Final Report

Valsetz Water Storage Concept Analysis

Appendix E

Contaminants/ Hazardous Materials/ Pathogens

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1 Introduction

This Valsetz Water Storage Concept Analysis is funded by a Senate Bill 1069 [2008] Water Conservation, Reuse, and Storage Grant Program grant awarded by the Oregon Water Resources Commission on November 20, 2008. The grant provides funding for developing information needed to evaluate development of a water conservation, reuse, or storage project in the South Fork Siletz Basin. The funded planning study includes collection of streamflow and environmental information, completion of hydrologic, streamflow, and water demand analyses, development of baseline environmental impacts assessments and completion of a storage concept and alternative analysis.

The purpose of this study is to conduct an appraisal level assessment of potential environmental effects and potential benefits of the Valsetz water storage project. The assessment focuses on three storage concept alternatives determined by dam height and reservoir storage. This analysis serves as a preliminary, concept-level review of the resources that may be affected if a project were developed. This initial investigation relies on existing information, an extremely limited amount of field data and some preliminary modeling and analysis. This is a first step in understanding potential effects in the area that would be inundated by a project and the Siletz and Luckiamute Rivers. Further investigation and technical studies will be required to definitively evaluate the magnitude and type of impacts and feasibility of project development.

This Appendix summarizes existing information and potential impacts related to the potential release of contaminants and introduction of invasive species and pathogens related to inundation and water transfer scenarios under review for the Valsetz water storage project as summarized below.

- Small reservoir (Storage: 14,000 Acre-feet; Water level at 1,120 ft)
- Medium reservoir (Storage: 70,000 Acre-feet; Water level at 1,160 ft)
- Large reservoir (Storage: 162,000 Acre-feet; Water level at 1,200 ft)

Specifically, this analysis addresses two principal questions including:

(1) If the storage basin is constructed, will it potentially inundate known contaminated areas that could lead to a potentially significant exposure or health risk to humans and/or animals?

(2) Are there any diseases or non-native invasive species present in the Valsetz watershed that could be introduced into the Luckiamute by the project and cause potentially significant harm?

2 Brief Site History

Timber operations in Valsetz have been present for more than 100 years, and have been owned and operated by several different parties:

1904 – 1947	Cobbs and Mitchell Lumber Company,
1947 – 1959	Herbert Templeton, operating as the Valsetz Lumber Company,
1959 – 2004	Boise Cascade Corporation,

2004 – 2005	Madison Dearborn Partners, LLC, and
2005 – Present	Meriwether Northwestern Oregon Land and Timber, LLC (managed by Forest Capital Partners, LLC).

Mitchell constructed the Valley and Siletz Railroad from Independence to the Upper Siletz River, established the town of Valsetz, Oregon at the Project site, built and operated a sawmill, and dammed the South Fork of the Siletz River to form a large log pond that would later be known as Lake Valsetz. Lake Valsetz originally covered 377 acres with 5.5 miles of shoreline at an elevation of 1,100 feet. Spur lines ran into the surrounding canyons to facilitate timber removal and transport by rail to the lake/mill pond (Hobson, 2000; OHS,2005).

3 Methods

3.1 Contaminants

The potential that the project would inundate existing contaminated areas was addressed through queries of publicly available records available from the Oregon Department of Environmental Quality. Records were queried to ascertain if site investigations had been conducted in the project area. No interviews, meetings or telephone communications were conducted. If the project proceeds, on-site investigations should be conducted to determine whether previously unidentified contaminant sources are present.

For the purposes of the contaminants/hazardous materials assessment provided here, the project site includes all areas that may be inundated by the proposed Project. These areas include the former town of Valsetz, the former dam site (Valsetz Lake), the former Boise Cascade mill site, and other areas of potential environmental concern (Figure 1).

