PERIODIC REVIEW

Weyerhaeuser Chlor-Alkali Plant
Facility Site ID#: 28

3451 Industrial Way
Longview, Washington 98632-9285

Industrial Section
Waste 2 Resources Program

July 2015

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1.0 Introduction

This document is a review by the Washington State Department of Ecology (Ecology) of post-cleanup Site conditions and monitoring data to ensure that human health and the environment are being protected at the Weyerhaeuser Chlor-Alkali Plant (Site). Cleanup at this Site was implemented under the Model Toxics Control Act (MTCA) regulations, Chapter 173-340 Washington Administrative Code (WAC).

The cleanup actions resulted in concentrations of mercury remaining at the Site that exceed MTCA cleanup levels. The MTCA cleanup levels for soil are established under WAC 173-340-740. The MTCA cleanup levels for groundwater are established under WAC 173-340-720. WAC 173-340-420 (2) requires that Ecology conduct a periodic review of a Site every five years under the following conditions:

- Whenever Ecology conducts a cleanup action.
- Whenever Ecology approves a cleanup action under an order, agreed order, or consent decree.
- Or, as resources permit, whenever Ecology issues a no further action opinion, and one of the following conditions exists:
    1. Institutional controls or financial assurance are required as part of the cleanup.
    2. Where the cleanup level is based on a practical quantitation limit.
    3. Where, in Ecology's judgment, modifications to the default equations or assumptions using Site-specific information would significantly increase the concentration of hazardous substances remaining at the Site after cleanup or the uncertainty in the ecological evaluation or the reliability of the cleanup action is such that additional review is necessary to assure long-term protection of human health and the environment.

When evaluating whether human health and the environment are being protected, the factors Ecology shall consider include [WAC 173-340-420(4)]:

(a) The effectiveness of ongoing or completed cleanup actions, including the effectiveness of engineered controls and institutional controls in limiting exposure to hazardous substances remaining at the Site.

(b) New scientific information for individual hazardous substances of mixtures present at the Site.

(c) New applicable state and federal laws for hazardous substances present at the Site.

(d) Current and projected Site use.

(e) Availability and practicability of higher preference technologies.

(f) The availability of improved analytical techniques to evaluate compliance with cleanup levels.

Ecology shall publish a notice of all periodic reviews in the Site Register and provide an opportunity for public comment.

2.0 Summary of Site Conditions

2.1 Site Description and History

The Weyerhaeuser Chlor-Alkali Plant is located on the north shore of the Columbia River, approximately 2 miles southwest of the city of Longview, in Cowlitz County in southwest Washington. The topography of the plant site is flat, overlying a remnant of Mt. Coffin, an isolated basalt erosional peak.

The Site produced chlorine and sodium hydroxide for use by the pulp and paper industry. Chlorine production using the mercury electrolytic cell process began in 1958, following construction of the No. 1 Cell Room. The plant was expanded in 1966 with the addition of a second cell room (the No. 2 Cell Room) and a liquefaction building. Chlorine production in the No. 1 Cell Room ceased in 1975. A year later, the mercury cells in the No. 2 Cell Room were converted to diaphragm cells (a non mercury-based process). The No. 1 Cell Room was demolished in 1991 and the No. 2 Cell Room continued to operate until 1999. All production operations ceased at the Site in March 1999. As a result of the operations prior to 1976, mercury was released to the Site from equipment and process leaks and spills.

2.2 Site Investigations and Sample Results

Between 1991 and 2001, Weyerhaeuser, under the direction of Ecology, conducted a remedial investigation and feasibility study (RI/FS) at the Chlor-Alkali facility (CH2M HILL, 1995). The RI/FS was submitted to Ecology in July 2001 (CH2M HILL, 2001a and 2001b). Ecology approved the RI/FS in August 2001.

2.2.1 Soil

The areas of concern identified in the RI work plan included the former surface impoundment area, staging area, former No. 1 Cell Room, No. 2 Cell Room, brine spill area, caustic storage area, loading area, liquefaction area, brine treatment area, and west area. The RI Report presented the following conclusions regarding the nature and extent of mercury remaining in Site soil in these areas:

- The average concentration of mercury in the liquefaction and loading areas, the west area, and the stormwater drainage ditch is 3 mg/kg.
- In the brine spill area, the No. 2 Cell Room, and the brine treatment, caustic storage, and staging areas, the average concentration of mercury is 18 mg/kg.
- Mercury concentrations are highest (average concentrations are 46 mg/kg) within the areas of the former No. 1 Cell Room and surface impoundments. These areas have undergone remedial actions and the area of the former No. 1 Cell Room is covered with a polymer-modified asphalt cap.

2.2.2 Groundwater

A groundwater monitoring program was initiated at the Site in 1991 and continued on a quarterly basis through April 1997. Between 1997 and 2004, groundwater monitoring was conducted semiannually at 17 wells and annually at 4 wells. Under the Compliance Monitoring Plan (CMP) developed in 2004, groundwater monitoring was conducted annually at 13 wells and

every two years at 6 wells. In 2011, Ecology modified the groundwater monitoring schedule to one year of quarterly sampling once every five years. Four wells located west of the source areas would need to be sampled once every five years only during the first quarter monitoring event. The first monitoring event under the 2011 revised schedule was conducted in 2014. Groundwater monitoring activities for the 2014 reporting period are detailed in the 2015 Annual Report, which is provided in Appendix A.

Site groundwater sampling results have shown that mercury concentrations are generally below detection limits in all areas of the Site except at the former No. 1 Cell Room and former surface impoundment area. In these areas, recent groundwater sampling indicates that mercury concentrations in alluvial and basalt groundwater range from below the detection limit of 0.2 µg/L up to 160 µg/L.

2.3 Cleanup Actions

Remedial actions implemented to reduce mercury concentrations at the Site are summarized below:

- Cessation of on-site production activities involving mercury use
- Approximately 41.5 tons of soil removed as hazardous waste during the 2004–2005 redevelopment activities
- Recycling of more than 1,500 pounds of elemental mercury
- Recycling of 61 55-gallon drums of mercury-contaminated debris
- Removal of the No. 1 Cell Room and diffuser
- Installation of capping, paving, or structures over 65 percent of the site
- Disposal of more than 72,480 tons of material (concrete, soil, sludge, debris, etc.)

Mercury present in soil, sludges, and debris has been largely removed or contained. As a result, mercury-associated human health and environmental risks have been greatly diminished. Weyerhaeuser entered into Agreed Order No. DE 1037 (dated April 9, 2004) with the Washington State Office of the Attorney General for implementation of a cleanup action plan (CAP) at the Chlor-Alkali Plant site.

The key elements of the CAP included limiting site access, recording a restrictive covenant, limiting infiltration, and developing a long-term groundwater monitoring plan for implementation at the site.

2.4 Cleanup Levels

MTCA cleanup levels for the Site were developed following procedures presented in WAC 173-340-700 through 760 (“Cleanup Standards”) and by reviewing applicable federal and state requirements (ARARs, or applicable or relevant and appropriate requirements) for the Site as required in WAC 173-340-380(1)(a)(vii).

As determined in the RI Report, mercury is the only hazardous substance subject to MTCA cleanup requirements for the site.

Ecology considered the following factors in developing MTCA cleanup levels:

- The frequency of mercury detection and its concentration
- The possible environmental fate of the mercury
- The contaminant's mobility and potential for exposure to human health and environmental receptors

2.4.1 Soil

The following MTCA cleanup methods have been determined to be applicable to the Site soils:

- The MTCA Method A mercury soil cleanup level of 2 mg/kg for industrial properties. This concentration is based on protection of groundwater (WAC 173-340-745, Table 745-1).
- The MTCA Method C mercury soil cleanup level of 1,005 mg/kg. This cleanup level is based on direct contact by industrial workers (CLARC II, February 1996). Use of this cleanup level would require institutional controls to ensure that exposure to Site soil remains consistent with the industrial exposure assumptions.

Under WAC 173 340-720, Ecology may establish more stringent cleanup level concentrations to protect groundwater. The proposed MTCA cleanup levels for mercury in Site soil is presented in Table 1.

Applicable Criteria for Soil

Analyte	Unit	Method C Industrial	Method A and Method C to Protect Groundwater	Proposed Final CUL to Protect Groundwater
Mercury	mg/kg	1,005	2	**2**

2.4.2 Groundwater

Groundwater in the vicinity of the Chlor-Alkali Plant is not used as a drinking water source. Because groundwater discharges to the Columbia River, a Class A water body (WAC 173-201A), protection of surface water is required. No exceedances of surface water criteria have been detected in the Columbia River adjacent to or immediately downstream of the site.

Characteristic uses for Class A water bodies include: domestic, industrial, and agricultural water supply; stock watering; fish and shellfish habitat; wildlife habitat; recreation; commerce; and navigation. An applicable or relevant and appropriate requirement (ARAR) value can be used as a MTCA groundwater or surface water cleanup level if it is sufficiently protective of human health and the environment. MTCA Method B cleanup levels for groundwater are considered to be appropriate for the Chlor-Alkali Plant groundwater because they establish concentrations that are protective of nearby surface waters (WAC 173-340-730(3)(b)(i)(B)). Method B groundwater cleanup levels were developed from the following sources:

- Drinking water levels, including ARARs such as MCLs and maximum contaminant level goals (MCLGs)

- Surface water levels, including water quality criteria published under WAC 173-201A, *Water Quality Standards for Surface Waters of the State of Washington*

The final Method B cleanup level should be the most stringent concentration obtained from the applicable criteria. Table 2 presents the selected cleanup level for groundwater at the Site.

Applicable Criteria for Groundwater

Analyte	Unit	MCL	MCLG	Hazard Quotient	MTCA Method B	Acute AWQC	Chronic AWQC	Proposed Final CUL
Mercury	µg/L	2	2	0.417	4.8	2.1	0.012	**0.012**

AWQC = Ambient Water Quality Criteria
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal

2.5 Restrictive Convenant

A Restrictive Covenant was included as Exhibit C to the 2004 Agreed Order for the Site which imposed the following limitations:

1. The Site may be used only for Industrial uses as defined in RCW 70.105D.020(23) and defined in and allowed under the Cowlitz County Zoning Code.
2. Any activity on the Site that may interfere with the integrity of the Remedial Action and continued protection of human health and the environment is prohibited, except as provided in Section 4.
3. Any activity on the Site that may result in the release or exposure to the environment of a hazardous substance that remains on the Site as part of the Remedial Action, or create a new exposure pathway, is prohibited without prior written approval from Ecology, except as provided in Section 4.
4. The Owner of the Site may prepare, and submit to Ecology for approval, a plan to manage health and safety issues that may arise during the course of routine and emergency maintenance and repairs.
5. No wells may be drilled and screened within the unconfined alluvial zone or the basalt zone groundwater, except for the purpose of groundwater monitoring.
6. The Owner of the Site shall maintain and inspect fences and locked gates around the Site or any larger contiguous industrial property.
7. The Owner of the Site must give written notice to the Department of Ecology, or to a successor agency, of the Owner's intent to convey any interest in the Site at least 30 days prior to such conveyance.
8. The Owner must restrict leases to uses and activities consistent with the Restrictive Covenant and notify all lessees of the restrictions on the use of the Site.

The 2004 Agreed Order with the Restrictive Covenant is available as Appendix B.

3.0 Periodic Review

3.1 Effectiveness of Completed Cleanup Actions

This Restrictive Covenant prohibits activities that will result in the release of contaminants at the Site without Ecology's approval, and prohibits any use of the property that is inconsistent with the Covenant. This Restrictive Covenant serves to ensure the long-term integrity of the remedy.

Building and asphalt cover at the Site continue to eliminate exposure to contaminated soils from ingestion and direct contact pathways. A soil and groundwater management plan that included protocols for implementing routine and emergency maintenance and repairs was prepared and submitted to Ecology in 2003 (CH2M HILL, 2003). The site continues to conduct operations in accordance with this plan. In 2012, degraded or damaged impervious surfaces were improved as part of redevelopment activities. The existing impervious surface areas at the site appear to be in satisfactory condition and no other repair, maintenance, or contingency actions have been required. The larger property that contains the Site is still operating as a pulp and paper mill.

Soils with mercury concentrations higher than MTCA cleanup levels remain at the Site. However, the remedy requiring impervious surfaces in impacted areas prevents human exposure to this contamination. The Restrictive Covenant for the property will ensure that the residual soil and groundwater contamination is contained and controlled.

3.2 New Scientific Information for Individual Hazardous Substances for Mixtures Present at the Site

There is no new scientific information for the contaminants related to the Site.

3.3 New Applicable State and Federal Laws for Hazardous Substances Present at the Site

The cleanup at the Site was governed by WAC 173-340 WAC. WAC 173-340-702(12) (c) provides that:

"A release cleaned up under the cleanup levels determined in (a) or (b) of this subsection shall not be subject to further cleanup action due solely to subsequent amendments to the provision in this chapter on cleanup levels, unless the department determines, on a case-by-case basis, that the previous cleanup action is no longer sufficiently protective of human health and the environment."

There are no new cleanup levels for the contaminant related to the Site. The cleanup action is still protective of human health and the environment.

3.4 Current and Projected Site Use

Weyerhaeuser operates a pulp and paper mill at the Site. A portion of the Site is currently leased by Axiall (formerly PPG Industries, Inc.) from Weyerhaeuser and is being operated as a chlor-alkali manufacturing plant. Axiall subleases a portion of the Site to Hasa Inc. as a sodium hypochlorite packaging facility. The Site also includes a Timberlands truck shop and a lumber cargo area.

There have been no changes in current or projected future Site or resource uses.

3.5 Availability and Practicability of Higher Preference Technologies

The remedy implemented included containment of hazardous substances through the use of impervious surfaces, and it continues to be protective of human health and the environment. While cleanup technologies may be available for mercury in groundwater, they are still not practicable or warranted at this Site.

3.6 Availability of Improved Analytical Techniques to Evaluate Compliance with Cleanup Levels

The long-term groundwater monitoring program that was implemented as part of the selected remedy at the site is a confirmational monitoring program, and is intended to "confirm the long-term effectiveness of the interim action or cleanup action once cleanup standards and, if appropriate, remediation levels or other performance standards have been attained" [WAC 173-340-410(1)(c)].

The areas of the site where mercury concentrations have been detected above the laboratory detection limit of 0.2 µg/L are in the vicinity of the most significant historical sources, the former No. 1 Cell and former surface impoundment area. As such, the analytical method used for the site is sufficient to monitor the long term effectiveness of the selected remedy.

Adopting an improved analytical technique would not affect decisions or recommendations made for the Site.

4.0 Conclusions

The following conclusions have been made as a result of this periodic review:

- The cleanup actions completed at the Site appear to be protective of human health and the environment.
- Soil and groundwater cleanup levels have not been met at the standard point of compliance for the Site; however, the cleanup action has been determined to comply with cleanup standards since the long-term integrity of the containment system is ensured, and the requirements for containment technologies are being met.
- The Restrictive Covenant for the property is in place and continues to be effective in protecting public health and the environment from exposure to hazardous substances and protecting the integrity of the cleanup action.

