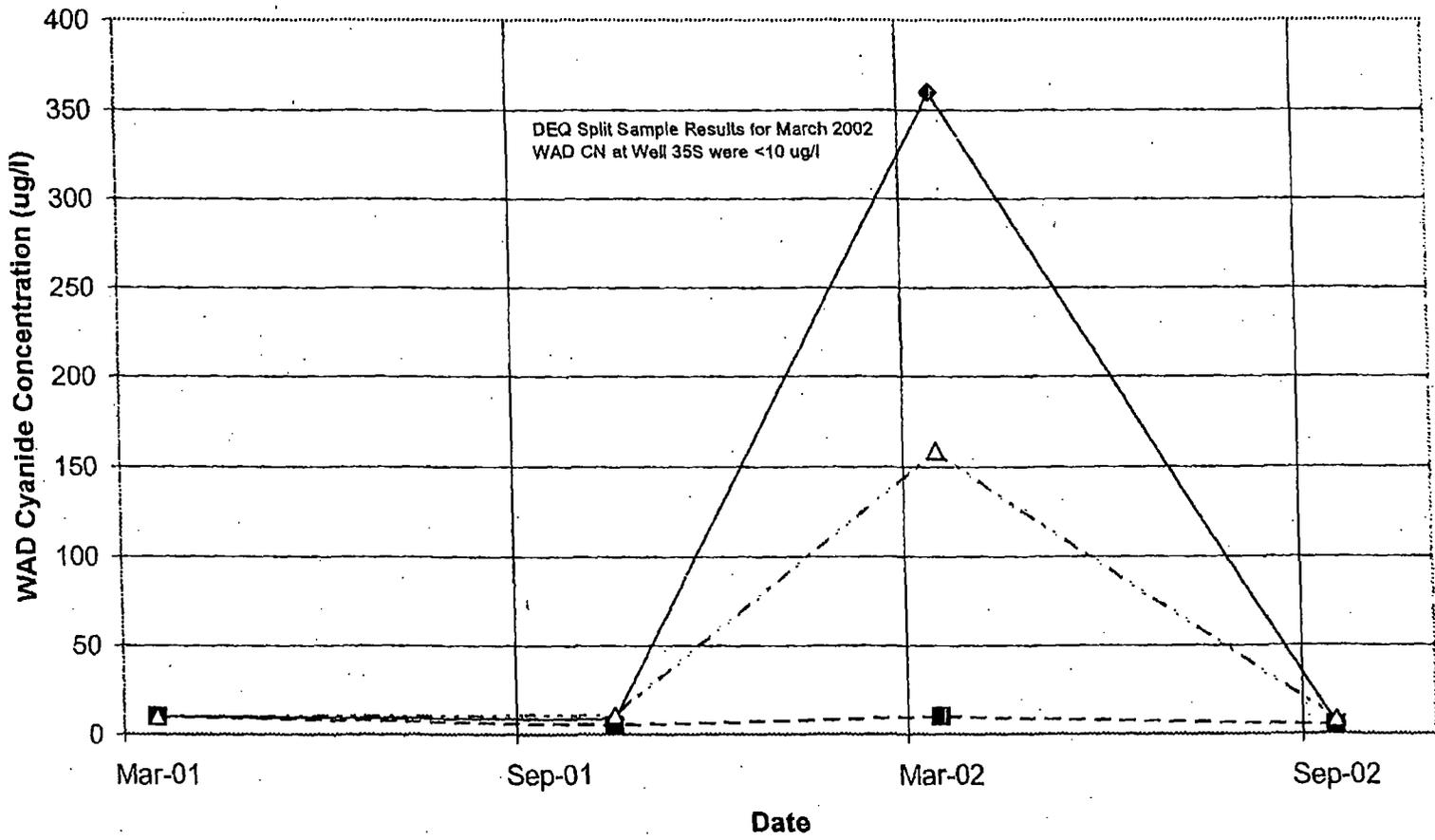


Figure 5 Fluoride Trends in Older RCRA Wells

### WAD Cyanide New RCRA Wells



—◆— MW-35S —■— MW-36S —△— MW-37S

Figure 7



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 10  
1200 Sixth Avenue  
Seattle, WA 98101

June 29, 2005

Reply To  
Attn Of: ECL-113

SUBJECT: Request for Signature on the Third Five-Year Review Report for the  
Martin Marietta Reduction Facility Superfund Site

FROM: Kathy Ivy, Remedial Project Manager  
Environmental Cleanup Office

THRU: Dean Ingemansen, Assistant Regional Counsel  
Office of Regional Counsel

THRU: Nicholas Ceto, Program Manager  
Hanford Project Office

TO: Daniel D. Opalski, Director  
Office of Environmental Cleanup

Enclosed is the Third Five-Year Review Report for the Martin Marietta Reduction Facility Superfund Site. The Site is located in The Dalles, Oregon just west of the Columbia River. The facility has historically been used for the production of aluminum. The aluminum production process generated spent potliner waste which contains cyanide, fluoride, and sulfate, which was disposed directly on the ground at the facility. The plant air pollution control system isolates fluoride that was sent to a series of four surface sludge impoundments. At the same time, a permitted landfill that received spent potliner waste was used at the facility. In 1991, the operating portions of the facility were sold to Northwest Aluminum Company, and the sections of the property that remained with Martin Marietta Corporation are now owned by the Lockheed Martin Corporation as a result of a corporate merger.