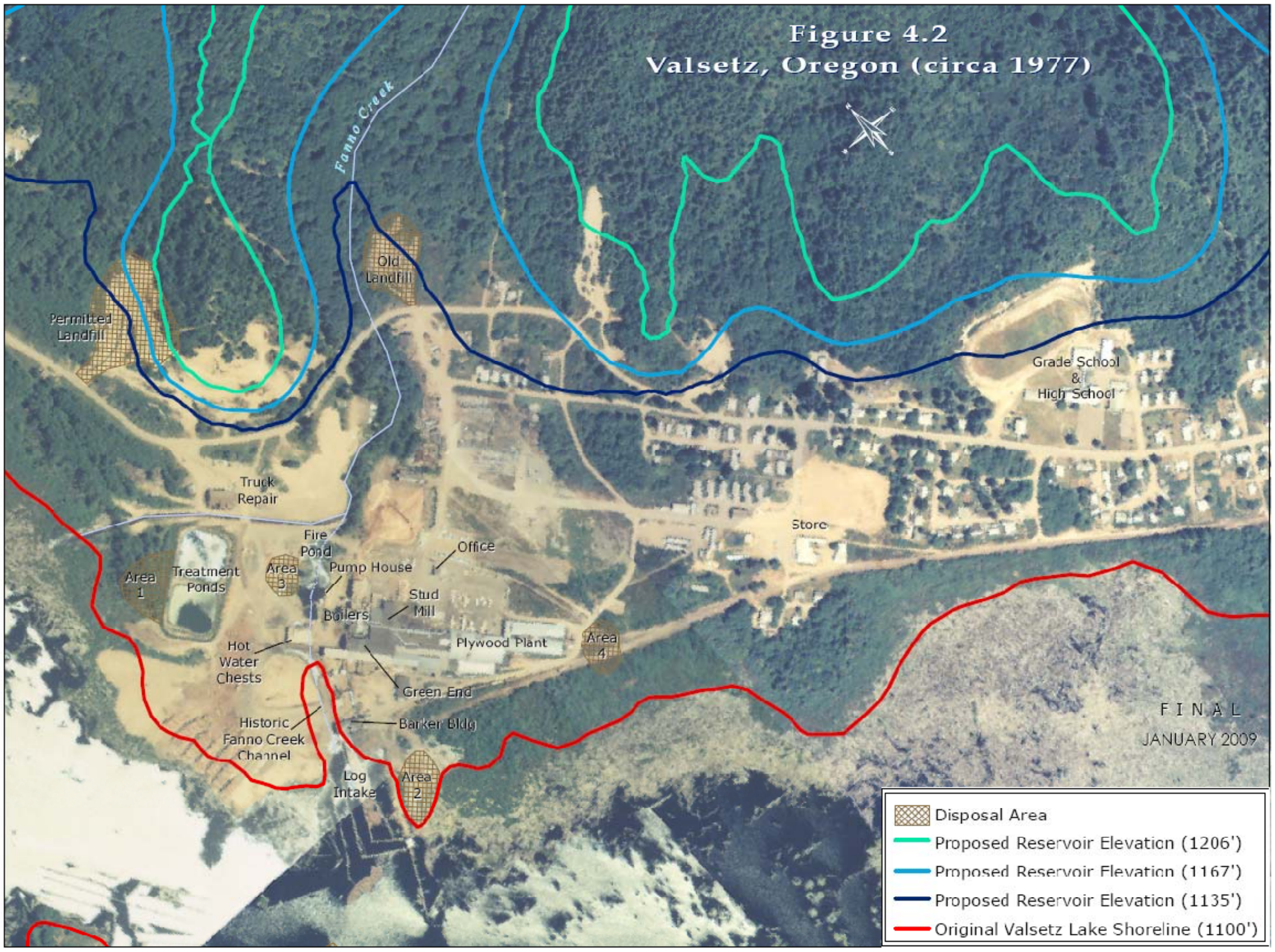

Figure 1. Areas of potential concern from past timber operations (represented by a circa 1977 photo) within the three scenarios of potential inundation.

Based on these historical operations, the major concerns on the Project site as they relate to the potential to mobilize contaminants include:

- Potential contaminants from the sawmill and plywood mill,
- Contaminants from electrical service,
- Contaminants from water supply and treatment,
- Contaminants from waste disposal, and
- Miscellaneous contaminant sources (UST's, drum disposal).

3.2 Invasive Species and Pathogens

The potential for the transfer of invasive species or pathogens from the Siletz Basin to the Luckiamute Basin was addressed through a review of invasive species databases maintained by state and federal resources and scientific organizations. Both a watershed and county focus was directed to the searches to capture the relevant geography. Unfortunately, invasive species lists often lack specificity to watershed or even county. Therefore, absence of invasive species typically cannot be established using public records. Field investigations would be required to firmly establish presence or absence of species of concern.

A larger project area was evaluated to determine the potential to transfer invasive species and/or pathogens from one basin to the other. Any non-native invasive species found in the entirety of the Siletz watershed associated with either the riparian corridor or aquatic habitat was initially considered for their potential to be introduced into the Luckiamute system. This broader scope is necessary because invasive species can spread through a watershed network to the limits of their environmental and physiological tolerance.

Mechanisms for spread can include the dispersal of invasive species' seeds carried by water. The hydrologic regime is considered the most important extrinsic factor determining seed dispersal patterns through water, however, the final location of water-dispersed seeds along riparian corridors is a function of at least three interacting factors:

1. The hydrologic regime during seed release and transport (i.e., timing and magnitude of peak flow and the rate and direction of change in discharge),
2. Channel morphology and hydraulics, and
3. The phenology of seed release as it relates to hydrologic regime.

