

**SECTION 2**

# **Water Treatment Plant Site Selection**

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# Water Treatment Plant Site Selection

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## Introduction

Evaluating potential sites for the city's new water treatment plant was a significant component of the current project. The goal of the evaluation was to recommend one or more sites for the city's consideration for purchase and development.

The city's existing WTP property is small and will not accommodate an expansion. Furthermore, to reduce the risk of accidental water contamination from an auto accident or runoff, locating the WTP so that the raw water intake can be moved upstream on the canal or relocated to the South Santiam River is desirable. Ideally, the new WTP site would have ready access to a raw water intake on either the Santiam Canal or the South Santiam River to give the city maximum flexibility. Additional site selection factors included the area needed for distribution system water storage and the length of transmission pipeline necessary for connection to the distribution system.

## Alternatives

Three possible locations for a site were identified by city staff, and are shown in **Exhibit 2-1**. These locations were identified as follows:

1. River Drive property (including the Canal Diversion property that is currently owned by Albany, or one or more properties located along River Drive between River View Street and Chestnut Lane)
2. Tree Farm property (property that fronts on River Drive, and is situated between River Drive and Fuller Lane, and is south of the intersection of River Drive and Mountain River Drive)
3. Weyerhaeuser property (property that is currently owned by Weyerhaeuser Company, which is located at the north end of Mayfly Street, northeast of Riverview Elementary School, and with the South Santiam River to the east;).

**Exhibits 2-2, 2-3, and 2-4** provide topographic maps of the River Drive (not including the Canal Diversion property), Tree Farm, and Weyerhaeuser sites, respectively.

## Evaluation of Alternatives

Current geographic information system (GIS) data were obtained from the city to check property lines, utilities, and similar mapped features, and each site was visited or viewed from the road by project team members.

A wide range of factors were considered in identifying and qualitatively evaluating sites. Site size, geometry, and the ability to accommodate future plant or storage expansions were very important. Other factors included the hydraulic requirements for raw water and finished water pumping, access to a river intake or a canal intake, road access, utility access, security, property permitting, and potential impacts on neighbors.

Cost-related factors included land purchase, potential excavation and fill requirements, required site improvements such as improvements to a frontage or access road, the presence of wetlands and possible need for wetlands mitigation, proximity to a high-voltage electrical transmission line(s) and the possible requirement for an electrical transmission upgrade, and the cost of new transmission pipelines, for both raw and finished water.

## Land Area

As presented in Section 5, Treatment Process Selection, the potential treatment process options were narrowed to two for further analysis: a conventional media option including flocculation, plate settlers, and conventional media filters, and a membrane filtration option including in-line coagulation and pressure membranes. To estimate the required property size, site plans including facilities sized for an ultimate expansion of the plant to 14 mgd, were developed for both options. An area of 8 to 10 acres was found to accommodate all facilities. A smaller area might suffice but would likely result in higher costs to optimize the arrangement of facilities and development of the site.