Based on this periodic review, the Department of Ecology has determined that the requirements of the Restrictive Covenant continue to be met. No additional cleanup actions are required to protect human health and the environment. It is the property owner's responsibility to continue to inspect the Site to assure that the integrity of the remedy is maintained.

4.1 Next Review

The next review for the Site will be scheduled five years from the date of this periodic review. In the event that additional cleanup actions or institutional controls are required, the next periodic review will be scheduled five years from the completion of those activities.

5.0 References

CH2M HILL. 1995. Remedial Investigation and Feasibility Study Work Plan. May 1995.

CH2M HILL. 2001a. Chlor-Alkali Plant Final Remedial Investigation Report.

CH2M HILL. 2001b. Chlor-Alkali Plant Final Feasibility Study Report.

CH2M HILL. 2003. Soil and Groundwater Management Plan. Prepared for Weyerhaeuser Company Longview, Washington.

CH2M HILL. 2004. Cleanup Action Plan for Chlor-Alkali Site.

Washington State Department of Ecology. Agreed Order No. DE 1037. 2004.

6.0 Appendices

6.1 Appendix A – 2014 Annual Report

PBS | Engineering + Environmental

April 29, 2015

Guy Barrett
Washington State Department of Ecology
Southwest Regional Office
P.O. Box 47600
Olympia, Washington 98504-7775

Re: 2015 Annual Monitoring Report
Weyerhaeuser Chlor-Alkali Plant Site, Longview, Washington
Ecology Site ID #2675
PBS Project No. 70862.001

Dear Mr. Barrett:

This letter report serves as the 2015 annual monitoring report for the Weyerhaeuser Chlor-Alkali site located in Longview, Washington, and provides a summary of work completed at the site from January 2014 to December 2014.

1.0 INTRODUCTION

In 1985, the Washington State Department of Ecology (Ecology) designated the plant as a medium priority on the Washington hazardous waste site list, due to mercury concentrations exceeding the Environmental Protection Agency (EPA) maximum contaminant level (MCL) in groundwater wells. Between 1989 and 1991, the area where historical mercury processing occurred was demolished.. Groundwater has been sampled at the site since 1991. In 2005, Ecology approved a long-term monitoring plan. After reviewing the *2010 Groundwater Monitoring Report*,[1] a revised schedule was proposed by Ecology in 2011. Under the revised schedule, one year of quarterly sampling is to be completed once every five years. The western monitoring wells (MW wells) only need to be sampled once during the sample year. The first monitoring event under the new schedule was conducted in 2014.

1.2 Site Location and History

The site is located at 3401 Industrial Way in Longview, Washington. The Chlor-Alkali site is bordered by other Weyerhaeuser operations, including the company's pulp and paper mill. The entire Weyerhaeuser facility, including the site, is zoned as heavy industrial.

The site is flat and overlies a remnant of Mount Coffin, an isolated basalt erosional peak that was leveled and covered with a thin layer of fill before the plant was built. Both stormwater and groundwater from the site flow toward the Columbia River.

[1] CH2M HILL. (May 2010). *2010 Groundwater Monitoring Report*. Prepared for Weyeraheuser Company.

4412 SW Corbett Avenue, Portland, OR 97239
503.248.1939 Main
866.727.0140 Fax
888.248.1939 Toll-Free
www.pbsenv.com

As a result of the historical operations prior to 1976 (production of chlorine and sodium hydroxide for use by the pulp and paper industry), mercury was released to the site from equipment and process leaks and spills. Mercury present at the site is inorganic, has relatively low mobility, and is considered the only constituent of concern at the site.

Historical operations and contaminant sources were removed when chlorine production in the No. 1 Cell Room ceased in 1975. In 1976, the mercury cells in the No. 2 Cell Room were converted to diaphragm cells (a non mercury-based process). Cell Room No. 1 was demolished in 1991 and Cell Room No. 2 continued to operate until 1999. Weyerhaeuser Chlor-Alkali production ceased at the facility in March 1999. A portion of the site is currently leased by the Axiall Corporation (Axiall) from Weyerhaeuser NR Company (Weyerhaeuser). Figure 1 shows the site location.

The site is an active Washington State Department of Ecology (Ecology) Cleanup site (Site #2675), which has undergone several phases of remediation and monitoring since approximately 1972, which is when remediation of the surface impoundments began. The current *Compliance Monitoring Plan*[2] for the site specifies that an annual compliance monitoring report is to be prepared summarizing the results of groundwater monitoring, additional work, and notable changes to site conditions for the monitoring period.

1.3 Site Geology

The site is located on the floodplain of the Columbia River. Over the years, dredged sediment and gravel fill have been placed across portions of the site at a thickness of between 2 and 20 feet. Alluvium underlying the fill consists of silt, sandy silt, and silty sand. Fine-grained alluvial deposits predominate to a depth of approximately 200 feet, where the alluvium becomes generally a coarse-grained mixture of sand, gravel, and cobbles. Flows of the Columbia River Basalt Group underlie the alluvium.

Basalt at the site is encountered at variable depths because of the buried remnant of Mt. Coffin, ranging from less than 5 feet at the Mt. Coffin remnant to greater than 300 feet elsewhere. The low-permeability basalt that makes up the remnant of Mt. Coffin influences groundwater flow directions in the southern portion of the site.

1.4 Hydrogeology

Groundwater occurring in alluvium is referred to as alluvial (or alluvial zone) groundwater, and groundwater occurring in basalt as basalt (or basalt zone) groundwater. These zones do not exist in a “layer cake” arrangement at the site. Instead, the buried, but steep, relief associated with the remnant of Mt. Coffin allows basalt groundwater and alluvial groundwater to occur side-by-side in the southern portion of the site. Groundwater in both of these zones discharges to the Columbia River, which controls the base level of the local and regional hydrologic systems.

Groundwater occurs in the upper part of the fill and alluvium deposits under unconfined conditions at depths of 8 to 15 feet below ground surface (bgs) in the west area and 2.5 to 4.5 feet bgs in the more easterly former No. 1 Cell Room area. Groundwater elevations in the upper, finer-grained part of the alluvium, as determined by site monitoring wells, are controlled by seasonal variations in precipitation and, to a lesser extent, by fluctuations in the Columbia River stage. Figure 2 presents the location of existing monitoring wells at the site.

[2] CH2M HILL. (September 2004). *Chlor-Alkali Plant - Compliance Monitoring Plan.* Prepared for Weyerhaeuser Company, Longview, Washington.

In general, groundwater elevations tend to be highest in the spring and lowest in the late summer or early fall. Based on the *Remedial Investigation*[3] (RI) findings, the hydraulic gradient in the alluvium ranges from 0.04 to 0.008, the hydraulic conductivity is estimated at 28 feet per day, and the horizontal groundwater flow velocity ranges from 1 to 6 feet per day.

The direction of groundwater flow varies across the site but is generally toward the river. In the central and western portions of the site, groundwater generally flows to the west-southwest. In the eastern portion of the site, groundwater in the alluvium flows around the less permeable, buried remnant of Mt. Coffin, with south-southeasterly flow east of Mt. Coffin and west to southwesterly flow west of Mt. Coffin. The area where the elevation of basalt exceeds 10 feet (that is, basalt is present within 10 feet of the surface) exhibits a greater effect on shallow groundwater flow, as noted in the RI. Based on the RI findings, the hydraulic gradient in the basalt zone is estimated at 0.03, the hydraulic conductivity is estimated at 6×10^3 foot/day, and the horizontal groundwater flow velocity is estimated at approximately 0.004 foot/day.

Below a depth of approximately 200 feet, groundwater occurs in a confined alluvial aquifer. The total thickness of this aquifer is poorly documented, but is at least 130 feet thick.

1.5 Nature and Extent of Contamination in Groundwater

The mercury released to the environment at the Chlor-Alkali Plant was elemental and inorganic, with relatively low mobility. Elemental mercury is very dense and readily sinks under gravity through openings in media through which it travels (e.g., large pores, fractures, joints). Mercury stops moving when it encounters a pore or fracture too small for it to enter. The residual mercury will then slowly dissolve into groundwater or soil pore water. In the unsaturated zone, mercury also will enter the vapor phase. Because of its density, high surface tension, presence as a separate-phase liquid, and accumulation in basalt fractures, active mercury remediation at the site is inherently complex and difficult.

Use of mercury at the plant ceased in 1976, and all of the processes and equipment using mercury have been either converted to another type of process or removed. As a result, there are no remaining sources of mercury at the site other than the residual from the earlier releases.

The distribution of mercury in the two water-bearing zones (alluvial groundwater and basalt groundwater) is predominantly a result of the proximity of the zones to historical sources (particularly, the former No. 1 Cell Room and former surface impoundment area) and of groundwater flow. Site groundwater sampling results have shown that mercury concentrations are generally below detection limits in all areas of the site except at the former No. 1 Cell Room and former surface impoundment area. In these areas, recent groundwater sampling indicates that mercury concentrations in alluvial and basalt groundwater range from below the detection limit of 0.2 micrograms per liter (µg/L) up to 80 µg/L.

Results from the RI include the following additional information:

- Mercury concentrations in groundwater are remaining steady or decreasing with time. The rate of decrease is slowest in the area of the former No. 1 Cell Room and the former surface impoundments. Except for in these areas, mercury concentrations are at or below the drinking water maximum contaminant level (MCL) of 2 µg/L for mercury.

[3] CH2M Hill. (July 25, 2001). *Remedial Investigation Report*. Prepared for Weyerhaeuser Company. Longview, Washington.

- Potential explanations for the slow decrease in mercury concentrations in the area of the former No. 1 Cell Room include the following:
    - The amount of groundwater flux (and therefore the rate of flushing) is limited because the asphalt cap reduces rainfall infiltration, and the permeability of the basalt and alluvium fill above the basalt is very low.
    - It is possible that small amounts of elemental mercury may be present below the water table as isolated globules in basalt fractures. If present, these globules could serve as an ongoing source of dissolved mercury in basalt groundwater.
- Although transient fluctuations in mercury concentrations may occur as a result of unusually high groundwater levels and rainfall conditions, concentrations in ground-water are not expected to increase substantially over time. The original mercury sources were removed from the plant more than 25 years ago. Additional mercury sources were addressed in subsequent removal actions. Furthermore, results from soil and groundwater sampling suggest that leaching of mercury from soil to groundwater by infiltration and percolation of precipitation is not a major factor influencing mercury concentrations in groundwater.
- Mercury is not present in groundwater upgradient of the former No. 1 Cell Room and former surface impoundment area based on semiannual groundwater sampling data from monitoring wells CH-7 and CH-8 collected from 1998 to 2009.
- The basalt portion of the shallow aquifer contains higher mercury concentrations than the alluvial aquifer, but transmits less groundwater flow. Therefore, mercury flux contributed by the basalt aquifer constitutes a relatively insignificant amount of mercury to the surrounding groundwater and Columbia River.

2.0 RECENT SITE ACTIVITIES

The following section summarizes recent site activities, including the current groundwater monitoring program and recent site redevelopment activities.

2.1 Groundwater Monitoring Program

The long-term monitoring program is intended to confirm the effectiveness of the cleanup action by monitoring to ensure that mercury concentrations in groundwater are either stable or decreasing. Groundwater monitoring consists of water level measurements, groundwater sample collection, and analysis for dissolved mercury and general groundwater parameters.

The 2014 groundwater monitoring event is the first monitoring event conducted under the revised schedule proposed by Ecology in their letter *Modifications in the groundwater network for the former Longview, WA Chlor-Alkali Plant*.[4] Under the revised schedule, one year of quarterly sampling is to be conducted once every five years. The western monitoring wells (MW wells) only need to be sampled once every five years during the first-quarter sampling event.

Based on their location, the wells in the monitoring network can be categorized into the following four groups:

- HLA shallow “A” wells: These wells are located in the area of the Former No. 1 Cell Room and are screened in alluvial fill material that overlies the basalt zone (Mount Coffin remnant) in this area. This group includes HLA-1A and HLA-3A.

[4] Ecology (February 8, 2011). *Modifications in the groundwater network for the former Longview, WA Chlor-Alkali Plant*.

- HLA shallow "B" wells: These wells are located in the area of the Former No. 1 Cell Room and are screened within the basalt zone. Included in this group are HLA-1B, HLA-3B, HLA-6B, and HLA-7B.
- MW wells: These wells are located in the western portion of the site and include MW-1, MW-2, MW-3, and MW-4.
- CH wells: These wells are screened within the alluvial aquifer and include wells CH-1 to CH-6. Two other wells in this group, CH-7 and CH-8, were background monitoring wells that were located upgradient of the site and were decommissioned in May 2011. Mercury was never detected above reporting limits in these two background wells.

Figure 2 presents the locations of the current groundwater monitoring well network.

2.2 Other Site Activities

The following work was completed during the reporting period related to groundwater monitoring.

In January 2014, Weyerhaeuser transitioned consulting service providers from CH2M HILL to PBS Engineering and Environmental Inc. (PBS). On January 30, 2014, Weyerhaeuser submitted a work plan for monitoring well network improvements and lysimeter abandonment in preparation for the 2014 quarterly groundwater monitoring. The work plan was approved by Ecology. The following work was proposed in the work plan:

- Decommissioning of well HLA-6A.
- Decommissioning of accessible shallow lysimeters installed in the former No. 1 Cell room area.
- Replacing the steel flush-mount monument at HLA-6B with a HDPE traffic-rated monument.
- Replacing the above-grade lockable steel casings for wells HLA-3A and HLA-3B with Line-X coated steel monuments.

On February 18 and 19, 2014, the monitoring well maintenance and monitoring well and lysimeter abandonments were completed. Private and public utility locates for potential underground utilities were completed for the work areas prior to commencing field activities. All County Locating Services of Battle Ground, Washington, cleared the locations of the five lysimeters to be abandoned, the monitoring well to be abandoned, and the three monitoring wells requiring maintenance. Refer to the attached Figure 3 for the locations of the lysimeters. Figure 2 shows the locations of the wells. A permit was obtained from Axiall (current occupant) for the work that required access to their salt pile area.

2.2.1 Monitoring Well Maintenance

Cascade Drilling, LP (Cascade) of Clackamas, Oregon performed the monitoring well maintenance. The flush-mount steel monument around Monitoring Well HLA-6B was removed and replaced with a high-density polyethylene (HDPE), traffic-rated monument to prevent future corrosion. The aboveground protective steel monuments for monitoring wells HLA-3A and HLA-3B were removed as they were corroded and could not be locked. They were replaced with Line-X coated steel aboveground monuments. A vacuum truck was used to remove the sand from inside the well monument and the asphalt and concrete were removed via jackhammer. Mercury vapor monitoring was conducted using a Jerome Mercury Vapor Analyzer to monitor the worker breathing zone during work required to remove debris from the borehole. Mercury vapor was not detected at any well location.