Alteration in natural flow regimes, as would result as an inevitable consequence of the water development proposals at Valsetz, could influence both the temporal availability and suitability of streamside habitat and the dynamics of seed delivery to sites suitable for establishment. The manipulation of the hydrologic regime through inundation and flow diversion could create a disturbance mechanism that provides a competitive advantage to non-native species affording them increased opportunity for colonization and spread.

Similarly, pathogens associated with migratory fish and wildlife could be introduced when waters are transferred from one basin to another. Alterations in hydrology, water temperatures and other water quality parameters that may result from the project could make conditions more (or less) conducive to pathogen spread through changes in the life history behaviors of their associated hosts, and/or water quality conditions that favor their persistence in environmental reservoirs of infection.

4 Potential Project Impacts

4.1 Contaminants/Hazardous Materials

In 1992, Oregon Department of Environmental Quality (DEQ) issued a No Further Action determination (http://www.deq.state.or.us/lq/ ECSI/ecsidetailfull.asp?seqnbr=15#contamination) concluding that no hazardous materials had been deposited or were present on the site. This determination did not consider the potential flooding of the site to create a lake used for a drinking water supply. Inundation has the potential to mobilize contaminants that are currently safely buried. Therefore, several areas of investigation should be considered further. Potential areas which may pose a risk for contamination if the site is inundated are addressed below.

4.1.1 Sawmill and Plywood Mill Sites

The Valsetz sawmill, operated from 1922 to 1957, was converted to a plywood mill and could be a potential source of contaminants. Glues used in the manufacture of plywood in this period generally contained pentachlorphenol (PCP). Oregon Department of Environmental Quality (DEQ) records indicate the glue used at the Valsetz plywood mill from 1957 to 1970 was a protein-based glue containing 15 pounds pentachlorophenol (PCP), liquid silicate, and 2,000 pounds of blood/soy protein glue base in each batch.

Waste water from the glue spreader at the plywood mill was discharged to a settling pond-ditch that ran from the mill to the lake from 1957 to 1974. Thus, a pathway for potential contamination of ‘lakebed’ sediments was created if the wastewater contained PCP or other contaminants.

Manufactured PCP products may contain dioxins as impurities. Consequently, dioxin contamination is commonly found in association with PCP contamination and use (Tonkin and Taylor, 2008). One of the major ways that dioxins enter the environment is through the uncontrolled incineration of PCP or PCP-treated wood (WHO, 1987). The history of plywood waste incineration at the site is unclear. Given the broadly recognized source of dioxins through combustion (Baker et al. 2001), the potential exists for dioxin contamination at the site as a result of both the direct use of PCP, and from the combustion of plywood prepared with PCP glue.

Dioxins can produce a myriad of health effects at extremely low concentrations and are considered among the most toxic compounds known to human kind. Dioxin's most powerful effects are seen in the reproductive system, the endocrine (hormone) system, and the immune system. Newborn infants and fetuses exposed while in the womb are considered most sensitive (EPA 2003). Dioxin exposure of mammals (including humans) shortly before or shortly after birth is most likely to impair intellectual development and the immune system. Immunosuppression can invite other serious diseases.

If unknown or unremediated sources of dioxins are inundated by the project, a mechanism is created for direct entry of these contaminants into the aquatic environment. Obviously, as a drinking water supply, the reservoir could serve as a potential source of exposure and adverse effects to humans under such a scenario. Contaminated soils would in essence become contaminated sediments, which can serve as a source of contaminant release and exposure to aquatic resources. The human population might be indirectly exposed to contaminants through the consumption of fish or wildlife. Dioxin degrades very slowly once it is released into the environment.

Salmonid fishes have also been found to be particularly sensitive to dioxins (TCDD and related congeners). The lowest adverse effect level (LOAEL) in fish, based on fish tissue residues, was determined in lake trout, where egg concentrations of 55 ng/kg-tissue (parts per trillion) significantly increased mortality (Walker et al. 1991). The no observable effect level (NOEL) for lake trout early-life-stage mortality was determined to be 34 ng/kg, and the LD50 was 65 ng/kg (dry weight). A pathognomonic (typical) wasting syndrome similar to that elicited in mammals occurs in fish following early-life-stage exposure to TCDD or its congeners. Pathological and toxicological effects are promoted by the binding of dioxins to the Ah receptor, which initiates a whole host of potential pathological and toxicological effects. The pathological outcomes of exposure in all animals are thought to occur through oxidative stress (Cantrell et al., 1996).

