

SECTION 3

Intake Site Selection and Design Alternatives

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Introduction

The City of Lebanon is considering alternatives for construction of a new raw water intake to provide water for the new water treatment plant (WTP). The potential new intake locations that were considered as part of this conceptual design were on the South Santiam River, downstream of the city's existing point of diversion at the headworks of the Santiam Canal, and on the Santiam Canal at locations that are upstream of the city's existing intake. The city's existing intake is located approximately 3.6 miles downstream from the canal headworks.

An advantage of a river intake is possibly improved water quality because of greater flow (greater dilution) and lower risk of contamination from an accidental spill or runoff. A river intake also may allow the city to eliminate or reduce annual costs paid to the City of Albany for operation and maintenance of the Santiam Canal.¹ Disadvantages of a river intake include greater capital and operating costs, and greater uncertainty related to river morphology. In addition, a river intake will require extensive permitting to comply with the Endangered Species Act, which will require a significant effort and additional cost.

Conversely, the advantages of a canal intake include lower capital and operating costs, less involved permitting requirements, and better-defined channel morphology. Disadvantages include a possibly greater risk of exposure to chemical contamination, and continued financial obligation for canal maintenance.

If a river intake is selected, the Oregon Water Resources Department (OWRD) is likely to allow a second point of diversion at a downstream location on the South Santiam River. Once a new intake site is tentatively selected, OWRD should be consulted to confirm the acceptability of the new point of diversion. The city's water rights appear to allow an intake at any location on the Santiam Canal.

Since the construction of an intake facility involves in-water work, the phasing was limited to two increments of 7 mgd to achieve the buildout capacity of 14 mgd. Other phasing options, such as increments of 5 mgd, could be considered during final design.

A site visit was conducted on November 6, 2008, to provide a preliminary assessment of possible intake sites. A review meeting to discuss concepts for the intake was held the same day following the site visit.

¹ Lebanon's long-term responsibility for operation and maintenance of the Santiam Canal, regardless of whether the canal is used for a water source, is yet to be determined.

River Intake

Location Description

Two general areas for a South Santiam River intake were identified. One location was near the former diversion structure associated with the Weyerhaeuser property, and the second was along River Drive. An intake could be located at either site, but the River Drive sites were better suited for an intake.

The morphology of the river at the Weyerhaeuser site is U-shaped with the deepest section of the river located in the center of the channel and the river floor gradually sloping up to sandy banks along the shoreline. To ensure submergence at low-flow conditions, intake screens would need to be located in the center of the river. This screen arrangement would require a more costly construction effort, and the intake screens would be more difficult to access for maintenance.

The River Drive sites are located on the outer edge of a river bend. River flow is more rapid along the bank at this location resulting in a deeper channel near the river bank. Intake screens could be located along the bank, allowing easier access. The higher river flow velocities would help move debris past the intake screens, and the deep channel would help provide screen submergence under low flow conditions. The river depth at minimum flow was assumed to exceed 3 feet. The actual depth at low flow needs to be determined. The elevation change between the water surface and the top of the bank was estimated at approximately 20 feet.

Design Considerations

The River Drive site was assumed for the development of a conceptual design of a river intake. The suggested screen design uses stainless steel screen panels installed in concrete structures at a slope of approximately 1 to 1.5 (vertical to horizontal). To protect listed and endangered fish species, screens have a maximum allowable spacing of 1.75 millimeters, and the maximum allowable flow velocity through the screens is 0.4 feet per second (fps). These requirements along with the depth of water under minimum river flow conditions dictate how wide an intake structure must be to allow the desired maximum day flow to be withdrawn from the river. Screens are typically installed with minimum flow depths of two to three feet. Assuming a minimum depth of 3 feet at a River Drive site, to meet a Phase one flow requirement of 7 mgd (11 cfs), the underwater portion of a river intake structure would be approximately 14 feet wide, with two 5-feet by 5.4-foot screens. An air burst system consisting of an air compressor, receiving tank, and air piping to each screen will provide periodic cleaning of the screens with pressurized air.

Other design considerations include the elevation difference between the water surface and the top of the river bank, and the space available to provide access to the intake. The vertical rise between the water surface and the intake will impact the concrete requirements for the structure, and the space available between the river and road will impact construction and future accessibility for intake maintenance. A very narrow site would require temporary re-routing of River Drive during construction, and might preclude locating the air burst system near the intake.