For each of the wells, the annular space between the monument, PVC, and borehole was filled with quick-setting concrete up to the existing ground surface. A new lock was placed on each monument. Details of the work performed at each well were provided in the *2014 Annual Report*.[5]

2.2.2 Monitoring Well Abandonment

Due to the degraded condition of the larger area of concrete surrounding the well monument at HLA-6A, it was decided to leave the well monument in place rather than remove it. The inside of the 2-inch PVC monitoring well was filled with hydrated bentonite chips. The annular space between the monument and the PVC was filled with concrete to the ground surface.

2.2.3 Lysimeter Abandonment

A total of five lysimeters (labeled "L" on Figure 3) were abandoned: L-1 located on the Weyerhaeuser site and L-3, L-4, L-5, and L-7 located on the Axiall site. Two lysimeters, L-2 and L-8, were not abandoned because the salt pile covered them during the field event. Lysimeter L-6 was not abandoned because it could not be located in an Axiall equipment storage area.

The following process was used to abandon each lysimeter. The monument lid was broken and removed. The rest of the monument was left in place. The top of each lysimeter (2-inch PVC) was located at 1-foot bgs and was noted to be covered with bentonite. The bentonite was removed and the lysimeter wires were observed to be sealed within the 2-inch PVC with a rubber stopper. Consistent with design drawings, the 2-inch PVC extended to a depth of 2 feet bgs. The contents of the lysimeter were removed and the 2-inch PVC and the annular space between the PVC and the monument were filled with quick-setting concrete.

2.3 Impervious Conditions

Site work completed by Axiall during the reporting period, which impacted the impervious surface within the boundary area, includes:

- Grading and paving interior plant roadways and construction of stormwater valley gutters
- Installation of bollards at the clean water sump
- Relocation of the chlorine compressor cooler foundation and existing fire hydrant
- Tank demolition and rebuild (tank # T-1840)

The current amount of impervious surfaces is approximately 28.2 acres. Impervious surface areas were calculated based on drawings showing recent site redevelopment activities. The amount of impervious area at the site needs to be maintained as part of the Agreed Order (AO). The extent of existing impermeable surfaces at Axiall and new impermeable surfaces added during this reporting period are shown in Figure 4. The amount of impervious surface areas in 2004, 2010, and 2014 are presented in Table 1.

3.0 QUARTERLY GROUNDWATER MONITORING

In October 2013, a work plan was submitted to Ecology detailing the proposed 2014 quarterly groundwater monitoring program at the site. Quarterly groundwater monitoring was conducted on the dates listed below.

- First Quarter: March 25 and 26
- Second Quarter: June 17 to 19

[5] PBS Engineering and Environmental. (May 5, 2014). *2014 Annual Monitoring Report*. Weyerhaeuser Chlor-Alkali Plant Site, Longview, Washington.

- Third Quarter: August 26 to 28
- Fourth Quarter: December 9 to 11

The sampling event was conducted in accordance with the *Field Sampling Plan for Long-Term Monitoring Program*.[6]

3.1 Water Level Monitoring

Prior to collecting groundwater samples, groundwater elevations were measured at all monitoring wells. Historical groundwater elevation data for site monitoring wells are summarized in Table 2. The water levels measured in 2014 were consistent with historical water levels. Groundwater level was not measured in monitoring well CH-4 during the first-quarter monitoring event due to the monument being filled with stormwater runoff. During the third-quarter monitoring event, well HLA-1A was dry, so water elevation could not be measured during that event.

3.2 Groundwater Sampling

Groundwater samples were collected quarterly per the revised groundwater monitoring schedule. As noted previously, well HLA-1A was dry during the third-quarter event and the monument for well CH-4 was filled with stormwater runoff during the first-quarter event so a sample could not be collected. All samples were field filtered and shipped to Weyerhaeuser Analytical Services for analysis of dissolved mercury by Method AM1-245.1.

3.2.1 Data Validation

To assess the quality of the data, the laboratory reviewed holding times, control samples, blank contamination, laboratory duplicates, spike recovery, and field duplicates. This evaluation concluded that all results were acceptable for all quarters. Laboratory quality control (QC) reports for all quarters are provided in Attachment 1.

The field duplicate results are provided in Table 3.

3.2.2 Specific Conductance Monitoring

Increases in specific conductance levels over historical values were identified at seven wells (HLA-1A, HLA-1B, HLA-3A, HLA-3B, HLA-6B, HLA-7B, and CH-6) between 2008 and 2010. The increase was attributed to resumption of salt storage and brine production at the facility following construction of the new membrane Chlor-Alkali plant. To address this issue, Equa-Chlor (now Axiall Corporation), relined their brine trench with heavy polyurethane in July 2008. In fall 2009, the salt pad storage area was lined with a 45-mil linear low-density polyethylene (LLDPE) liner, and a perimeter retaining wall was installed by Axiall.

In 2014, specific conductance in the shallow “A” wells decreased back to pre-increase levels. Specific conductance in the shallow “B” wells remains elevated from pre-increase levels. Levels in the CH wells did not experience the historical significant increase except for well CH-6; in 2014, this well had the highest specific conductance measured since 2007. Table 4 provides historical specific conductivity data dating back to 2005.

[6] CH2M HILL (2004). *Field Sampling Plan for Long-Term Monitoring Program*. Attachment A of the *Compliance Monitoring Plan*. Prepared for Weyerhaeuser.

3.2.3 Groundwater Sampling and Mercury Results

Detections of dissolved mercury were similar to previous sampling events. The 2014 mercury concentrations ranged from 0.6 to 57 µg/L in the HLA wells, and from below detection limits (0.2 µg/L) to 3.1 µg/L in the CH wells.

Recent and historical mercury concentrations dating back to 2005, which is when monitoring under the Cleanup Action Plan (CAP)[7] schedule began, are summarized in Table 5. Field parameters for all quarters are summarized in Tables 6, 7, 8, and 9. Time series graphs of mercury concentrations and groundwater levels are shown in Figures 5, 6, 7, and 8. Laboratory analytical results are provided in Attachment 1.

3.3 Statistical Analysis Summary

As per the *Compliance Monitoring Plan*, the Mann-Kendall test (or Kendall's test) was used to assist in identifying whether trends are present in mercury concentrations at each of the active monitoring wells. Kendall's tests were not evaluated for monitoring wells CH-6, MW-1, and MW-2 as mercury has not been detected at these wells during the past 12 monitoring events. The monitoring data were also compared with average, maximum, minimum, and 95th-percentile concentrations.

Table 10 summarizes the results of the Kendall's test and statistical evaluation. The Kendall's test indicated that concentrations appear to be decreasing at seven wells (HLA-1A, HLA-1B, HLA-7B, CH-2, CH-3, CH-4, and MW-3) and stable at six wells (HLA-3A, HLA-3B, HLA-6B, CH-1, CH-5R, and MW-4). Mercury levels at CH-5R during the fourth-quarter event were the highest measured, in this well, over the past 12 monitoring events. The cause for the increase at this location is not clear.

3.4 Handling of Investigation-Derived Waste

Purged groundwater from the quarterly monitoring events was stored in a 30-gallon plastic drum that was transported to Sump D, an on-site, approved disposal area.

For the 2014 monitoring well maintenance activities, the two aboveground steel monuments, monument lids, and the lysimeter parts (wires and stoppers) were steam cleaned by Cascade upon completion of the work. Steam-cleaned parts and debris were disposed of at the Weyerhaeuser Material Recovery Center. The steam cleaning water (approximately 40 gallons) was disposed of in Sump D.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the historical and 2014 monitoring results, the following modifications to the long-term monitoring program for mercury are recommended for the site:

- **Discontinue groundwater monitoring of the western monitoring wells (MW-1 to MW-4) and decommission wells.** These wells were installed in 1987. Mercury has never been detected above method reporting limits in MW-1. The last detections in wells MW-2 and MW-4 were in 1997 and 1998, respectively. At well MW-3, its last detection was an estimated value ("J" flag) during the March 2001 sampling event; prior to that, the last detection in MW-3 was in 1998. With 16 years of monitoring in these four wells without a reliable detection, one can surmise that the groundwater in the vicinity of these wells does not pose a threat to human health and the environment. Elimination of these wells from the monitoring program will not impact future assessment of the site.

[7] CH2M HILL (2004). Cleanup Action Plan (CAP) for Chlor-Alkali Site.

- **Reduce monitoring well frequency to one single monitoring event every five years for all HLA and CH wells.** There are over 20 years of monitoring well data for the CH and HLA wells. These data show that mercury concentration trends have been relatively consistent, and the Kendall's test indicates that the concentrations are either stable or decreasing in all existing wells. Therefore, reducing monitoring to one event every five years poses minimal risk to human health and the environment. Historically, higher concentrations have been detected in the first- and fourth-quarter monitoring events, and more recent semi-annual sampling was conducted in the first and third quarters. To maintain the historical sampling schedule, a conservative approach will be to conduct the groundwater monitoring in the first quarter once every five years.

Please contact Mark Leece at 503.806.2253 if you have any questions regarding this report.

Sincerely,
PBS Engineering and Environmental Inc.

Mark Leece, PE
Principal Engineer

LG/HY/ML/ln

Figures:

Figure 1 – Project Location
Figure 2 – Groundwater Monitoring Well Locations
Figure 3 – Lysimeter and Monitoring Well Locations
Figure 4 – Extent of Impermeable Surface
Figure 5 – Dissolved Mercury Concentrations and Groundwater Levels – Shallow Wells Overlying Basalt
Figure 6 – Dissolved Mercury Concentrations and Groundwater Levels – Basalt Wells
Figure 7a – Dissolved Mercury Concentrations and Groundwater Levels – Alluvial Aquifer Wells (CH-1 to CH-3)
Figure 7b – Dissolved Mercury Concentrations and Groundwater Levels – Alluvial Aquifer Wells (CH-4 to CH-6)
Figure 8 – Dissolved Mercury Concentrations and Groundwater Levels – Western Monitoring Wells

Tables:

Table 1 – Amount of Impervious Area within Restricted Covenant Area
Table 2 – Historical Monitoring Well Groundwater Elevation Data
Table 3 – Field Duplicate Results
Table 4 – Historical Specific Conductance
Table 5 – Historical Analytical Results
Table 6 – First Quarter Field Parameters

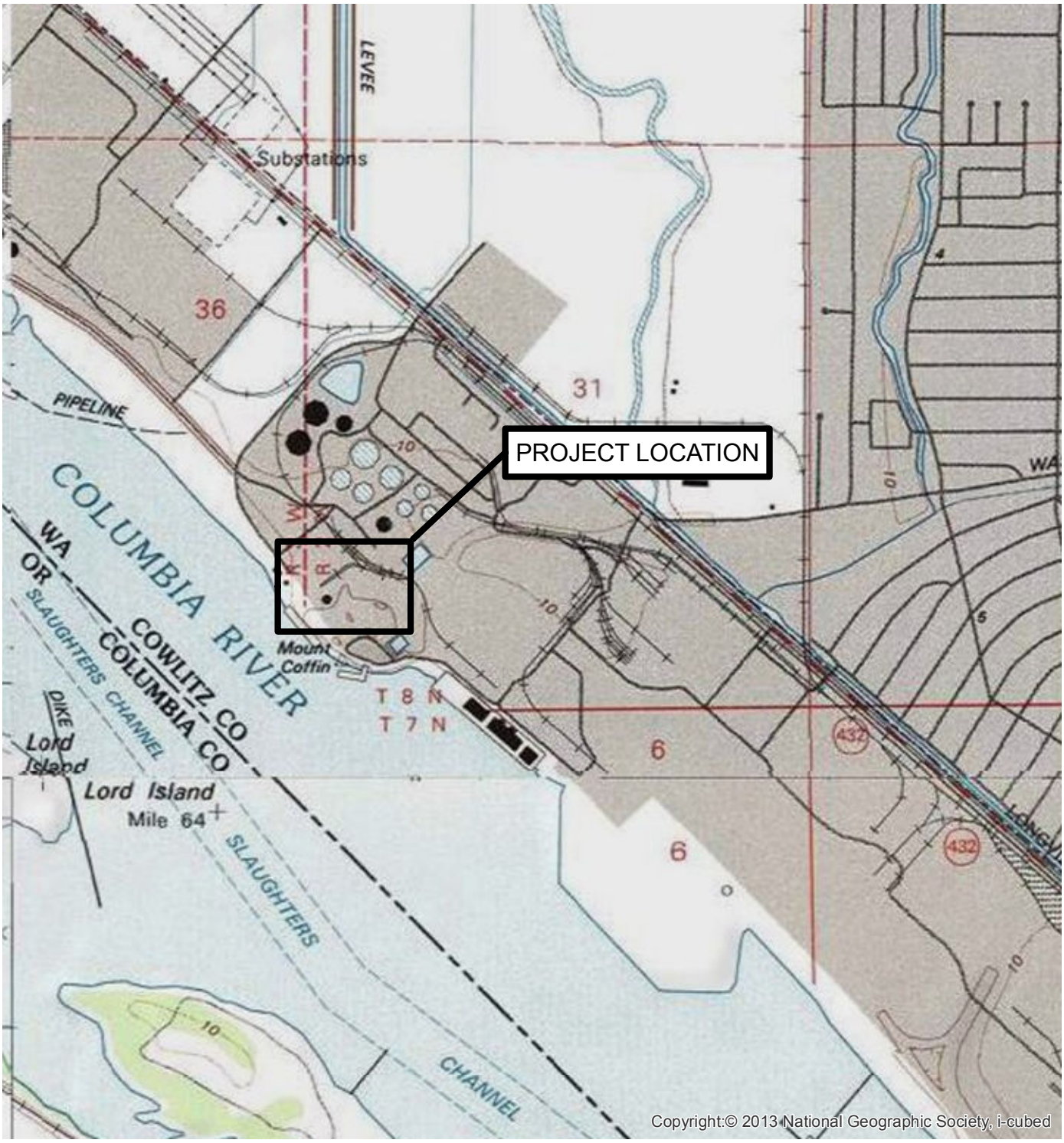
Table 7 – Second Quarter Field Parameters
Table 8 – Third Quarter Field Parameters
Table 9 – Fourth Quarter Field Parameters
Table 10 – Statistics for Mercury in Groundwater

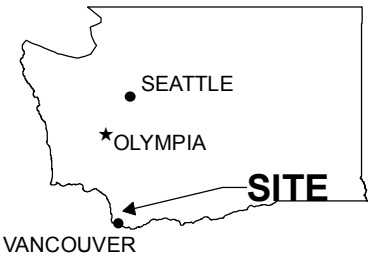
Attachments:

Attachment 1 – Laboratory Analytical Reports

cc: Carol Wiseman, Weyerhaeuser
Brian Wood, Weyerhaeuser
Lauren Bradford, Axiall
Kim Wigfield, Ecology
Shingo Yamazaki, Ecology

FIGURES





0 1,000 2,000 4,000'