Pathological signs associated with toxicity in fish include severe subcutaneous edema, craniofacial malformations, and disturbances in the cardiovascular system (Walker et al., 1991; Spitsbergen et al., 1991; Fisher et al., 1996; Elonen el al., 1998; Cooper and Chen, 1998). The timing of onset of these signs is somewhat predictable, regardless of the species tested, with mortality primarily occurring during hatching or shortly thereafter. Wasting can occur in older fish as well. It should be noted that aquatic invertebrates are much less sensitive to dioxins. This has been thought due to the lack of the Ah receptor in the invertebrates analyzed. Thus, dioxins, if present at the site, would have their most significant *potential* effects on vertebrate species.

Exposure in and of itself is not sufficient for toxicity to occur, and even if present at concentrations above the background found from atmospheric deposition, adverse effects cannot be presumed likely unless concentrations exceed well established toxicity thresholds based on exposure duration and concentration. In humans, over 90 percent of dioxin exposure occurs through diet (water and food); therefore risks should be insignificant if exposure through these pathways can be minimized.

4.1.2 Contaminants from Electrical Service

The town of Valsetz and the mill facility were supplied electricity from an on-site powerhouse until 1975. In 1975, Consumers Power constructed power lines to serve the town and mill. The lines remained in use until the demolition of Valsetz in 1984 (Hafley, 1992). The powerhouse burned sawdust, planer shavings, wood scrap, and veneer scrubber sludge to heat a boiler that drove steam turbines to generate electricity (Hafley, 1992). Scrubber sludge was produced in the process and consists of non-hazardous oily resins derived from the burning of wood (Hoy, 1990). Scrubber sludge was also imported to Valsetz for incineration from the Boise Cascade Corporation’s Sweet Home and Albany mill sites, authorized under ACD Permit 27-7002 (Hafley, 1992).

The powerhouse used polychlorinated biphenyls (PCBs) as coolants and lubricating fluids for transformers and capacitors. PCBs are considered persistent organic pollutants by the EPA due to toxicity and ability to bioaccumulate. Like dioxins, PCBs have been found to cause immunosuppression, hepatotoxicity and tumor promotion, and biochemical and behavioral alterations in fish (Jacobson et al. 2003, Fisher et al. 1994), and can also adversely affect human health (EPA 2003).

Boise Cascade Corporation reported in the Valsetz closure plan documents, that the capacitors containing PCBs and an undisclosed number of liquid-filled transformers were to be shipped to the company’s Willamina, Oregon plant (following PCB testing) for storage and later disposal by incineration (BCC, 1984). These capacitors and transformers were subsequently removed from Valsetz.

Boise Cascade representatives indicate that 30 transformers were tested in 1980 and two were found to contain PCBs (EPA, 1989). In the 1989 EPA investigation, no PCBs were discovered in ten of the samples collected and low levels (less than 1 part per million (ppm)) were found in the remaining two samples. A map of the sample locations was not found in the review of EPA or DEQ documentation. No further information pertaining to the disposal of PCB-containing transformers and capacitors has been identified. It appears unlikely that PCB contamination exists in significant quantity on the Project site; however the possibility of its existence cannot eliminated.

4.1.3 Contaminants from Water Treatment

Under NPDES permit 3301-J from DEQ, Boise Cascade operated an industrial/domestic wastewater treatment system and a storage pond known as the “Fire Pond” that discharged to the lake (Jackson, 1985; DEQ, 2008). All sewage generated by the mill and the larger Valsetz community was sent by pipeline to an on-site treatment system and associated treatment ponds. Closure documents for Valsetz detail the procedures for the decommissioning of the wastewater system (BCC, 1984). The collection system was shut down by sealing the inlets and outlet of each manhole with cement. The closure plan also indicates that the wastewater treatment pondswere decommissioned by pumping the contents of the primary and secondary ponds into the chlorination basin, and then landfilling the sludge in-place by leveling dikes.

The Fire Pond was the disposal site for the boiler blowdown water, turbine cooling water, and grate cooling water (Hafley, 1992). From the Fire Pond, the wastewater stream flowed into Fanno Creek and then to the lake. The Fire Pond was constructed in 1975 in line with the former channel of Fanno Creek, which was diverted to allow space for dry land log handling (Haffley 1992).

According to the closure plan, the wastewater in the Fire Pond was flushed with fresh water during the rainy season; the outlet was sealed and then the remaining liquids were slowly pumped into Fanno Creek (BCC, 1984). Several sources suggest that the pond was used as a demolition landfill for inert demolition debris (eg. concrete, metal, etc.) (BCC, 1984; Hafley 1992). Information from these sources does not suggest that the inundation of the area formerly known as Fire Pond would pose significant risk of release of contaminants, but the potential for metals contamination from solid waste disposal that may have occurred here cannot be totally precluded.