Permitting

Two permitting efforts will be required: 1) a Joint 404 Division of State Lands/Corps of Engineers permit, and 2) a transfer application to OWRD to move the point of diversion downstream to the intake location. A biological assessment on the river is required for the Joint 404 permit application, and preparing the application could require 6 months. The approval process could require an additional 12 to 18 months.

Uncertainty and Further Investigation

Once a site is selected, bathymetric analyses will be needed to confirm the shape of the river, and the river's profile at low flow. River flow analyses performed when the City of Albany's diversion dam and fish screen project was designed can be used to assess flood potential. In addition, property availability and accessibility for construction must be determined.

Canal Intake

Location Description

Several areas along the canal were visited, and all sites were considered acceptable. The canal site opposite the Tree Farm was described as ideal, with a water surface to road elevation change of approximately 8 feet. According to Lebanon staff, canal flows are to be maintained at between 190 and 220 cfs, with a guaranteed minimum of 70 cfs. A test to determine the canal's water level profile at the minimum flow of 70 cfs will be needed.

Design Considerations

Because of the new diversion dam and fish screen installed at the canal's headwaters, the canal is not considered a habitat for fish. Therefore, the maximum allowable flow velocity through the screens can be greater than for a river intake. This allows the canal intake's screen area to be smaller than a river intake's screen area. **Exhibit 3-1** shows a cross-section view and **Exhibit 3-2** shows a plan view of a conceptual design for a canal intake. The underwater intake structure is approximately 14 feet wide, with two 5-feet by 3.6-foot screens. The design criteria used to develop this conceptual design are as follows:

- Phase one capacity = 7 mgd (11 cfs)
- Approach velocity = 0.8 fps
- Minimum canal water depth = 2 feet

Similar to a river intake, an air burst system consisting of an air compressor, receiving tank, and air piping to each screen will provide periodic cleaning of the screens with pressurized air. Because the canal intake screens have a smaller area and larger openings, the airburst system can be smaller than for a river intake.

Permitting

Permitting for a canal intake is expected to be far less involved than for a river intake, and may not require any permitting, except possibly land use modifications required as part of the WTP site permitting. The OWRD considers the city's point of diversion to be at the

diversion dam on the South Santiam River, so a canal intake does not appear to require any water rights changes.

Uncertainty

The Santiam Canal is owned and operated by the City of Albany. The City of Lebanon has an agreement with the City of Albany for use of the canal, and pays annual fees for canal improvements, and operation and maintenance. Continued use of the canal requires a continued relationship with Albany, and future costs associated with the operation and maintenance of the canal is uncertain.

Preliminary Cost Estimate

CH2M HILL developed comparative cost estimates for canal and river intakes based on the concepts that have been presented. The estimates assume that site conditions and access are reasonably favorable for construction. Estimates are for construction only, and include appropriate contractor mark-ups and a 30 percent contingency.

The cost for a river intake is more uncertain than a canal intake because the river bottom profile changes from site to site, and whether the property at the most favorable site could be purchased is unknown. Further, a river intake will require a Joint 404 (Division of State Lands/Corps of Engineers) permit. The cost for this permitting effort was not estimated, but is expected to be significant. The estimated construction cost for a river intake for the River Drive properties area, not including property purchase or permitting, is \$250,000. The cost is expected to be higher for a river intake near the Weyerhaeuser property because of the river channel profile. The estimated cost for an intake on the canal is \$200,000. These costs are for construction, only, and include contractor markups and contingency. They do not include the raw water pump station.