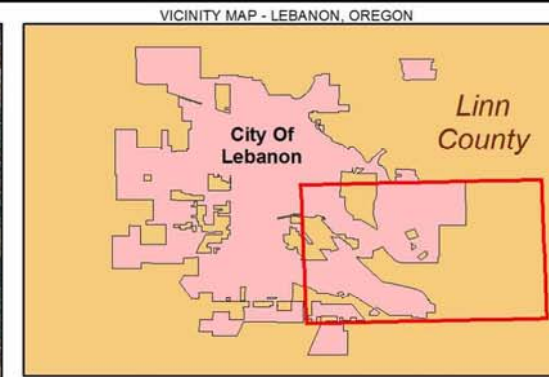
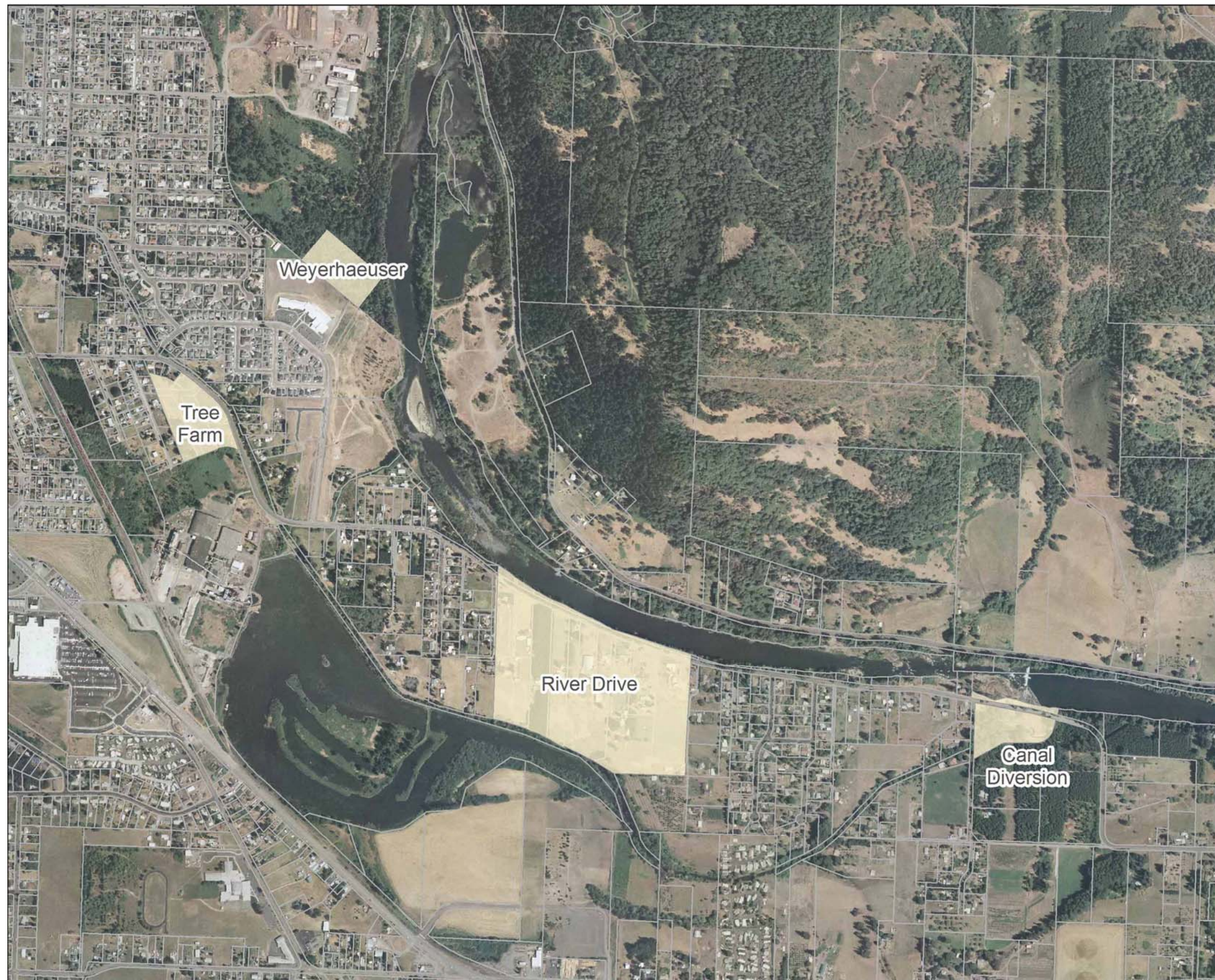
One of the River Drive properties, the canal diversion structure property, was eliminated from further consideration based on this preliminary sizing. The total area within the property is approximately 7 to 8 acres. However, the canal runs through the property removing 1 to 2 acres from the 7 to 8 acre inventory, and creating a small and difficult-to-access portion on the west side. Further, the property is bisected in the north-south direction by high voltage Bonneville Power Administration overhead power lines that have an associated easement that restricts development through a large portion of the property. This property would not be suitable to accommodate Lebanon's long-term WTP needs.

The city may be able to acquire a property, or two adjoining properties, along River Drive to the north of the canal diversion site, so the River Drive area was not ruled out entirely.

## Non-Cost Factors

**Exhibit 2-5** presents the non-cost criteria and the relative ranking (positive, negative, or neutral) of each of the three sites with respect to each criterion. The Tree Farm and River Drive sites are both generally favorable – they have good access and are generally flat properties that will not require excessive site work. In contrast, the Weyerhaeuser site has limited access and requires extensive site work (clearing of trees and brush and fill of low areas) prior to construction. This site would require either a new access road from the north or extensive improvements to the south to minimize impacts on the adjoining neighborhood.