4.1.4 Contaminants from Waste Disposal

There are three known waste disposal sites in the Project area including a closed sanitary landfill, a log yard waste disposal site, and a demolition landfill where the remains of the town and mill were disposed.

Closed Sanitary Landfill

Non-hazardous waste generated from the town and the mill was disposed of in a DEQ permitted, “unlined” sanitary landfill of approximately two acres under Solid Waste Permit #208. In 1978. A DEQ inspection of the permitted water treatment and sanitary landfill at Valsetz reported the site was operating in a state of general compliance (DEQ, 1978).

In the early 1980s, ten cubic yards of asbestos insulation was disposed of in the sanitary landfill at Valsetz (BCC, 1981). Asbestos is an inert hazardous substance that is a known carcinogen when airborne. The EPA was notified of the waste and completed Potential Hazardous Waste

Site Identification and Preliminary Assessment documents (EPA, 1982). A follow up inspection by DEQ reported that the landfill was in compliance. No further action was taken regarding the asbestos waste.

The Boise Cascade closure plan indicates that asbestos waste resulting from the demolition of the town and the mill would be disposed of in the sanitary landfill by an asbestos abatement specialty contractor (BCC, 1984). An “Asbestos - Notice of Intent to Demolish and/or Renovate” permit was submitted to DEQ in 1984. The notice indicated that if insufficient space was available in the Valsetz landfill, then another unspecified licensed landfill would be used. The quantity of asbestos-containing waste material in the sanitary landfill could not be verified from the DEQ and EPA files for Valsetz. However, the sanitary landfill was found in compliance and closed under a permit issued by DEQ in April 1985.

Under each of the three proposed reservoir sizes discussed in this report, the location of the closed sanitary landfill would be inundated. Inundation would be in violation of the closure permit (DEQ, 1985). Further research is needed to determine the proper mitigation for the sanitary landfill if the proposed reservoir is to be built.

Log Yard Waste Disposal Site

In DEQ’s preliminary assessment of the Valsetz area in 1991, a map depicts an “old landfill” located just southeast of the permitted landfill location. This ‘old landfill’ label may refer to the Log Yard Waste Disposal Site discussed here which was also in the area. No other reference to this “old landfill” was found in the documents reviewed for this report. In 1978, the log yard waste disposal site was noted by a DEQ inspector to have expanded north and northwest towards Handy Creek and Valsetz Lake (DEQ, 1978). The exact location of this wood waste is not depicted on any of the site maps reviewed in DEQ or EPA files. However, one log yard waste disposal site was described in a contact report associated with DEQ’s Extended Preliminary Assessment. That site was located northwest of the mill and the treatment ponds associated with the sewage treatment system (Hafley,1991a). According to Boise Cascade closure plan documents, the Log Yard Waste Disposal Site was to be pushed away from Lake Valsetz, graded, covered with one foot of soil, and replanted with trees (BCC, 1984).

The DEQ Preliminary Assessment (DEQ, 1991), indicates an area on the western bank of Valsetz Lake labeled “Old Log Dump,” which may indicate another area of highly concentrated wood waste debris. Other unknown wood waste disposal sites could also exist. The wood waste on this and any other sites could pose detrimental environmental impacts to water quality in the proposed project area if inundated. The accumulation of wood debris, especially bark, on sediments near log handling facilities can affect sediments in several ways. As wood debris decays in an aquatic environment, especially in low energy systems, it can have negative impacts on local ecosystems by the release of potentially toxic hydrogen sulfide and ammonia, and through the facilitated growth of bacterial mats on the wood waste (Schaumburg, 1973). The microbial (bacterial) community will expand until the limiting nutrient (usually nitrogen) is consumed and remain at some steady population state that uses as much of the available nutrient as possible, thereby competing for the nutrient with other aquatic resources that would otherwise use it. When oxygen is the limiting factor, microbial degradation of wood waste can lead to localized anoxic conditions. For example, Freese and O’Clair (1987) found that bark depths of up to 19 cm decreased oxygen concentrations at the sediment surface from approximately 10 mg/liter in control areas to 2.5 mg/liter. In these fashions, the microbial growth associated with wood waste can further affect water quality. .

Inundated wood waste can also leach naturally occurring, but potentially toxic, turpenes (e.g., pinene) and acids (abietic and dehydroabietic acids) that have been demonstrated to elicit toxicity in fish and invertebrates. Pease (1974) found that leachates from hemlock, spruce, red cedar, and yellow cedar could be toxic to pink salmon fry in laboratory bioassays and that toxicity was generally greater in freshwater than in seawater. Because the leachate from wood waste is highly labile, it is generally not an issue in aquatic environments except when freshly cut wood is immersed in relatively static aquatic environments. However, the issues of effects on sulfide, ammonia and biological oxygen demand can persist for as long as the wood waste is present.