1 inch = 2,000 feet

PREPARED FOR: WEYERHAEUSER COMPANY

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PBS

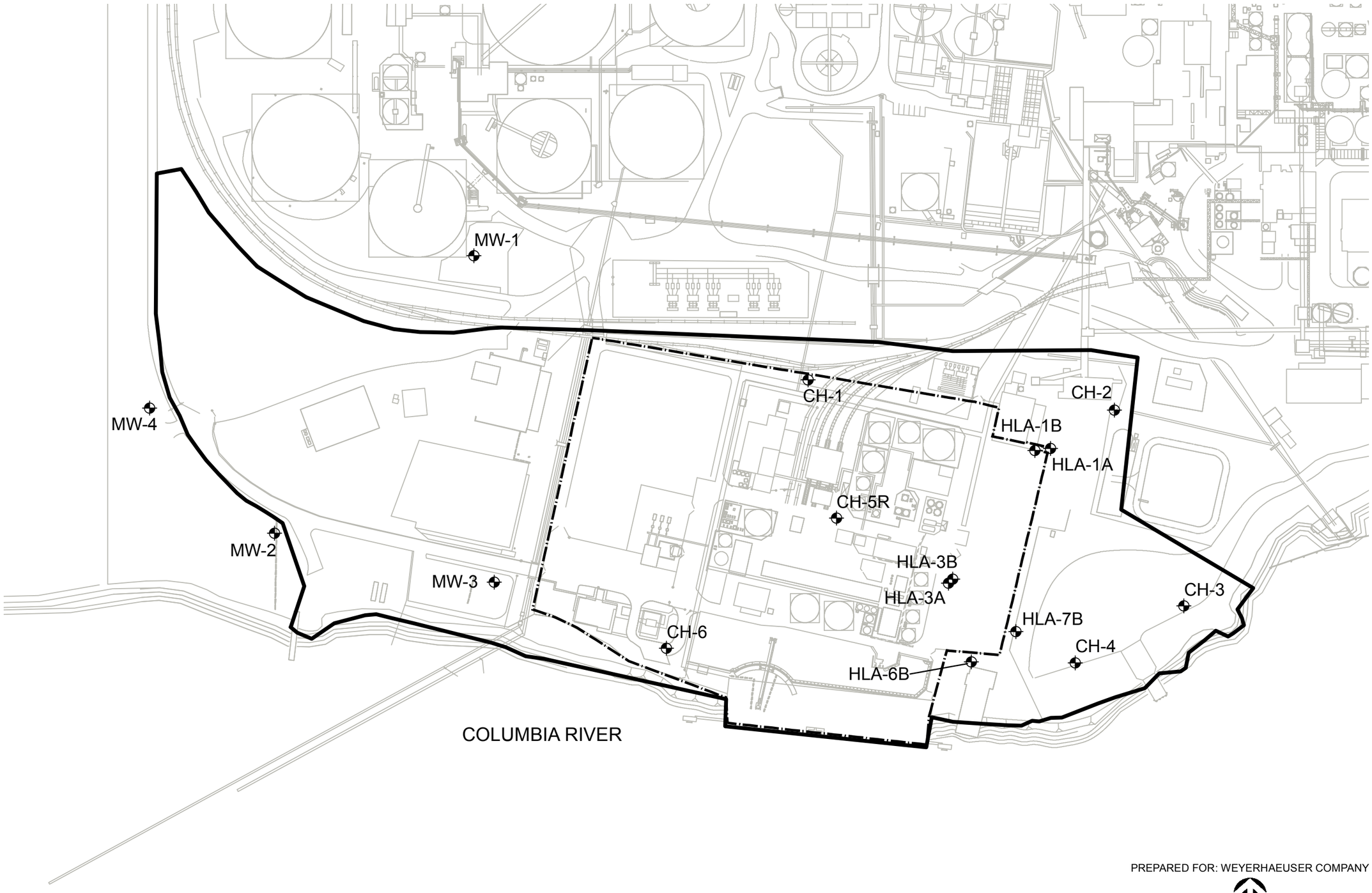
PROJECT # 70862.001

DATE MAY 2014

SITE PLAN

3401 INDUSTRIAL WAY
LONGVIEW, WASHINGTON

FIGURE 1



SOURCES: WEYERHAEUSER COMPANY

LEGEND
Extent of Restrictive Covenant
Axiall Facility

PREPARED FOR: WEYERHAEUSER COMPANY

PLANT GRID NORTH

200 100 0 200'

PBS
Engineering + Environmental
4412 SW Corbett Ave
Portland, OR 97239
503.248.1939 Main
866.727.0140 Fax
www.pbsenv.com

WEYERHAEUSER CHLOR-ALKALI PLANT

3401 INDUSTRIAL WAY
LONGVIEW, WASHINGTON

PROJECT	70862.001
DATE	APR 2015
FIGURE	2

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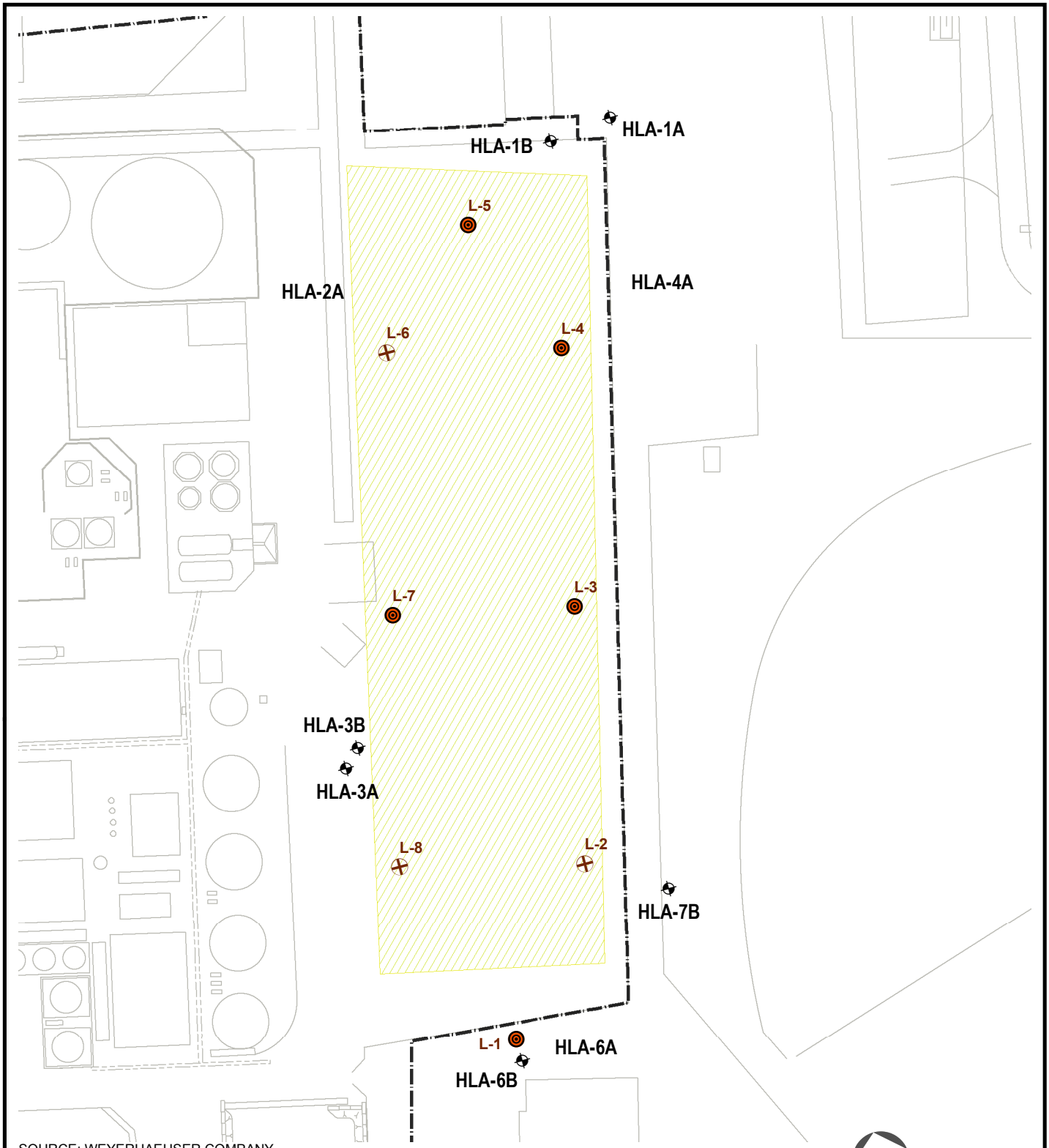

SOURCE: WEYERHAEUSER COMPANY

Legend

- Abandoned Monitoring Well
- Monitoring Well
- Axiall Facility
- Lysimeter
- Lysimeter - Abandoned Feb 2014
- Approximate Area for Lysimeters

HLA-6A – ABANDONED

HLA-6B, HLA-3A, HLA-3B } MAINTENANCE FEBRUARY 2014

PLANT GRID NORTH

0 37.5 75 150'

1 inch = 75 feet

PREPARED FOR: WEYERHAEUSER COMPANY

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PBS

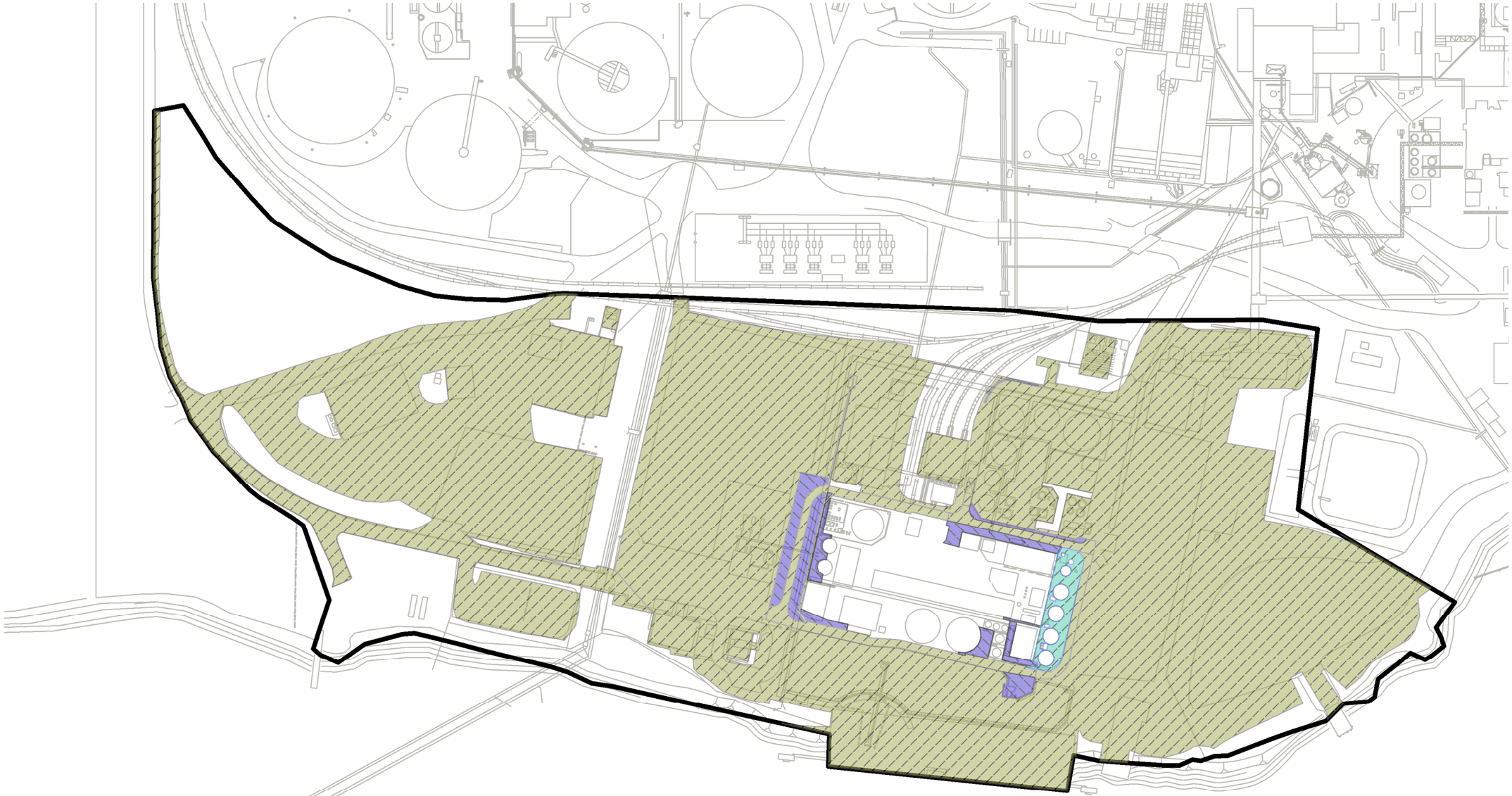
PROJECT # 70862.001

DATE MAY 2014

LYSIMETER AND MONITORING WELL LOCATIONS

3401 INDUSTRIAL WAY
LONGVIEW, WASHINGTON

FIGURE 3



SOURCES: WEYERHAEUSER CORPORATION

LEGEND

- Extent of Restrictive Covenant
- Impervious surfaces added during project
- Impervious surfaces added in 2014
- Existing impervious surfaces

PREPARED FOR: WEYERHAEUSER COMPANY

PLANT GRID NORTH

200 100 0 200'

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Engineering + Environmental
4412 SW Corbett Ave
Portland, OR 97239
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866.727.0140 Fax
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WEYERHAEUSER CHLOR-ALKALI PLANT
IMPERVIOUS SURFACES