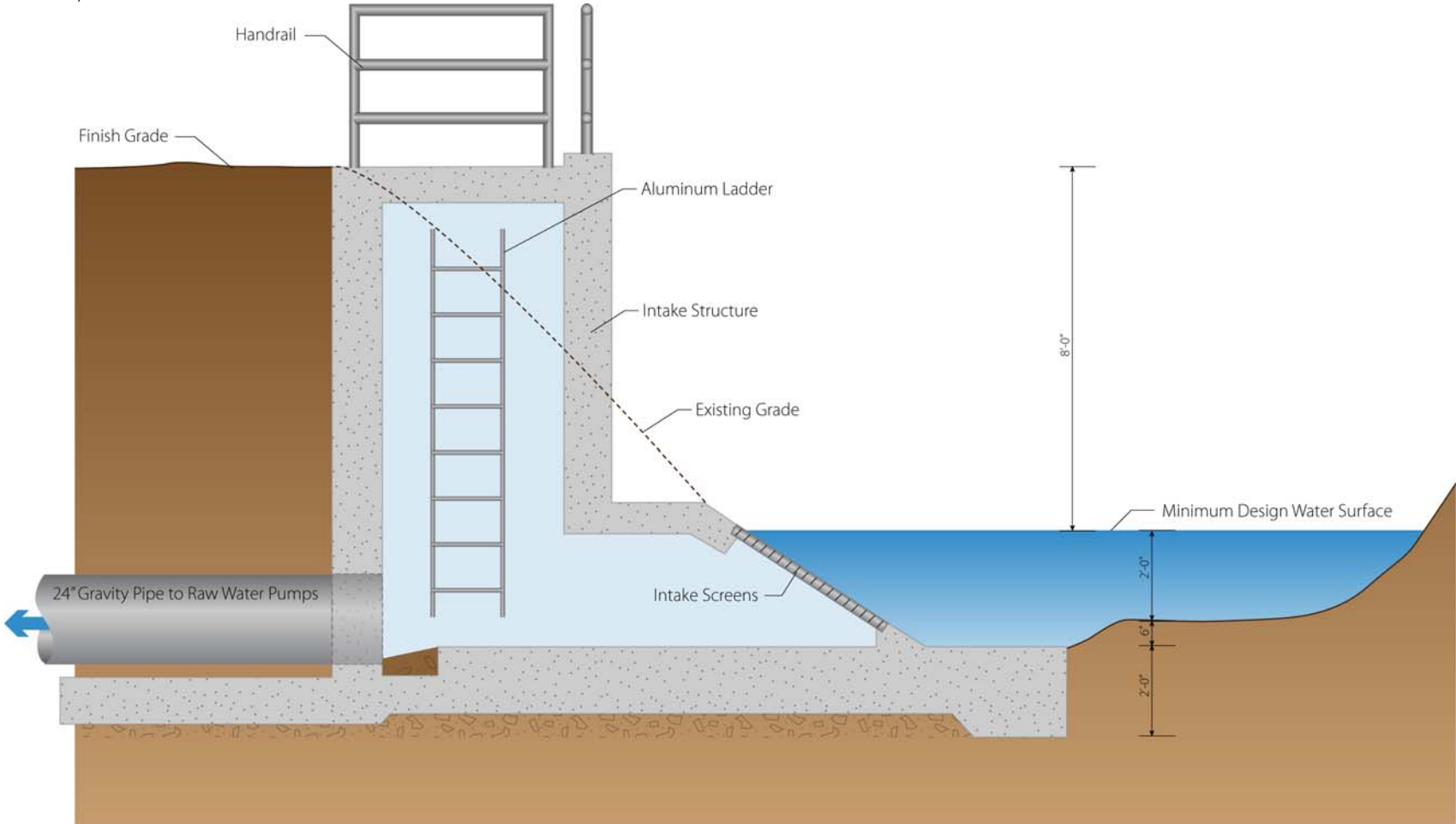
Additional Design Considerations

The conceptual designs presented here are for a Phase one capacity of 7 mgd (11 cfs). When needed, a Phase 2 expansion would double the intake capacity to an ultimate capacity of 14 mgd (22 cfs). Provisions for this phasing should be included in the actual intake design.

Once a site or sites have been identified, additional design considerations will include the following:

- Profile of intake super-structure and access to screens. Whether the structure is built up to the level of the road as show in Exhibit 3-1, or is built closer to the water surface is often a matter of preference.
- Location of pump station. Several potential sites require the intake to be on the opposite side of a road from the WTP site. The initial response of Lebanon staff is that the raw water pump station would be located at the WTP site with a gravity raw water pipe routed beneath a road as necessary.
- Location of air burst equipment. If possible, the recommendation is to locate an air burst system's air compressor and receiver in a small building close to the intake.