For example, a court decision issued in 2007 by federal district court in Arkema, Inc. v. Asarco (Case No. C05-5087 RBL) found that, "although the evidence does not support the conclusion that wood that contains hazardous substances, when placed in significant volume in still water the degradation of wood attracts microorganisms that excrete hazardous substances such as ammonia, hydrogen sulfide and 4-methylphenol, which "come to be located" at the site". Weyerhaeuser was found liable in this case as the owner of a facility from which hazardous substances were released to the environment (U.S. District Court 2006).

The quantity of wood waste located at the Project site is not well documented and its disposition upon immersion may represent a source of impact to both water quality and aquatic animal health in the reservoir. However, wood deposits have been degrading for several decades, which substantially reduces the likelihood of contamination. Further clarity is needed regarding the location and quantities of wood waste. Wood waste would not be considered a hazardous waste, and inundation of remaining wood wastes would not affect the safety of the proposed Valsetz water supply for drinking water. Therefore, the inundation of wood waste is unlikely to pose a significant human health risk.

Inert Demolition Landfill and Town Demolition Disposal

As discussed in Boise Cascade Valsetz closure plan documents http://www.deq.state.or.us/lq/ECSI/ecsidetailfull.asp?seqnbr=15#contamination and in interviews conducted for DEQ's Preliminary and Expanded Preliminary investigations of the Valsetz site (Hafley 1992), inert demolition debris from the mill and/or town clearing was deposited just north of the former mill site in a drained industrial pond known as the Fire Pond

The Boise Cascade closure plan states that demolition debris from the town would be burned at a location approximately 1,000 feet north of the truck repair shop and east of the wastewater treatment ponds, near the location of the sanitary/wood waste landfill (BCC, 1984). The burning was conducted following the notification of DEQ. Asphaltic products were separated from the demolition debris to the greatest extent possible prior to burning. In the closure documents and subsequent environmental investigations there is no mention of the testing or disposal of lead based paint, or whether lead based paint, if any, was discovered during the demolition or incineration activities. The burning of wood covered with lead paint could cause the release of lead dust contamination. It is therefore possible that lead contamination exists on the former burning site and the surrounding areas.

4.2 Miscellaneous Contaminants

Two known additional potential sources of miscellaneous contaminants may exist on the site: (1) alleged and confirmed drum disposal areas, and (2) petroleum underground storage tanks.

Alleged and Confirmed Drum Disposal Areas

During a Preliminary Assessment in 1991, allegations were made by several former employees of the Valsetz mill that steel drums were buried in various areas around the site.. These alleged sites were later narrowed down to two locations where further investigation occurred during DEQ's Extended Preliminary Assessment (Hafley1992). In this investigation, drums were uncovered in an area known as drum disposal Area 2. The contents of the drums buried at this location were determined, through laboratory analysis, to be consistent with non-hazardous veneer scrubber sludge resulting from the burning of wood.

Petroleum Underground Storage Tanks

Historic photographs of the company store at Valsetz show that the store operated a fuel station and associated underground storage tank (UST) system (Maxwell, 2008). No readily available information was found pertaining to the decommissioning of these tanks, or any other potential USTs at Valsetz.

4.3 Invasive Species and Pathogens

4.3.1 Invasive Species

Disturbance by geomorphic and anthropogenic processes affects riparian substrate, nutrient levels, canopy shading, and hydrology. As such, fluvial systems commonly serve as conduits for the dispersal of exotic plant species. Therefore, inundation of the riparian zone provides a water conduit for the spread of invasive species.

To address the potential for invasive species spread from water transfer from the Siletz into the Luckiamute system, state and federal databases were reviewed[1] to determine if certain aquatic and/or riparian associated species are present in the Siletz basin but absent in the Luckiamute basin. Three species are recognized in the Siletz that are not recorded in the Luckiamute system (Table 1). One of these species, dwarf eelgrass, is associated with marine systems, and would not be viable even if seeds or vegetative propagules were somehow permitted to transfer to the Luckiamute system. Seeds of pickerelweed are readily consumed by waterfowl and dispersed through this mechanism. Given that the reservoir will attract waterfowl, it may be challenging to prevent the introduction of this species into the reservoir, regardless of which alternative might be sought. As a result, an invasive species management plan is recommended to assert rapid response measures in the event that infestations are observed. Himalayan knotweed is primarily wind pollinated and dispersed, thus, minimizing its spread, also

[1] Hanson, Erik and M. Sytsma. 2001. Oregon Aquatic Nuisance Species Management Plan. Portland State University, Center for Lakes and Reservoirs. http://www.anstaskforce.gov/State%20Plans/OR_ANS_Plan.pdf

requires diligent implementation of invasive species management measures. As there is uncertainty regarding the prevalence of these latter two species in Polk county, despite state and local records to contrary, measures to prevent the spread of these species into the Luckiamute watershed may be irrelevant.