3401 INDUSTRIAL WAY
LONGVIEW, WASHINGTON

PROJECT	MAR 2015
DATE	70862.001
FIGURE	4

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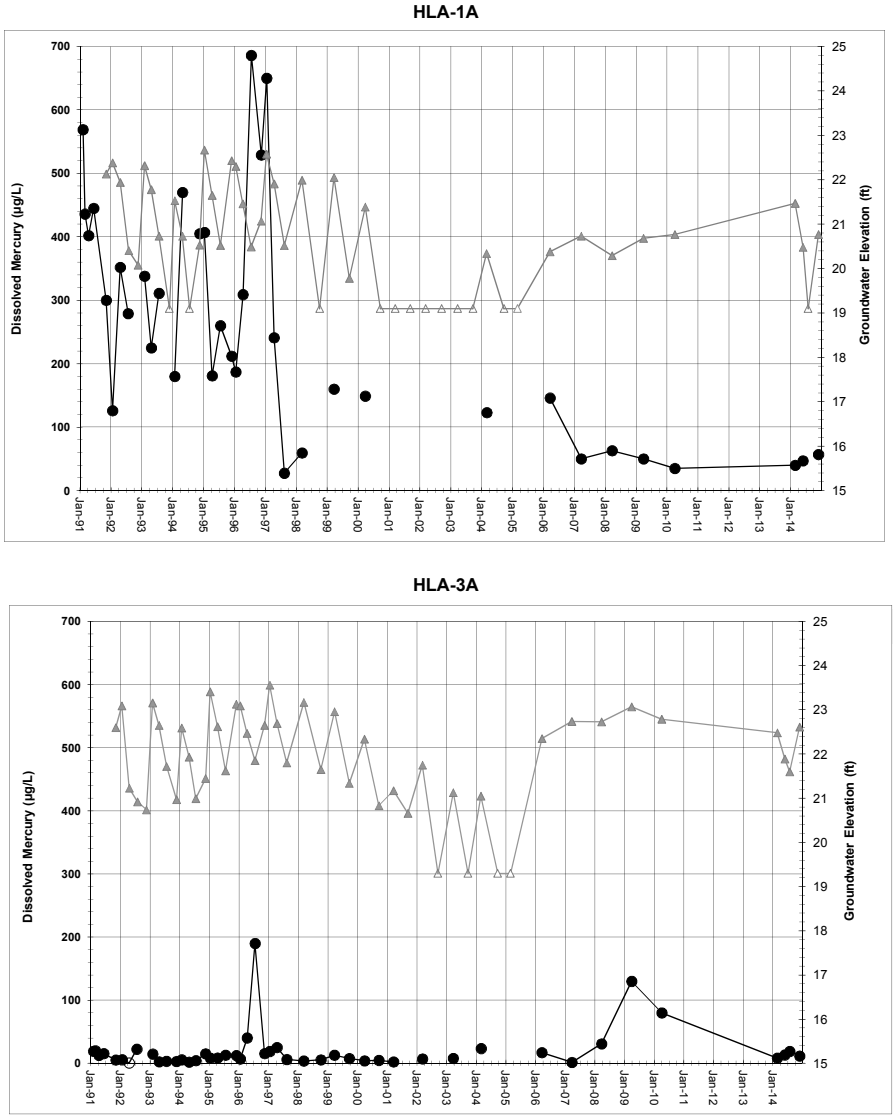
Figure 5: Dissolved Mercury Concentrations and Groundwater Levels - Shallow Wells Overlying Basalt
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington



Analytical Results

- Dissolved Mercury Concentration (µg/L)
- Not Detected, Value Shown at Reporting Limit

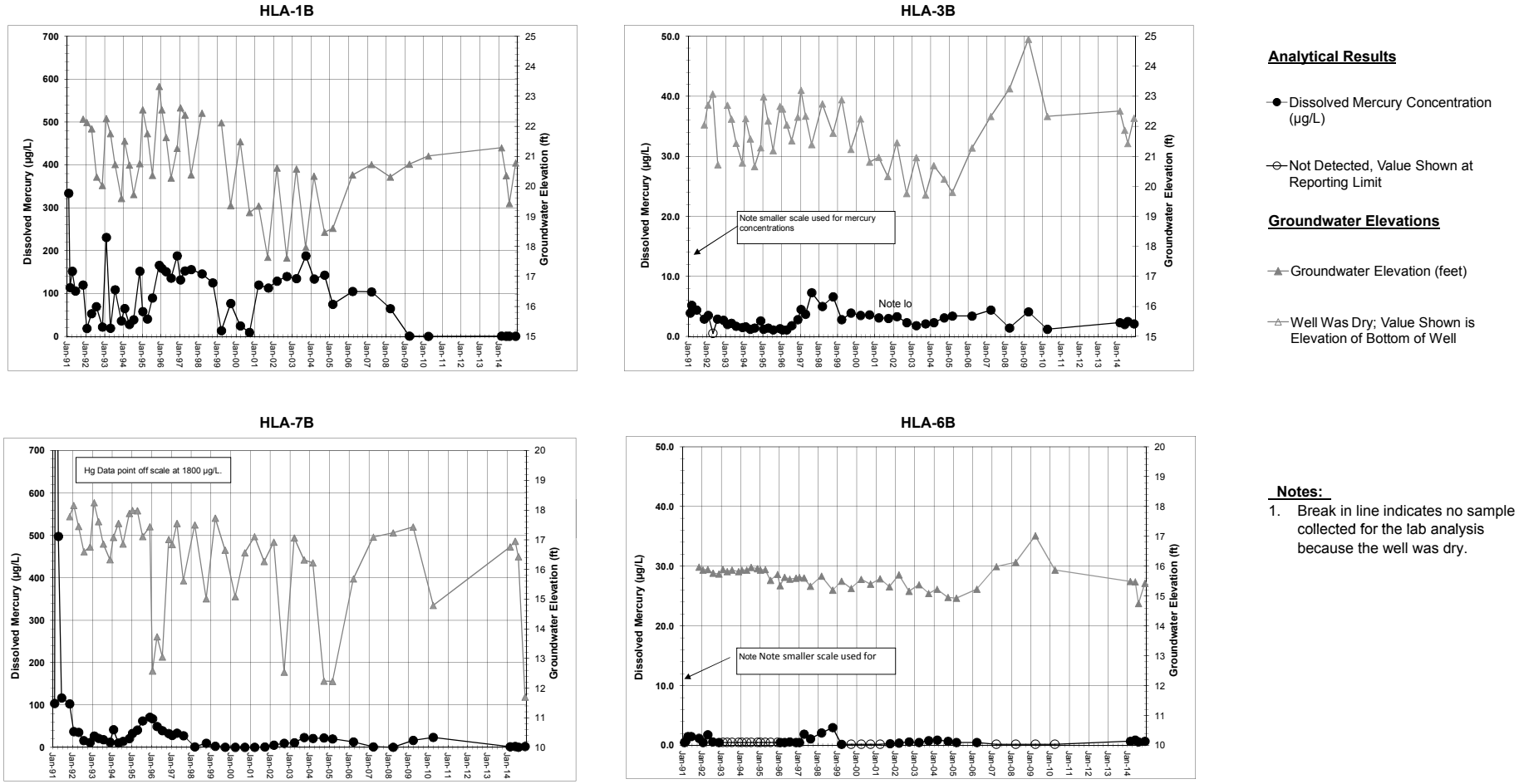
Groundwater Elevations

- Groundwater Elevation (feet)
- Well Was Dry; Value Shown is Elevation of Bottom of Well

Notes:

1. Break in line indicates no sample collected for lab analysis because the well was dry.

Figure 6: Dissolved Mercury Concentrations and Groundwater Levels - Basalt Wells
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington

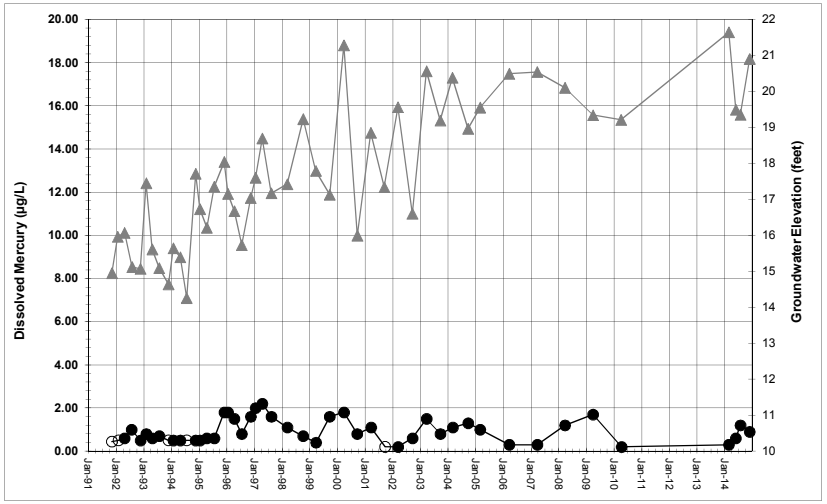


Notes:

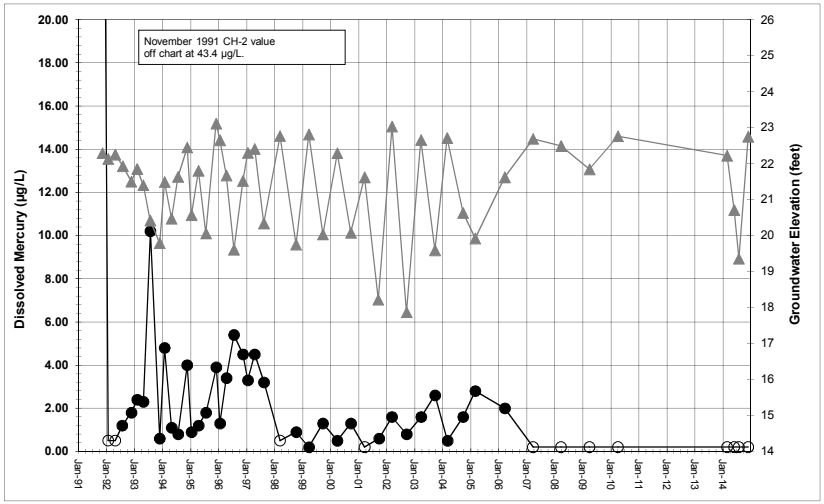
1. Break in line indicates no sample collected for the lab analysis because the well was dry.

Figure 7a: Dissolved Mercury Concentrations and Groundwater Levels - Alluvial Aquifer Wells (CH-1 to CH-3)
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington

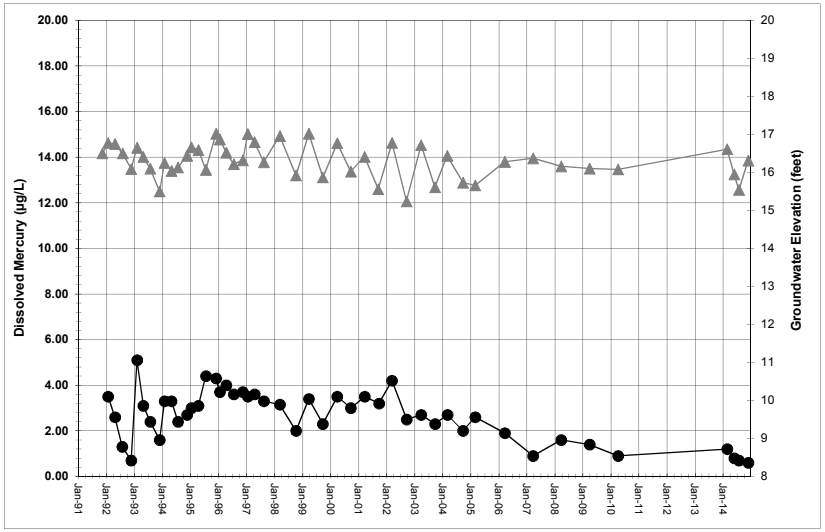
CH-1



CH-2



CH-3



Analytical Results

- Dissolved Mercury Concentration (µg/L)
- Not Detected, Value Shown at Reporting Limit

Groundwater Elevations

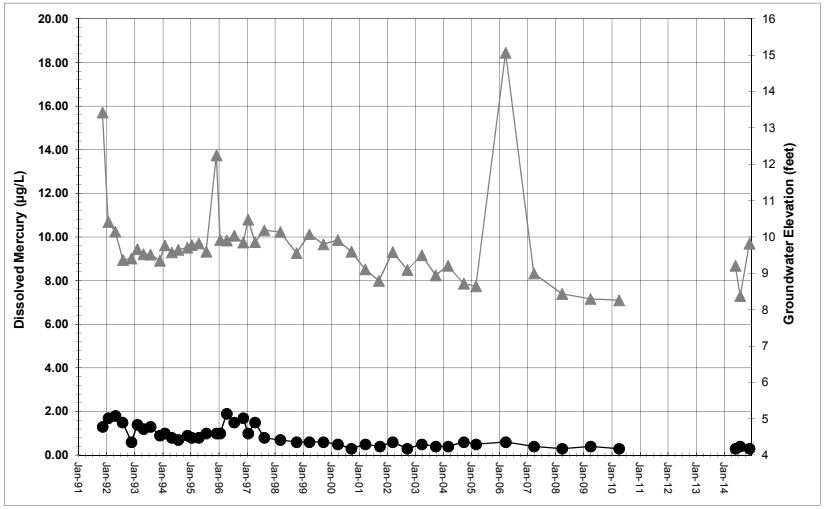
- Groundwater Elevation (feet)
- Well Was Dry; Value Shown is Elevation of Bottom of Well

Notes:

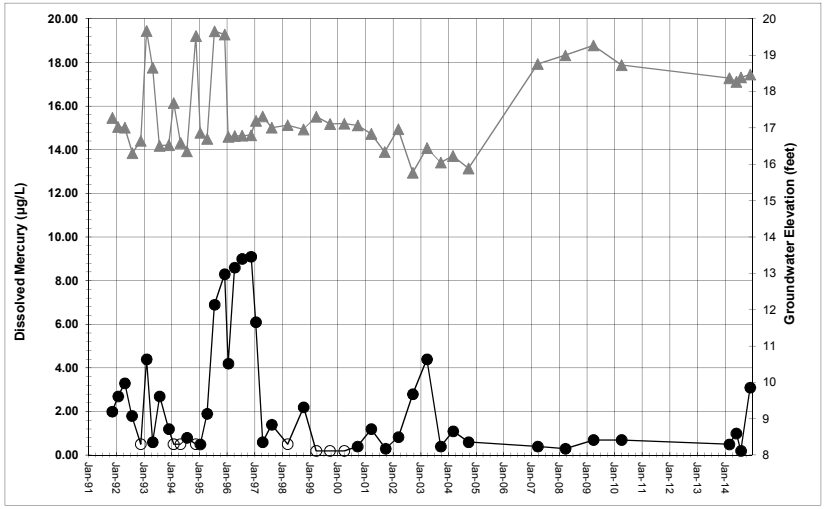
1. Break in line indicates no sample collected for lab analysis because the well was dry.