LEGEND  
 ■ Potential Water Treatment Plant Sites  
 □ Taxlot

Notes:  
 1. Aerial Photo, 2005, Oregon Explorer Streaming Imagery  
 2. Taxlots, City of Lebanon, OR

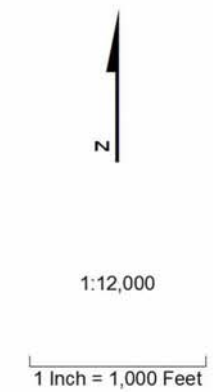
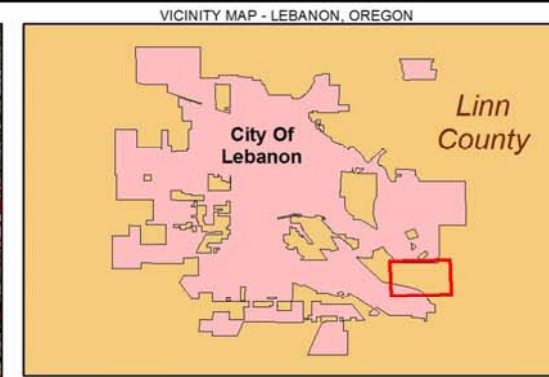


EXHIBIT 2-1  
 Potential Water Treatment Plant Sites  
 City of Lebanon Water Improvement  
 Lebanon, OR





LEGEND  
 Site  
 Taxlot  
 2 Foot Contour (NGVD 29)

Notes:  
 1. Aerial Photo, 2005, City of Lebanon, OR  
 2. Taxlots, City of Lebanon, OR

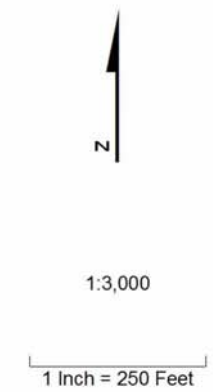
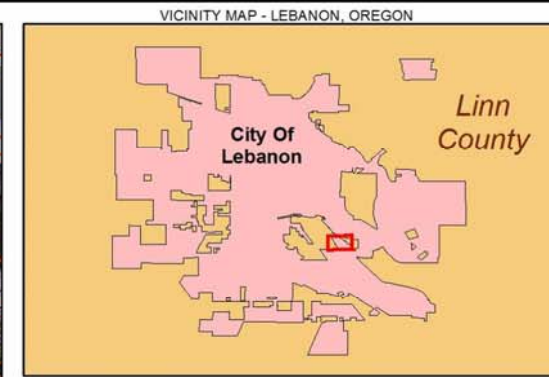


EXHIBIT 2-2  
 River Drive Site  
 City of Lebanon Water Improvement  
 Lebanon, OR





- LEGEND
- Site
  - Taxlot
  - 1 Foot Contour (NAVD 88)

- Notes:
1. Aerial Photo, 2005, City of Lebanon, OR
  2. Taxlots, City of Lebanon, OR