Table 1. Reported invasive species and noxious weeds recognized in Polk and Lincoln Counties

Family Name	Scientific Name	Common Name	Location	Source	Noxious Weed Classification[1]	Target Weed Designation[2]	Plant Auarantine List	Prohibite Designation[3]
Callitrichaceae	*Callitriche stagnalis*	Pond water-starwort	Siletz-Yaquina watershed, Polk County	USGS 2010	Not listed			
Haloragaceae	*Myriophyllum aquaticum*	Parrot feather, Brazilian watermilfoil	Siletz-Yaquina watershed, Polk County	USGS 2010, USDA 2011	Class B		X	
Haloragaceae	*Myriophyllum spicatum*	Eurasian watermilfoil	Siletz-Yaquina watershed, Polk County	USGS 2010, USDA 2011	Class B		X	
Hydrocharitaceae	*Egeria densa*	Brazilian waterweed	Siletz-Yaquina watershed, Polk County	USGS 2010	Class B		X	X
Iridaceae	*Iris seudacorus*	Yellow flag iris	Polk and Lincoln Counties	USGS 2010	Class B		X	
Lythraceae	*Lythrum alicaria*	Purple loosestrife	Polk and Lincoln Counties	USGS 2010, USDA 2011	Class B		X	X
Poaceae	*Phalaris arundinacea*	Reed canarygrass	Tributary to Ash Creek, Lincoln and Polk Counties	LWC 2010, USDA 2011	Not listed			
Polygonaceae	*Fallopia japonica (Polygonum)*	Japanese knotweed	Lincoln and Polk Counties	LSWCD 2009, WeedMapper 2007	Class B,	X	X	X

Family Name	Scientific Name	Common Name	Location	Source	Noxious Weed Classification[1]	Target Weed Designation[2]	Plant Auarantine List	Prohibite Designation[3]
Polygonaceae	*Fallopia sachalinensis (Polygonum)*	Giant knotweed	Lincoln and Polk Counties	LSWCD 2009, USDA 2011	Class B,	X	X	X
Polygonaceae	*Polygonum polystachyum*	Himalayan knotweed	Lincoln County	LSWCD 2009	Class B		X	X
Pontederiaceae	*Pontederia cordata*	Pickerelweed	Siletz-Yaquina watershed	USGS 2010	Not listed			
Rosaceae	*Rubus armeniacus*	Himalayan blackberry	Little Luckiamute River, Lincoln and Polk Counties	LWC 2010, USDA 2011	Class B		X	
Zosteraceae	*Zostera japonica*	Dwarf eelgrass	Siletz-Yaquina watershed	USGS 2010	Not listed			

[1]Oregon State Noxious Weed List (ODA 2010a)
[2]Designated “T” for target weeds by ODA (2010a)
[3]As listed in the Oregon Aquatic Nuisance Species Management Plan (Hanson and Sytsma 2001)

4.3.2 Pathogens

A survey of readily available literature sources identified at least 12 fish pathogen species associated with diagnoses conducted on Siletz-Yaquina River fish in varying degrees of prevalence (Table 2). We could not identify reports of these species in Luckiamute fish species. However, this finding must be considered largely an artifact of the sampling. Fish have been sampled at a variety of hatcheries in the Siletz system, but we did not identify hatchery investigations (or other studies) in the Luckiamute. Therefore, the pathogens reported from the Siletz could certainly be found in Luckiamute fish, but remain unreported simply because no relevant or comparable investigations have been conducted.

A relationship exists between pathogens, a susceptible host, and environmental conditions as discussed in Arkoosh et al. (1998). In their report, the authors remarked that pathogens appear to be “integral and ubiquitous components of the river and estuarine habitat” and found that juvenile salmon, immunosuppressed as a result of polluted waters, are more susceptible to disease.

Risks from the transfer of fish pathogens from one watershed into another through water transfer can largely be managed through engineering solutions that quarantine fish access away from the primary location of water transfer. Additional water treatment solutions can be implemented as well (e.g., ozonation, etc.) to minimize the potential spread.