Figure 7b: Dissolved Mercury Concentrations and Groundwater Levels - Alluvial Aquifer Wells (CH-4 to CH-6)
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington

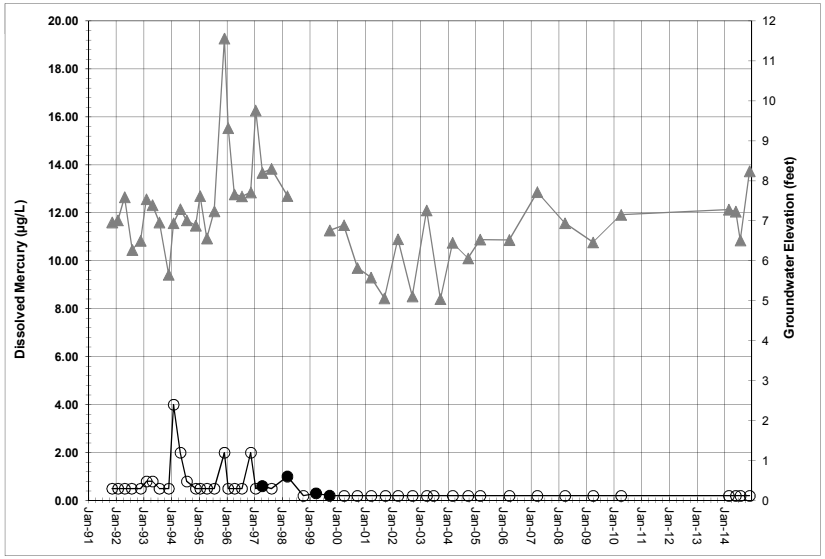
CH-4



CH-5 / CH-5R



CH-6



Analytical Results

- Dissolved Mercury Concentration (µg/L)
- Not Detected, Value Shown at Reporting Limit

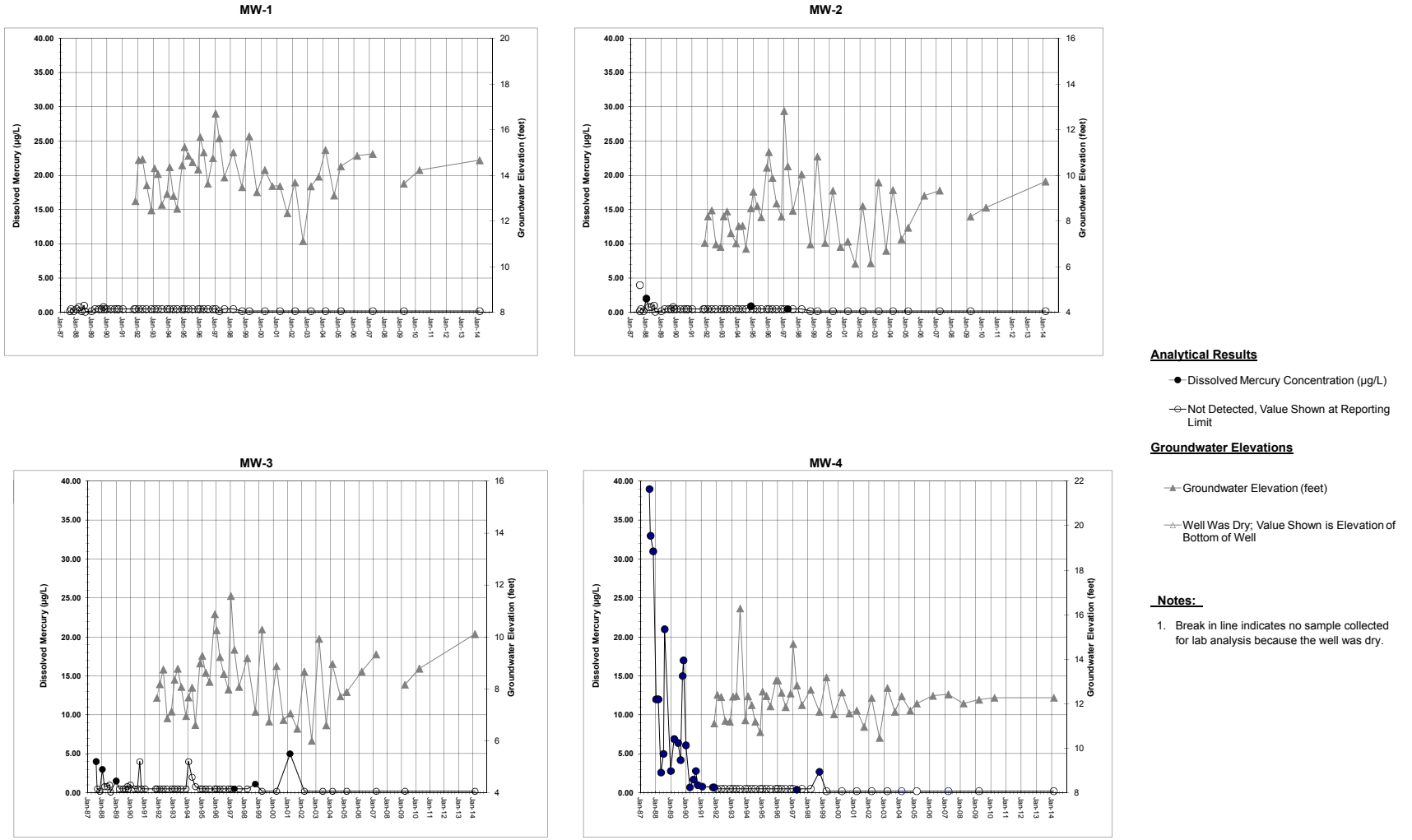
Groundwater Elevations

- Groundwater Elevation (feet)
- Well Was Dry; Value Shown is Elevation of Bottom of Well

Notes:

1. Break in line indicates no sample collected for lab analysis because the well was dry.
2. CH-5 was decommissioned in January 2005.

Figure 8: Dissolved Mercury Concentrations and Groundwater Levels - Western Monitoring Wells
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington



TABLES

Table 1. Amount of Impervious Area Within Restrictive Covenant
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington

Year	Total Area (acres)	Pervious Area (acres)	Impervious Area (acres)
2004	38.5	14.68	23.84
2010	38.5	11.14	27.36
2014	38.5	10.3	28.2

Table 2: Historical Monitoring Well Groundwater Elevation Data
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington

	MPE	Overall Well Depth (ft bMPE)	Bottom of Screen Elevation (ft)	Location	Date	Mar-2005	Mar-2006	Mar-2007	Mar-2008	Apr-2009	Apr-2010	Mar-2014	Jun-2014	Aug-2014	Dec-2014
MW-1	**24.06**	**21.7**	**4.9**	**Western Site Area**	**DTW**	9.67	9.20	9.12	NM	10.43	9.83	9.40	NM	NM	NM
					ELEV	14.39	14.86	14.94	NM	13.63	14.23	14.66	NM	NM	NM
MW-2	**17.57**	**22.7**	**5.0**		**DTW**	9.86	8.46	8.24	NM	9.38	8.98	7.84	NM	NM	NM
					ELEV	7.71	9.11	9.33	NM	8.19	8.59	9.73	NM	NM	NM
MW-3	**17.10**	**22.5**	**-3.9**		**DTW**	9.22	8.43	7.77	NM	8.94	8.32	6.99	NM	NM	NM
					ELEV	7.88	8.67	9.33	NM	8.16	8.78	10.11	NM	NM	NM
MW-4	**26.38**	**27.1**	**1.8**		**DTW**	14.37	14.02	13.96	14.37	14.20	14.11	14.11	NM	NM	NM
					ELEV	12.01	12.36	12.42	12.01	12.18	12.27	12.27	NM	NM	NM
HLA-1A	**27.63**	**7.9**	**19.1**	**Former No. 1 Cell Room Area**	**DTW**	DRY	7.25	6.90	7.34	6.95	6.86	6.16	7.15	DRY	6.86
					ELEV	19.10	20.38	20.73	20.29	20.68	20.77	21.47	20.48	---	20.77
HLA-1B	**27.03**	**34.3**	**-4.2**		**DTW**	8.43	6.65	6.30	6.72	6.29	6.02	5.74	6.67	7.60	6.25
					ELEV	18.60	20.38	20.73	20.31	20.74	21.01	21.29	20.36	19.43	20.78
HLA-3A	**26.54**	**6.3**	**19.3**		**DTW**	DRY	4.19	3.80	3.81	3.47	3.75	4.06	4.65	4.94	3.93
					ELEV	19.30	22.35	22.74	22.73	23.07	22.79	22.48	21.89	21.60	22.61
HLA-3B [1]	**27.88**	**29.3**	**-2.4**		**DTW**	7.46	5.98	5.55	4.63	2.98	5.55	5.37	6.01	6.45	5.61
					ELEV	19.80	21.28	22.33	23.25	24.90	22.33	22.51	21.87	21.43	22.27
HLA-6B [1]	**26.54**	**28.2**	**-1.1**		**DTW**	12.39	12.09	10.55	10.41	9.52	10.67	11.05	11.06	11.79	11.11
					ELEV	14.93	15.23	15.99	16.13	17.02	15.87	15.49	15.48	14.75	15.43
HLA-7B	**26.08**	**26.3**	**0.9**		**DTW**	13.85	10.40	8.99	8.85	8.65	11.29	9.32	9.13	9.65	14.38
					ELEV	12.23	15.68	17.09	17.23	17.43	14.79	16.76	16.95	16.43	11.70
CH-1	**25.29**	**19.0**	**8.3**	**Central Site**	**DTW**	5.74	4.80	4.75	5.19	5.95	6.08	3.65	5.80	5.94	4.39
					ELEV	19.55	20.49	20.54	20.10	19.34	19.21	21.64	19.49	19.35	20.90
CH-2	**25.42**	**16.6**	**8.8**	**Former Surface Impoundments Area**	**DTW**	5.50	3.80	2.73	2.93	3.58	2.66	3.20	4.71	6.06	2.67
					ELEV	19.92	21.62	22.69	22.49	21.84	22.76	22.22	20.71	19.36	22.75
CH-3	**25.07**	**17.5**	**8.3**		**DTW**	9.41	8.79	8.70	8.91	8.97	8.99	8.46	9.12	9.53	8.76
					ELEV	15.66	16.28	16.37	16.16	16.10	16.08	16.61	15.95	15.54	16.31
CH-4	**26.30**	**20.6**	**6.2**		**DTW**	17.65	11.23	17.30	17.86	18.00	18.04	NM	17.09	17.92	16.48
					ELEV	8.65	15.07	9.00	8.44	8.30	8.26	NM	9.21	8.38	9.82
CH-5 / CH-5R [2]	**25.64 / 27.41** [2]	**17.1**	**10.3**	**Central Site**	**DTW**	NM	NM	8.65	8.41	8.14	8.68	9.04	9.14	9.02	8.94
					ELEV	NM	NM	18.76	19.00	19.27	18.73	18.37	18.27	18.39	18.47
CH-6	**23.16**	**32.0**	**-6.3**	**Adjacent to River**	**DTW**	16.63	16.64	15.44	16.22	16.70	16.01	15.88	15.93	16.65	14.92
					ELEV	6.53	6.52	7.72	6.94	6.46	7.15	7.28	7.23	6.51	8.24

Notes:
DRY = water level apparently below bottom elevation of well
DTW = Depth to groundwater (feet below MPE).
ELEV = Groundwater elevation (feet, NGVD 1929). Groundwater elevation = MPE - DTW.
MPE = Measuring Point Elevation (feet, 1929 NGVD), corresponding to top of PVC well casing.
NM = Not Measured
Notes:
[1] Wells were modified and re-surveyed prior to the March 2007 monitoring event. Previous MPE were: HLA-3B = 27.76, HLA-6A = 27.16, HLA-6B = 27.32
[2] Well CH-5 was replaced by well CH-5R before the March 2007 sampling event. The MPE for CH-5 was 25.64.

Table 3. Field Duplicate Results
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington

Monitoring Event	Sample	Parent Sample (µg/L)	Duplicate Sample (µg/L)	%RPD
Mar-14	032614-HLA-1B	0.8	0.8	0
Mar-14	032514-CH-5R	0.5	0.7	33*
Jun-14	061814-CH-3	0.8	0.5	46.2*
Aug-14	082714-CH-6	< 0.2	< 0.2	0
Dec-14	120914-CH-5R	3.1	3.3	6.3

*Given the very low concentration of dissolved mercury, even a relatively small difference between the sample and the duplicate can have a larger impact on the RPD. It is PBS' opinion that the RPD calculated from the duplicate sample is acceptable.

Table 4. Historical Specific Conductance
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington

Well ID	Mar-2005	Mar-2006	Mar-2007	Mar-2008	Apr-2009	Apr-2010	Mar-2014	Jun-2014	Aug-2014	Dec-2014
	Specific Conductance (µS/cm)									
HLA-1A	DRY	650	573	690	801	1,040	346	557	NS	640
HLA-1B	2,126	2,003	1,756	1,900	8,020	69,000	17,310	21,590	19,940	17,340
HLA-3A	DRY	635	2,890	69,700	>99,900	67,000	2,004	3,830	3,627	2,880
HLA-3B	22,340	18,980	17,870	36,900	>99,900	230,000	71,780	105,800	98,010	102,600
HLA-6B	1,674	1,841	97,500	>99,900	>99,900	194,000	31,630	39,320	28,350	33,300
HLA-7B	1,655	1,617	5,750	13,900	60,200	125,000	31,740	16,030	24,320	29,820
CH-1	2,633	1,964	1,952	1,950	1,940	1,860	1,271	2,000	1,648	1,850
CH-2	137	141	130	140	219	219	115	114	182	139
CH-3	1,303	1,213	1,090	1,280	1,110	1,180	835	1,150	1,040	1,220
CH-4	2,766	1,772	2,105	1,520	1,900	1,500	(a)	1,640	1,942	1,950
CH-5R	(b)	(b)	2,336	3,150	3,620	3,140	2,208	3,560	1,299	2,470
CH-6	61,800	59,000	54,300	>99,900	>99,900	102,000	44,780	85,900	89,060	145,800
MW-1	509	NS	280	NS	461	NS	326	NS	NS	NS
MW-2	1,502	NS	1395	NS	1350	NS	899	NS	NS	NS
MW-3	8,140	NS	5970	NS	8580	NS	1224	NS	NS	NS
MW-4	742	NS	454	NS	645	NS	478	NS	NS	NS

µS/cm = microSiemens per centimeter
NS = Not sampled per approved monitoring plan
(a) Well not sampled due to monument being filled with rain
(b) CH-5 decomissioned in Jan. 2005. Replacement installed in Aug. 2006
DRY = Well had no recoverable water so no analysis was conducted

Table 5. Historical Analytical Results
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington

Well ID	Mar-2005	Mar-2006	Mar-2007	Mar-2008	Apr-2009	Apr-2010	Mar-2014	Jun-2014	Aug-2014	Dec-2014
	Dissolved Mercury (µg/L)									
HLA-1A	DRY	146	50	63	50	35	40	47	DRY	57
HLA-1B	75	105	104	65	0.9	0.3	0.8	0.6	0.6	0.6
HLA-3A	DRY	17.1	1.5	31	130	80	8.4	13.4	19	11.6
HLA-3B	3.4	3.4	4.4	1.4	4.1	1.2	2.3	2	2.5	2.1
HLA-6B	0.5	0.5	<0.2	<0.2	<0.2	<0.2	0.7	0.9	0.6	0.7
HLA-7B	20.3	13.2	1.5	0.7	16.8	24	1.8	2.5	0.8	2.5
CH-1	1.0	0.3	0.3	1.2	1.7	0.2	0.3	0.6	1.2	0.9
CH-2	2.8	2	<0.2	<0.2	<0.2	<0.2	<0.2	< 0.2	<0.2	<0.2
CH-3	2.6	1.9	0.9	1.6	1.4	0.9	1.2	0.8	0.7	0.6
CH-4	0.5	0.6	0.4	0.3	0.4	0.3	(a)	0.3	0.4	0.3
CH-5R	(b)	(b)	0.4	0.3	0.7	0.7	0.5	1	<0.2	3.1
CH-6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	< 0.2	<0.2	<0.2
MW-1	<0.2	NS	<0.2	NS	<0.2	NS	<0.2	NS	NS	NS
MW-2	<0.2	NS	<0.2	NS	<0.2	NS	<0.2	NS	NS	NS
MW-3	<0.2	NS	<0.2	NS	<0.2	NS	<0.2	NS	NS	NS
MW-4	<0.2	NS	<0.2	NS	<0.2	NS	<0.2	NS	NS	NS