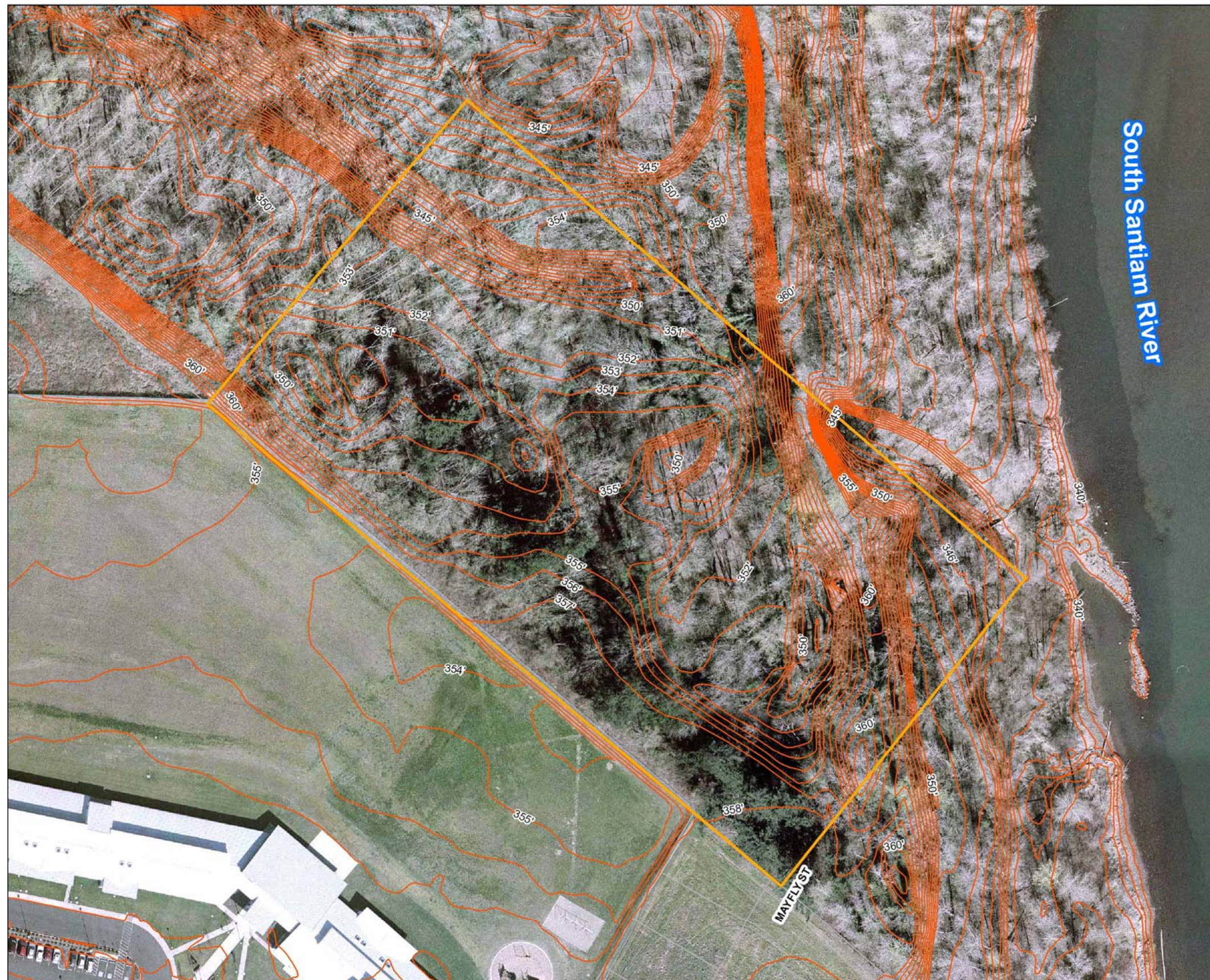


1:1,200

1 Inch = 100 Feet

EXHIBIT 2-3  
 Tree Farm Site  
 City of Lebanon Water Improvement  
 Lebanon, OR





- LEGEND
- Site
  - Taxlot
  - 1 Foot Contour (NAVD 88)

- Notes:
1. Aerial Photo, 2005, City of Lebanon, OR
  2. Taxlots, City of Lebanon, OR



1:1,200

1 Inch = 100 Feet

EXHIBIT 2-4  
 Weyerhaeuser Site  
 City of Lebanon Water Improvement  
 Lebanon, OR



**EXHIBIT 2-5**  
**Water Treatment Plant Site Non-Cost Considerations and Relative Ranking**  
*City of Lebanon Water Improvement*  
*Lebanon, OR*