5 Conclusions and Recommendations

There remain significant uncertainties with regards to potential site wide contamination from historic activities. DEQ's 1992 No Further Action determination (http://www.deq.state.or.us/lq/ECSI/ecsidetailfull.asp?seqnbr=15#contamination) did not consider the potential for the site to be inundated to create a drinking water supply, as is currently proposed. Further investigation of soils is needed to determine if water used to flood the site could become contaminated. The most significant of which is associated with the past use of PCP in glue used to make plywood, and the ultimate disposal and burning of any wastes associated with this process. Additional sources of contamination are also possible, but appear from this screening level review to be less likely to represent significant contamination issues in the event of inundation. Significant engineering to cap landfills containing wood waste and other solid materials may need to be explored and full site investigation may be required if the areas are significantly large.

5.1 Contaminants/Hazardous Materials

It is our current understanding that no dioxin sampling has been conducted at the site. None of the samples reported to the DEQ or EPA was analyzed for dioxins. Surface and subsurface sampling of soil and groundwater in the area of the former glue settling pond and known incineration areas is strongly advised to address any potential dioxin contamination. Burn areas used for disposal of solid wastes, including plywood, should also be evaluated for dioxins and dibenzofurans. If dioxins were found through an organized sampling plan, a quantitative risk assessment evaluating the potential for environmental release, receptor exposure, and risk characterization should be performed to consider risks from inundation. Sediment transport potential (the primary vehicle for downstream transport of dioxins), routes of potential uptake, and engineering strategies to limit exposure to safe levels would be appropriate in this analysis.

Table 2. Reported fish pathogens in the Siletz and Luckiamute Systems

Disease/Pathogen	Found in Siletz-Yaquina	Found in Luckiamute	Source
Aeromonas salmonicida	X		Arkoosh et al. 1998
Ceratomyxa Shasta	X		Arkoosh et al. 1998
Cryptobia salmositica	X		Arkoosh et al. 1998
Cytophaga psychrophilia	X		Holt 1988
Erythrocytic necosus virus (ENV) or Erythrocytic inclusion body syndrome (EIBS)	X		Arkoosh et al. 1998
Infectious hematopoietic necrosis virus (IHNV)	X		Arkoosh et al. 1998
Infectious pancreatic necrosis virus (IPNV)	X		Arkoosh et al. 1998
Nanophyetus salmincola	X		Arkoosh et al. 1998
Renibacterium salmoninarum	X		Arkoosh et al. 1998
Sanguinicola sp.	X		Arkoosh et al. 1998
Vibrio anguillarum	X		Arkoosh et al. 1998
Viral hemorrhagic septicemia virus (VHSV)	X		Arkoosh et al. 1998

Laboratory analysis for volatile organic compounds, pesticides/herbicides, petroleum products, and other analyses may also be appropriate. A work plan should be developed to identify specific areas to be sampled and laboratory analyses to be executed. Any on- site detections from the landfill or other areas of the Project site may require additional risk assessment to determine potential impacts to the proposed Project.

The burning of wood covered with lead paint could release lead dust contamination. It is possible that lead contamination exists on the site from the burning of the demolition debris from the town. This fugitive dust can represent both a source of inhalation exposure to lead in humans (and wildlife), and, if inundated, lead paint residue could be released into the water column and sediments. To address potential lead contamination, surface and subsurface soil and groundwater sampling is recommended. These investigations should first focus on the areas containing burn demolition debris from the former town/mill.

Further research, interviews and possible subsurface investigation is recommended to address concerns regarding USTs. Enquiries with the former Boise Cascade personnel at Forest Capital may be required to help identify the location of current and/or historical USTs and to assess the decommissioning/former removal of the USTs. Given the size of the prospective reservoir and the probable quantities of petroleum stored on the Project site, any petroleum impacts on the project would likely be minimal, but must be considered as potential contributors to the overall contamination load at the site.

At this time, no specific treatment of onsite wood waste is recommended. Although the wood waste may present manageable issues in later phases of the Project, it is not considered a high priority.

5.2 Invasive Species and Pathogens

Two invasive species are identified in this review that are present in the Siletz system and have not been reported in the Luckiamute System. Localized site data on invasive species distributions are limited. Field surveys are recommended to provide site-specific information regarding the presence or absence of invasive species within the inundation area. This information will provide an environmental baseline and can be used to further address the potential for the transfer and spread of invasives into the Luckiamute system. .

Seven potentially invasive pathogens identified in fish or invertebrate species in the Siletz system have not been reported in fish in the Luckiamute. Publicly available data for this assessment are very limited and largely absent for the Luckiamute system. Enquiries with state agency representatives and possible sampling are necessary to conclusively summarize the status of human and animal pathogens recorded in both watersheds.

Engineering solutions associated with the water transfer should be considered that will minimize in perpetuity the potential spread of invasive species and pathogens through water transfer. Such solutions have included screening, filtration, and water treatment. The ability to implement such measures on the high flow volume anticipated for transfer would require engineering analysis.

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