µg/L: micrograms per liter
DRY = Well had no recoverable water so no analysis was conducted
NS = Not Sampled per approved monitoring plan
(a) Well not sampled due to monument being filled with rain
(b) CH-5 decomissioned in Jan. 2005. Replacement installed in Aug. 2006

Table 6. First Quarter Field Parameters
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington

Well ID	Sample Date	Field Parameters				
		Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)
MW-1	3/26/2014	12.45	326	5.26	6.38	55.8
MW-2	3/26/2014	12.5	899	2.26	6.62	-79.8
MW-3	3/26/2014	11.98	1,224	0.5	6.45	-72.7
MW-4	3/26/2014	11.25	478	2.01	7.28	-159
HLA-1A	3/25/2014	12.11	346	5.64	6.47	87.1
HLA-1B	3/26/2014	14.68	17,310	0.45	8.53	-84
HLA-3A	3/25/2014	10.69	2,004	1.11	9.21	155.7
HLA-3B	3/25/2014	14.04	71,780	1.68	8.02	160.8
HLA-6B	3/26/2014	13.47	31,630	1.45	7.56	-34.1
HLA-7B	3/26/2014	13.49	31,740	1.54	7.86	-21.7
CH-1	3/25/2014	11.47	1,271	0.68	9.47	-71.2
CH-2	3/26/2014	10.61	115	4.48	6.51	77.7
CH-3	3/25/2014	14.23	835	0.78	7.26	-149.3
CH-4*	3/26/2014	13.8	1,218	0.91	6	-110.4
CH-5R	3/25/2014	14.58	2,208	1.38	6.63	52.2
CH-6	3/25/2014	16.04	44,780	1.06	6.04	-40.4

*: Did not sample well due to monument being filled with stormwater runoff
µS/cm: microsiemens per centimeter
mg/L: milligrams per liter
mV: millivolts
°C = degrees Celsius

Table 7. Second Quarter Field Parameters
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington

Well ID	Sample Date	Field Parameters				
		Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)
HLA-1A	6/17/2014	17.9	557	5.39	7.14	103.4
HLA-1B	6/18/2014	15.7	21,590	0.16	8.51	-24
HLA-3A	6/17/2014	15.3	3,830	7.35	9.32	102.1
HLA-3B	6/17/2014	14.9	105,800	0.57	7.84	173.7
HLA-6B	6/19/2014	16.8	39,320	0.29	7.33	59.8
HLA-7B	6/18/2014	16.9	16,030	5.31	8.07	133
CH-1	6/19/2014	16.5	2,000	1.62	9.4	-28.7
CH-2	6/18/2014	17	114	3.71	6.26	144.4
CH-3	6/18/2014	15.7	1,150	0.11	7.22	-97.7
CH-4	6/19/2014	17.7	1,640	.0.27	6.87	-92.5
CH-5R	6/17/2014	15.3	3,560	0.6	7.2	-37.2
CH-6	6/19/2014	16.5	85,900	0.18	5.94	9.2

µS/cm: microsiemens per centimeter
mg/L: milligrams per liter
mV: millivolts
°C = degrees Celsius

Table 8. Third Quarter Field Parameters
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington

Well ID	Sample Date	Field Parameters				
		Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)
HLA-1A*	8/26/2014	NA	NA	NA	NA	NA
HLA-1B	8/26/2014	17.1	19,940	1.27	8.87	36.5
HLA-3A	8/26/2014	20.36	3,627	5.67	9.25	72.2
HLA-3B	8/26/2014	17.84	98,010	3.08	7.73	81.2
HLA-6B	8/28/2014	16.46	28,350	2.72	8.07	80.3
HLA-7B	8/27/2014	17.68	24,320	3.63	8.11	17.9
CH-1	8/27/2014	17.21	1,648	0.66	10.13	-146.6
CH-2	8/28/2014	17.06	182	1.33	7.01	52.5
CH-3	8/27/2014	17.51	1,040	0.59	7.78	-115.7
CH-4	8/27/2014	17.94	1,942	0.64	7.43	-76
CH-5R	8/26/2014	18.17	1,299	1.1	6.61	53.5
CH-6	8/27/2014	17.31	89,060	0.79	6.42	26.1

µS/cm: microsiemens per centimeter
mg/L: milligrams per liter
mV: millivolts
°C = degrees Celsius
NA = Not analyzed because well was dry during sampling
*: Did not sample well

Table 9. Fourth Quarter Field Parameters
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington

Well ID	Sample Date	Field Parameters				
		Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)
HLA-1A	12/9/2014	15.2	640	5.68	7.57	71.2
HLA-1B	12/10/2014	16	17,340	0.16	8.63	-46.4
HLA-3A	12/9/2014	13.8	2,880	0.79	9.52	61.2
HLA-3B	12/9/2014	15.4	102,600	2.42	7.77	162.4
HLA-6B	12/11/2014	15.7	33,300	0.38	7.57	72.8
HLA-7B	12/10/2014	15.2	29,820	3.67	7.93	94.2
CH-1	12/11/2014	14	1,850	0.17	9.87	-108
CH-2	12/10/2014	13.2	139	4.04	6.62	159.5
CH-3	12/10/2014	17.2	1,220	0.06	7.27	-146.6
CH-4	12/11/2014	15.7	1,950	0.11	7.08	-100.2
CH-5R	12/9/2014	17.4	2,470	0.59	6.72	25.7
CH-6	12/11/2014	17.7	145,800	0.08	5.69	57.3

µS/cm: microsiemens per centimeter
mg/L: milligrams per liter
mV: millivolts
°C = degrees Celsius
NA = Not analyzed because well was dry during sampling
*: Did not sample well

Table 10: Statistics for Mercury in Groundwater (µg/L)
Weyerhaeuser Chlor-Alkali Plant
Longview, Washington

Well	Number of Detections	Number of Samples	Frequency of Detection	Range of Non-Detect Concentrations[1]		Range of Detected Concentrations[1]		Mean[1]	Median[1]	95 UCL[1]	Kendall's Test for Most Recent 12 Events		
				Minimum	Maximum	Minimum	Maximum				Date Interval		Trend
HLA-1A	37	37	1.00			27.5	686	256.9	225	585.2	03/11/98	12/09/14	decreasing
HLA-1B	52	52	1.00			0.3	334	93.4	105	188	03/05/04	12/10/14	decreasing
HLA-3A	45	46	0.98	0.5	0.5	0.5	190	19.3	10.1	70.1	03/12/02	12/09/14	stable
HLA-3B	51	52	0.98	0.5	0.5	1.1	7.3	2.8	2.7	5.1	03/04/04	12/09/14	stable
HLA-6B	25	51	0.49	0.2	0.5	0.3	2.1	0.68	0.5	1.8	03/04/04	12/11/14	stable
HLA-7B	58	58	1.00			0.5	1800	68.8	20.8	109.8	03/04/04	12/10/14	decreasing
CH-1	38	49	0.78	0.2	0.5	0.2	2.2	0.91	0.75	1.8	03/05/04	12/11/14	stable
CH-2	37	51	0.73	0.2	0.5	0.2	43.4	2.7	1.3	5.2	03/05/04	12/10/14	decreasing
CH-3	53	53	1.00			0.6	5.1	2.6	2.7	4.3	03/04/04	12/10/14	decreasing
CH-4	48	48	1.00			0.2	1.9	0.82	0.7	1.7	09/23/03	12/11/14	decreasing
CH-5/CH-5R	44	53	0.83	0.2	0.5	0.2	9.1	2.2	0.92	8.5	03/25/03	12/09/14	stable
CH-6	3	53	0.06	0.2	4	0.2	4.0	0.6	0.5	2	03/03/04	12/11/14	NA
MW-1	0	58	0	0.1	1			0.4	0.5	0.6	03/11/98	03/26/14	NA
MW-2	3	57	0.05	0.1	1	0.5	2.0	0.5	0.5	0.8	03/10/98	03/26/14	NA
MW-3	5	57	0.09	0.1	4	0.5	5	0.8	0.5	4	03/10/98	03/26/14	decreasing
MW-4	24	58	0.41	0.2	0.5	0.4	39	4.2	0.5	23	03/11/98	03/26/14	stable

Notes:

(1) Includes all detect and nondetect results at their reporting limit concentration.

NA indicates that the test was not applicable because mercury was not detected in these monitoring wells during the most recent 12 monitoring events.

ATTACHMENT 1

Weyerhaeuser Analytical & Testing Services **Service Request 14-0538**

32901 Weyerhaeuser Way South

Federal Way, WA 98001

Report

Longview Chloralkali Plant Remediation

Client ID	Date Sampled	Time Sampled	Lab ID	Dissolved Mercury Hg	Date of Analysis	Analyst
				ug/L		
032614-MW-1	03/26/14	1703	001	< 0.2	04/07/14	DJD
032614-MW-2	03/26/14	1814	002	< 0.2	04/07/14	DJD
032614-MW-3	03/26/14	1910	003	< 0.2	04/07/14	DJD
032614-MW-4	03/26/14	1718	004	< 0.2	04/07/14	DJD
032514-HLA-1A	03/25/14	1452	005	40	04/07/14	DJD
032614-HLA-1B	03/26/14	1050	006	0.8	04/07/14	DJD
DUP032614	03/26/14	1000	007	0.8	04/07/14	DJD
032514-HLA-3A	03/25/14	1025	008	8.4	04/07/14	DJD
032514-HLA-3B	03/25/14	1230	009	2.3	04/07/14	DJD
032614-HLA-6B	03/26/14	0900	010	0.7	04/07/14	DJD
032614-HLA-7B	03/26/14	1233	011	1.8	04/07/14	DJD
032514-CH-1	03/25/14	1620	012	0.3	04/07/14	DJD
032614-CH-2	03/26/14	1402	013	< 0.2	04/07/14	DJD
032514-CH-3	03/25/14	1921	014	1.2	04/07/14	DJD
032514-CH-5R	03/25/14	1242	015	0.5	04/07/14	DJD
032514-CH-6	03/25/14	1752	016	< 0.2	04/07/14	DJD
DUP032514	03/25/14	1000	017	0.7	04/07/14	DJD
			QL:	0.2		
			Method Number:	E-245		

Approved: Dan Deprez Date: 04/11/14

Telephone: (253) 924-6188

Weyerhaeuser Analytical & Testing Services
32901 Weyerhaeuser Way South
Federal Way, WA 98001

Service Request 14-0538

Metals QC Report

Longview Chloralkali Plant Remediation

Method Blank Report

Element	Method Blank Found
	ug/L
Hg	< 0.2

Water Laboratory Control Sample Report

Element	LCSW Found	True Value	Lower Limit	Upper Limit	% Recovery
	ug/L				
Hg	2.0	2.0	1.7	2.3	100

Duplicate Report for Sample 001

Element	Sample Found	Duplicate Found	RPD
	ug/L		
Hg	< 0.2	< 0.2	NC

Spike Report for Sample 001

Element	Sample Found	Spike Found	Net Spike	Spike Level	% Recovery
	ug/L				
Hg	< 0.2	1.9	1.9	2.0	95

Approved: Dan Deprez Date: 04/11/14
Telephone: (253) 924-6188

Weyerhaeuser Analytical & Testing Services
32901 Weyerhaeuser Way South
Federal Way, WA 98001

Service Request 14-0984

Report

Longview Chloralkali Plant Remediation 2Q14

Client ID	Date Sampled	Time Sampled	Lab ID	Dissolved Mercury Hg	Date of Analysis	Analyst
				ug/L		
061714-HLA-3B	06/17/14	1433	001	2.0	07/02/14	DJD
061714-HLA-3A	06/17/14	1234	002	13.4	07/02/14	DJD
061714-CH-5R	06/17/14	1526	003	1.0	07/02/14	DJD
061714-HLA-1A	06/17/14	1645	004	47	07/02/14	DJD
061814-HLA-1B	06/18/14	1133	005	0.6	07/02/14	DJD
061814-CH-2	06/18/14	1340	006	< 0.2	07/02/14	DJD
061814-HLA-7B	06/18/14	1538	007	2.5	07/02/14	DJD
061814-HLA-CH3	06/18/14	1645	008	0.8	07/02/14	DJD
061814-DUP	06/18/14	1000	009	0.5	07/02/14	DJD
061914-CH-6	06/19/14	1130	010	< 0.2	07/02/14	DJD
061914-CH-1	06/19/14	1330	011	0.6	07/02/14	DJD
061914-HLA-6B	06/19/14	1550	012	0.9	07/02/14	DJD
061914-CH-4	06/19/14	1645	013	0.3	07/02/14	DJD
			QL:	0.2		
			Method Number:	E-245		

Approved: Dan Deprez Date: 07/11/14

Telephone: (253) 924-6188

Weyerhaeuser Analytical & Testing Services
32901 Weyerhaeuser Way South
Federal Way, WA 98001

Service Request 14-0984

Metals QC Report

Longview Chloralkali Plant Remediation 2Q14

Method Blank Report

Element	Method Blank Found
	ug/L
Hg	< 0.2

Water Laboratory Control Sample Report

Element	LCSW Found	True Value	Lower Limit	Upper Limit	% Recovery
	ug/L				
Hg	2.0	2.0	1.7	2.3	100

Duplicate Report for Sample 001

Element	Sample Found	Duplicate Found	RPD
	ug/L		
Hg	2.0	2.2	9.5

Spike Report for Sample 001

Element	Sample Found	Spike Found	Net Spike	Spike Level	% Recovery
	ug/L				
Hg	2.0	5.6	3.6	4.0	90

Approved: Dan Deprez Date: 07/11/14
Telephone: (253) 924-6188

Weyerhaeuser Analytical Chemistry and Microstructure
32901 Weyerhaeuser Way South
Federal Way, WA 98001

Service Request 14-1263

Report

Longview Chloralkali Plant Remediation 3Q14

Client ID	Date Sampled	Time Sampled	Lab ID	Dissolved Mercury Hg	Date of Analysis	Analyst
				ug/L		
082614-HLA-3B	08/26/14	1140	001	2.5	09/03/14	DJD
082614-HLA-3A	08/26/14	1245	002	19.0	09/03/14	DJD
082614-CH-5R	08/26/14	1352	003	< 0.2	09/03/14	DJD
082614-HLA-1B	08/26/14	1608	004	0.6	09/03/14	DJD
082714-DUP	08/27/14	1000	005	< 0.2	09/03/14	DJD
082714-CH-1	08/27/14	1030	006	1.2	09/03/14	DJD
082714-CH-6	08/27/14	1230	007	< 0.2	09/03/14	DJD
082714-CH-3	08/27/14	1353	008	0.7	09/03/14	DJD
082714-CH-4	08/27/14	1500	009	0.4	09/03/14	DJD
082714-HLA-7B	08/27/14	1702	010	0.8	09/03/14	DJD
082814-CH-2	08/28/14	1000	011	< 0.2	09/03/14	DJD
082814-HLA-6B	08/28/14	1140	012	0.6	09/03/14	DJD
			QL:	0.2		
			Method Number:	E-245		