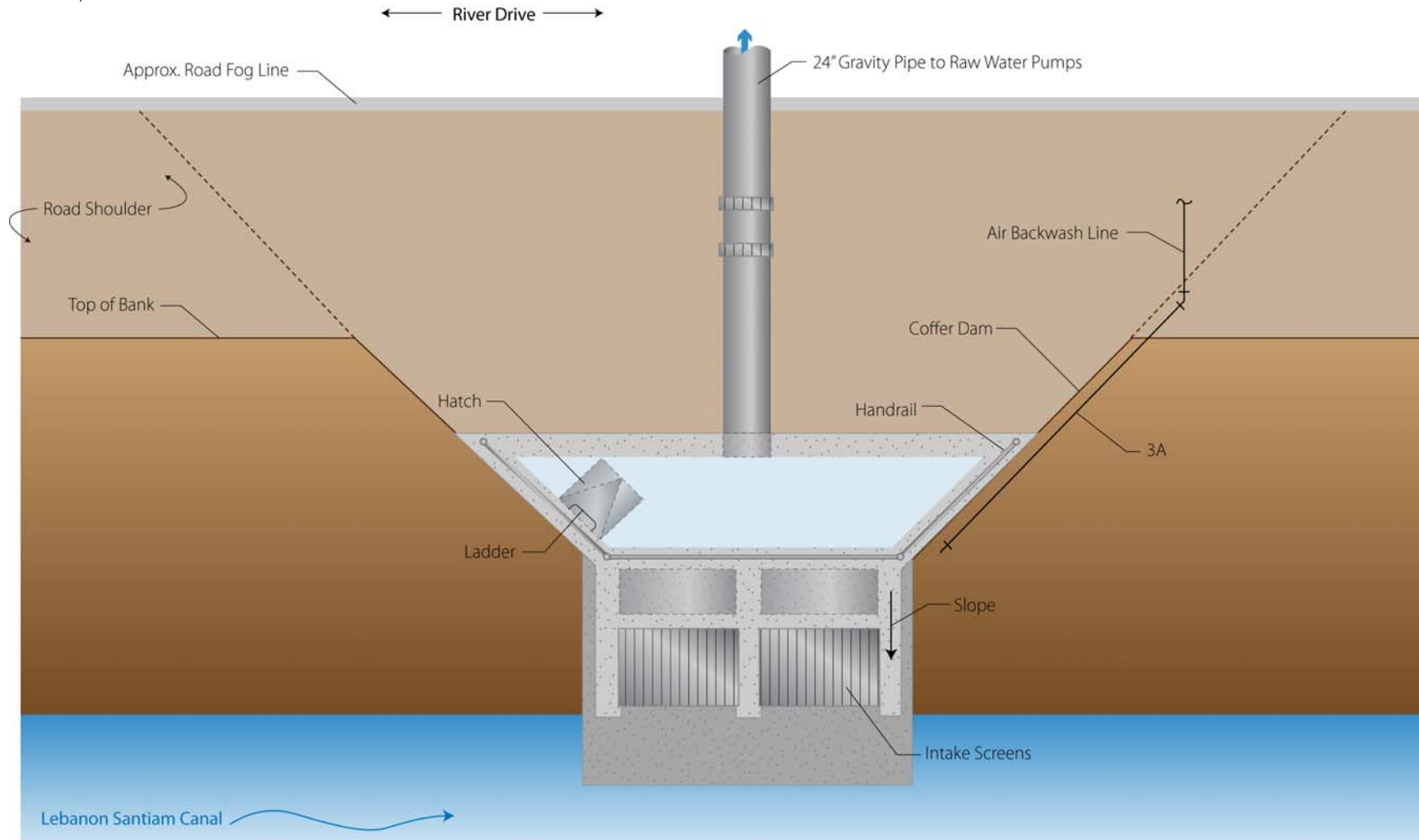
EXHIBIT 3-1
Canal Intake-Section
City of Lebanon Water Improvement
Lebanon, OR



Section
Approx 1" = 3.5'

WB122008001CVO-LWI_100_CanalSection_03

EXHIBIT 3-2
Canal Intake-Plan
City of Lebanon Water Improvement
Lebanon, OR



Plan
Approx 1" = 6'

WB122008001CVO-LWI_101_CanalPlan_03

Recommendations

CH2M HILL and Lebanon staff concur that for phase one development, an intake on the Santiam Canal is recommended for the following reasons:

- The diversion structure at the canal headworks controls flow and can help prevent damage from water-carried debris.
- The fish screen at the canal headworks reduces screening requirements at the intake itself, allowing for a smaller intake structure.
- Less permitting is required for a canal intake compared to a river intake, because the canal is not considered a habitat for fish.
- The canal is in closer proximity to the most favorable sites (Tree Farm and River Drive sites). Therefore, raw water transmission piping requirements are minimized.
- A canal intake has a lower capital cost for all of the above reasons.
- The risk of chemical contamination of the canal from spills or residential runoff is greater than for the river because the river is farther removed from private properties, the canal has greater proximity to roads and bridges, and the river's higher flow provides more dilution. However, historic water quality in the canal has been very good and the risk of future contamination is not considered to be extraordinary. In addition, the proposed location for the River Drive or Tree Farm sites is farther upstream than the city's existing intake and therefore, less vulnerable.