In 1987, the Site was added to the National Priorities List for environmental evaluation and response after cyanide compounds were detected in the groundwater. In 1988, a Record of Decision was signed documenting the approach that would be taken to clean up the Site. In 1989, Martin Marietta, the Environmental Protection Agency (EPA), and the Oregon Department of Environmental Quaility (DEQ) entered into a Consent Decree which required Martin Marietta to implement the remedial action presented in the Record of Decision. Remediation at the facility consisted of excavating and consolidating spent potliner waste and contaminated soil into an existing unlined landfill, identified as the CERCLA landfill; capping the waste with a multi-media cover; constructing a leachate collection system around the landfill perimeter; pumping

the liquid from the collection system into a large tank; treating the cyanide in a high temperature/pressure system called the Cyanide Destruction System; and discharging treated liquid through a permitted outfall to the Columbia River. Remediation also included placement of a soil cap over the surface sludge impoundments known as the Scrubber Sludge Ponds. Completion of the remedial action was certified in 1995 and the Site was taken off the National Priorities List in 1996. Ongoing operation and maintenance of the capped areas and treatment system is required, and long-term groundwater monitoring is necessary to measure performance. The protectiveness of the remedy is reviewed every five years, with the first report issued in December 1994 and the second report in December 1999. The permitted landfill, identified as the RCRA landfill, was handled separately by DEQ and went into post-closure status in 2000.

Historically, regulatory oversight at the Site has been performed by an EPA project manager with consultation provided by a DEQ project manager in the Cleanup Program. Regulatory oversight of the RCRA landfill has been the responsibility of a separate DEQ project manager in the Hazardous Waste Program. In order to simplify the oversight process and achieve more efficient use of state and federal resources, a Memorandum of Agreement between EPA and DEQ was signed in 2004 that transfers primary oversight responsibilities across the facility to one project manager under a single regulatory process. Under normal operations, primary oversight is provided by the DEQ Hazardous Waste Program using the RCRA post-closure permit process. The permit identifies the CERCLA areas as Solid Waste Management Units and incorporates by reference the requirements of the 1989 CERCLA Consent Decree. DEQ performs technical and regulatory reviews of CERCLA deliverables, develops the CERCLA five-year review report, and meets the requirements of any CERCLA significant or fundamental remedy change through the RCRA permit modification process. EPA remains the lead at the Site according to the 1989 CERCLA Consent Decree, providing review and approval of final decisions at the Site.

After project management consolidation occurred, the level of regulatory oversight has still remained high because of innovative treatment technologies proposed and implemented at the facility by Arcadis, the Lockheed Martin contractor. Arcadis has been given temporary authorization to use biotreatment of cyanide in landfill leachate in place of the high temperature/pressure treatment in the Cyanide Destruction System. Biotreatment of the leachate involves a nutrient of sugar or glucose which is introduced as an application to the ground surface where it travels along the base of the CERCLA landfill into the leachate collection system, as a direct injection into the leachate collection system, and as a feed into the collection tank. Arcadis is also testing direct treatment of the cyanide source material in the RCRA landfill. Generally, Arcadis, as the Lockheed Martin contractor and operator at the regulated areas, provides good maintenance and oversight. This facility is a good example how post-closure care can be performed. Arcadis typically provides timely communication of activities and events which allows EPA and DEQ the opportunity to track and direct the various projects and issues.

The remedy continues to control direct and airborne contact with contaminants through the CERCLA landfill and Scrubber Sludge Ponds caps, which provide a primary barrier, and fencing, signage, and on-site institutional controls, which afford additional protection. However, more information is necessary to demonstrate that the remedy continues to minimize

contaminant migration from the source areas such that the correct environmental standards are met in surface water and groundwater. First, the protocols that have been developed for treatment of landfill leachate using bioremediation need to be formally adopted and implemented to ensure that treated liquid consistently meets standards for discharge to the Columbia River. Other questions related to the long-term effectiveness of the new treatment technology also must be answered. At the same time, it is now understood that cleanup standards for contamination in groundwater should be set at drinking water levels rather than the alternate levels that were originally developed. A reasonable timeframe should be identified for meeting the correct standards in groundwater, and effective controls to prevent use of contaminated groundwater outside the facility should be described in the interim. Therefore, based on the review of information at the Site, EPA and DEQ have concluded that a protectiveness determination of the remedy at the Site cannot be made at this time until further information is obtained. Currently, Arcadis is processing a RCRA permit modification/CERCLA remedy change that should address these issues, at which time EPA and DEQ will make a protectiveness determination.

I request your signature on the enclosed report.

Enclosure:

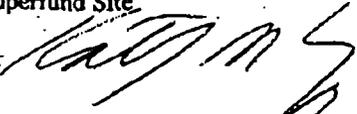


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