Approved: Dan Deprez Date: 09/03/14

Telephone: (253) 924-6188

Weyerhaeuser Analytical Chemistry and Microstructure
32901 Weyerhaeuser Way South
Federal Way, WA 98001

Service Request 14-1263

Metals QC Report

Longview Chloralkali Plant Remediation 3Q14

Method Blank Report

Element	Method Blank Found
	ug/L
Hg	< 0.2

Water Laboratory Control Sample Report

Element	LCSW Found	True Value	Lower Limit	Upper Limit	% Recovery
	ug/L				
Hg	2.1	2.0	1.7	2.3	105

Duplicate Report for Sample 001

Element	Sample Found	Duplicate Found	RPD
	ug/L		
Hg	2.5	2.6	3.9

Spike Report for Sample 001

Element	Sample Found	Spike Found	Net Spike	Spike Level	% Recovery
	ug/L				
Hg	2.5	6.8	4.3	4.0	108

Approved: Dan Deprez Date: 09/03/14
Telephone: (253) 924-6188

Weyerhaeuser Analytical Chemistry and Microstructure
32901 Weyerhaeuser Way South
Federal Way, WA 98001

Service Request 14-1770

Report

Longview Chloralkali Plant Remediation 4Q14

Client ID	Date Sampled	Time Sampled	Lab ID	Dissolved Mercury Hg	Date of Analysis	Analyst
				ug/L		
120914-HLA-3B	12/09/14	1347	001	2.1	12/19/14	DJD
120914-HLA-3A	12/09/14	1436	002	11.6	12/19/14	DJD
120914-CH-5R	12/09/14	1600	003	3.1	12/19/14	DJD
120914-HLA-1A	12/09/14	1655	004	57	12/19/14	DJD
121014-HLA-1B	12/10/14	1115	005	0.6	12/19/14	DJD
121014-CH-2	12/10/14	1300	006	< 0.2	12/19/14	DJD
121014-HLA-7B	12/10/14	1530	007	2.5	12/19/14	DJD
121014-CH-3	12/10/14	1635	008	0.6	12/19/14	DJD
121114-CH-1	12/11/14	1046	009	0.9	12/19/14	DJD
121114-CH-6	12/11/14	1240	010	< 0.2	12/19/14	DJD
121114-CH-4	12/11/14	1442	011	0.3	12/19/14	DJD
121114-HLA-6B	12/11/14	1611	012	0.7	12/19/14	DJD
120914-DUP	12/09/14	1120	013	3.3	12/19/14	DJD
			QL:	0.2		
			Method Number:	E-245		

Approved: Dan Deprez Date: 12/23/14
Telephone: (253) 924-6188

Weyerhaeuser Analytical Chemistry and Microstructure
32901 Weyerhaeuser Way South
Federal Way, WA 98001

Service Request 14-1770

Metals QC Report

Longview Chloralkali Plant Remediation 4Q14

Method Blank Report

Element	Method Blank Found
	ug/L
Hg	< 0.2

Water Laboratory Control Sample Report

Element	LCSW Found	True Value	Lower Limit	Upper Limit	% Recovery
	ug/L				
Hg	2.0	2.0	1.7	2.3	100

Duplicate Report for Sample 001

Element	Sample Found	Duplicate Found	RPD
	ug/L		
Hg	2.1	2.3	9.1

Spike Report for Sample 001

Element	Sample Found	Spike Found	Net Spike	Spike Level	% Recovery
	ug/L				
Hg	2.1	5.8	3.7	4.0	93

Approved: Dan Deprez Date: 12/23/14
Telephone: (253) 924-6188

6.2 Appendix B – Restrictive Covenant

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05/14/2015 04:07:12 PM Pages: 7 $78.00
Covenants
FIRST AMERICAN TITLE NCS - SEATTLE
eRecorded at Cowlitz County, WA

FILED FOR RECORD AT THE REQUEST OF:

Weyerhaeuser NR Company
33663 Weyerhaeuser Way South
Federal Way, WA 98003

When recorded mail to:

Weyerhaeuser NR Company
Attn.: Tonya Hebert
P.O. Box 9777, Mailstop CH 1J25
Federal Way, WA 98063-9777

Type of Document:	Restrictive Covenant
Reference Number(s) of Document Supplemented:	N/A
Grantor(s):	Weyerhaeuser NR Company
Grantee(s):	Washington Department of Ecology
Abbreviated Legal Description:	PTN. FR S½, SEC 31, T8N, R2W; PTN. ORLAND GEORGE DLC 37; PTN. S½, SEC 36, T8N R3W; PTN. CRUMLINE LADUE DLC 46

Assessor's Property Tax Parcel or Account Number(s): Ptn. 608780100; Ptn. 60878; Ptn. 61947

RESTRICTIVE COVENANT

The property involved in this Restrictive Covenant is the subject of remedial action under RCW 70.105D. The work done to clean up the property (hereafter the "Remedial Action") is described in Washington State Department of Ecology Agreed Order No. DE 1037, and in attachments to the Order. This Restrictive Covenant is made pursuant to RCW70.105D.030(1)(f) and (g) and WAC 173-340-440 because the Remedial Action at the Site will result in residual concentrations of mercury that exceed Ecology's cleanup levels for Industrial soil and ground water established under Chapter 173-340 WAC.

Weyerhaeuser NR Company is the fee owner ("Owner") of real property known as the Weyerhaeuser Chlor-Alkali Plant in the County of Cowlitz, State of Washington referred to as the "Site," legally described in Attachment 1 and more particularly depicted in Attachment 2 hereto, and by this reference incorporated herein.

Weyerhaeuser NR Company makes the following declaration as to limitations, restrictions, and uses to which the Site may be put, and specifies that such declarations shall constitute covenants to run with the land, as provided by law, and shall be binding on all parties and all persons claiming under them, including all current and future owners of any portion of or interest in the Site.

Section 1 The Site may be used only for Industrial uses as defined in RCW 70.105D.020(23) and defined in and allowed under the Cowlitz County Zoning Code as of the date of this Restrictive Covenant.

Section 2 Any activity on the Site that may interfere with the integrity of the Remedial Action and continued protection of human health and the environment is prohibited, except as provided in Section 4.

Section 3 Any activity on the Site that may result in the release or exposure to the environment of a hazardous substance that remains on the Site as part of the Remedial Action,

or create a new exposure pathway, is prohibited without prior written approval from Ecology, except as provided in Section 4.

Section 4 The Owner of the Site may prepare, and submit to Ecology for approval, a plan to manage health and safety issues that may arise during the course of routine and emergency maintenance and repairs (hereafter the "Plan"). If the Plan meets applicable regulatory requirements, is updated periodically as necessary, and is approved by Ecology for use at the Site, then such routine and emergency maintenance and repairs may be performed at the Site to the extent covered by and in accordance with the Plan. The Owner must notify Ecology immediately if any routine or emergency maintenance or repairs result in the release or exposure to the environment of a hazardous substance that remains on the Site as part of the Remedial Action, and shall comply with any orders or written directives from Ecology for the remediation of such releases.

Section 5 No wells may be drilled and screened within the unconfined alluvial zone or the basalt zone groundwater (as defined in the Cleanup Action Plan), nor may the groundwater therefrom be extracted for any use except for the purpose of groundwater monitoring within the Site as required by the Agreed Order.

Section 6 The Owner of the Site shall maintain and inspect fences and locked gates around the Site or any larger contiguous industrial property, and shall perform regular inspections at the Site boundary line or any larger contiguous industrial property, to assure that the restrictions on access to the Site are effective, except that fencing of the southern boundary of the Site along the Columbia River shall not be required.

Section 7 The Owner of the Site must give written notice to the Department of Ecology, or to a successor agency, of the Owner's intent to convey any interest in the Site at least 30 days prior to such conveyance. The Owner shall include notice of this Restrictive Covenant in any instrument conveying any interest in any portion of the Site. No conveyance of title, easement, lease or other interest in the Site shall be consummated by the Owner

without adequate and complete provision for the continued operation, maintenance and monitoring of the Remedial Action.

Section 8 The Owner must restrict leases to uses and activities consistent with the Restrictive Covenant and notify all lessees of the restrictions on the use of the Site.

Section 9 The Owner shall allow authorized representatives of the Department of Ecology, or of a successor agency, the right to enter the Site at reasonable times and upon reasonable advance notice provided by Ecology, unless an emergency prevents such notice, for the purpose of inspecting and evaluating the Remedial Action, to take samples, and to inspect records that are related to the Remedial Action.

Section 10 The Owner must notify and obtain approval from the Department of Ecology, or from a successor agency, prior to use of the Site in a manner that is inconsistent with the terms of this Restrictive Covenant. The Department of Ecology, or its successor agency, may approve such a use only after public notice and comment.

Section 11 The Owner and Owner's assigns and successors in interest reserve the right under WAC 173-340-730 and WAC 173-340-440 to record an instrument which provides that this Restrictive Covenant shall no longer limit the use of the Site or be of any further force or effect. However, such an instrument may be recorded only with the consent of the Department of Ecology or of a successor agency. The Department of Ecology or a successor agency may consent to the recording of such an instrument only after public notice and comment.

Weyerhaeuser NR Company

May 8th, 2015
Date

ATTACHMENT 1 – SITE

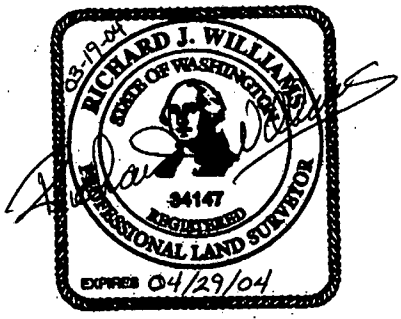
Weyerhaeuser Company
Restrictive Covenant Boundary Description
March 2004
Page 1 of 2

A restrictive covenant located in Section 31, Township 8 North, Range 2 West, Willamette Meridian, Cowlitz County, Washington, described as follows:

Commencing at brass cap set in concrete stamped "LS 21711, WEYCO #303597 as recorded in Cowlitz County Auditor's Book 8 of Surveys, page 187, Auditor's File No. 880419002, also being the Southeast corner of Lot 17 in the Mint Farm Industrial Park as recorded in Volume 13 of Plats, pages 71 and 72, Auditor's File No. 3007473; thence South 49°05'00" East along the Southerly extended line of said Lot 17 a distance of 100 feet to a brass cap set in concrete stamped "LS 21711, WEYCO #303598; thence South 40°55'00" West a distance of 300 feet to the Northeasterly line extended of the Weyerhaeuser Company Longview Mill Site; thence South 49°05'00" East ("East", Weyerhaeuser Mill datum) a distance of 134.31 feet to Weyerhaeuser Mill monument WT-4; thence South 89°59'13" West (South 49°04'29" West, Weyerhaeuser Mill datum) to Weyerhaeuser Mill monument WT-3; thence South 40°54'38" West (South 00°00'06" East , Weyerhaeuser Mill datum) along the Westerly property line of Weyerhaeuser Company's Longview Mill property a distance of 1,618.82 feet to a brass cap in concrete designated as Weyerhaeuser Mill monument WT-2; thence North 60°55'22" East (North 20°00'38" East, Weyerhaeuser Mill datum) a distance of 326.44 feet to a point on the Easterly edge of the Weyerhaeuser chlorine plant access road, said point being 12.00 feet Easterly opposite road centerline monument Weyerhaeuser No. 280593, said point also being the Point of Beginning; thence along the Easterly edge of said access road Southeasterly along a curve to the left, having a back tangent of North 40°56'09" East (North 00°01'25" East, Weyerhaeuser Mill datum) concave to the Northeast through a central angle of 64°06'05", with a radius of 497.05 feet, an arc distance of 556.09 feet; thence South 22°14'49" West (South 18°39'55" East, Weyerhaeuser Mill datum) a distance of 145.80 feet; thence South 56°27'12" West (South 15°32'28" West, Weyerhaeuser Mill datum) a distance of 100 feet, more or less, to the Columbia River's ordinary high water line; thence Easterly and Northeasterly along said ordinary high waterline 2,260 feet; thence leaving said ordinary high waterline, North 18°26'24" West (North 59°21'08" West, Weyerhaeuser Mill datum) a distance of 340 feet more or less to a point which bears South 53°59'54" East (South 86°58'34" East, Weyerhaeuser Mill datum) a distance of 2,254.57 feet from said Weyerhaeuser Mill monument WT-2; thence North 47°03'26" East (North 06°08'42" East, Weyerhaeuser Mill datum) a distance of 341.08 feet to a point which bears South 54°35'05" East (North 84°30'11" East, Weyerhaeuser Mill datum) a distance of 2,298.52 feet from said Weyerhaeuser Mill monument WT-2; thence North 42°36'58" West (North 83°31'42" West, Weyerhaeuser Mill datum) a distance of 108.79 feet; thence North 36°46'12" West (North 04°08'33" East, Weyerhaeuser Mill datum) a distance of 8.48 feet; thence North 45°03'17" East (North 89°59'10"West, Weyerhaeuser Mill datum) a distance of 306.58 feet; thence North 42°37'53" West (North 83°32'37" West, Weyerhaeuser Mill datum) a distance of 176.41 feet; thence North 46°55'03" West (North 87°49'47" West, Weyerhaeuser Mill datum) a distance of 824.57 feet to the center of the Westerly rail of the Westerly rail line, said point bears South 67°32'16" East (North 71°33'00" East, Weyerhaeuser Mill datum) a distance of 921.96 feet from said Weyerhaeuser monument WT-2; thence along the center of said Westerly rail, Westerly and

Weyerhaeuser Company
Restrictive Covenant Boundary Description
March 2004
Page 2 of 2

Northwesterly along a curve to the right, having a radial bearing in of North 48°32'03" East, (North 07°37'19" East Weyerhaeuser Mill datum) concave to the Northeast, through a central angle of 52°50'32", with a radius of 661.15 feet, an arc distance of 609.76 feet; thence North 59°01'36" West (South 80°03'40" West, Weyerhaeuser Mill datum) a distance of 54.08 feet, to a point on the Easterly edge of the aforedescribed chlorine plant access road; thence South 40°56'09" West (South 00°01'25" West, Weyerhaeuser Mill datum) along said Easterly edge of the chlorine plant access road a distance of 327.44 feet, to the Point of Beginning.



865-6111/Survey Data/Boundary Description Revised

ATTACHMENT 2 – MAP