Site Issue	Qualitative Assessment		
	River Drive	Weyerhaeuser	Tree Farm
Size/Layout	Positive; city can purchase as much property as needed	Positive; city can purchase as much property as needed	Positive; appears to have ample area
Clearing	Neutral; must clear some trees and brush depending on which site is selected along River Drive	Negative; must do extensive clearing of trees and brush to clear site	Positive; half the site is clear, the other half has Christmas trees ready to harvest.
Earthwork	Positive; sites are generally flat	Negative; must do extensive over excavation and fill	Positive; site is generally flat
Access to Utilities (sewer, storm sewer, phone, internet)	Neutral; more remote	Positive; utilities should be available	Positive; closest to utilities in city
Site Access	Positive; River Drive allows truck traffic, direct access to plant,	Negative; truck traffic must travel through residential neighborhood, may require reconstruction of streets.	Neutral; River Drive allows truck traffic direct access to plant, requires improvements to River Drive
Impact on Neighbors (noise, lights, chemical delivery and storage)	Positive; fewest neighbors to be affected	Negative; truck traffic must travel through residential neighborhood, site is next to residents and school	Neutral; more neighbors around site, but good buffer available
Security	Neutral; site is accessible to public, but its visibility from the road may discourage vandalism	Negative; site is secluded and easily accessible from hiking trails	Neutral; site is accessible to public, but its visibility from the road may discourage vandalism
Intake Location and Type	Canal Intake — Positive; connection to canal is close and direct	Canal Intake — Negative; longest distance to canal	Canal Intake — Neutral; canal is close, but must trench/tunnel across River Drive
	River Intake — Positive; connection to river is close and direct; requires trench or tunnel under River Drive.	River Intake — Negative; nearest river access is not well-suited for an intake; design and construction will be more involved	River Intake — Negative; long distance to suitable river site, and requires a trench/tunnel under River Drive
Water Quality	Positive; furthest upstream on canal or river	Positive; water likely to be taken directly from river (with high dilution factor, fewer discharges)	Negative; downstream of some private properties, bridges, and Cheadle Lake
Permitting and Schedule Implications	Negative; site's location outside the UGB makes a conditional use permit necessary	Negative; the additional site work, wetlands and location near school may complicate permitting	Neutral



## Floodplain Limitations and Impacts

Each of the potential sites was assessed with respect to its location in or near a floodplain. In accordance with federal codes (44 CFR 9.4A), a water treatment plant is generally considered a critical facility that must maintain operations during or soon after a flood. Therefore, water treatment plants should be located above the 500-year floodplain or be designed to withstand a 500-year flood.

Research for floodplain issues was conducted using the Federal Emergency Management Agency (FEMA) Issued Flood Insurance Rate Maps and Flood Insurance Study for Linn County, as well as the Code of Federal Regulations (CFR), and Linn County and City of Lebanon Floodplain Codes.

According to the 2008 Lebanon Zoning map, the Tree Farm site is the only site located within the city limits of Lebanon, while the River Drive and Weyerhaeuser sites are located in Linn County.

### FEMA Flood Insurance Rate Maps and Flood Insurance Study

The most current FEMA Flood Insurance Rate Maps (Panel 4101360 380B) and Flood Insurance Study for the sites are located under the Unincorporated Areas of Linn County study which was issued September 29, 1986. The Tree Farm and River Drive sites are located in floodplain Zone B, which are areas between the 100-year and 500-year flood boundary. The Weyerhaeuser site is located in floodplain Zone A10 which is within an area of the 100-year flood. **Exhibit 2-6** summarizes the approximate 100-year and 500-year flood elevations for each site. The table also indicates the finished floor elevation that is 24-inches above the 500-year flood elevation. As discussed in subsequent paragraphs to this floodplain subsection, the 24-inch difference accounts for the code requirement that structural members shall be 18-inches above the design flood elevation and a typical floor slab is 6 inches in thickness.

The probability of the area experiencing a 100-year flood is 26 percent in 30 years and 40 percent in 50 years. The probability of experiencing a 500-year flood is 6 percent in 30 years and 10 percent in 50 years.



## EXHIBIT 2-6

Floodplain Zones and Elevations for Water Treatment Plant Site Alternatives  
*City of Lebanon Water Improvement*  
*Lebanon, OR*

Site	Floodplain Zone	100-yr Flood Elevation NGVD 29 <sup>1</sup> (NAVD 88) <sup>2</sup>	500-yr Flood Elevation NGVD 29 (NAVD 88)	Minimum Finished Floor Elevation at 24-inches Above 500-yr Flood NGVD 29 (NAVD 88)
Tree Farm Site	B	351.0 ft (354.36 ft)	355.0 ft (358.36 ft)	357.0 ft (360.36 ft)
River Drive Site <sup>3</sup>	B	354.5 – 358.5 ft (357.86 – 361.86 ft)	358.0 – 363.0 ft (361.36 – 366.36 ft)	360.0 – 365.0 ft (363.36 – 368.36 ft)
Weyerhaeuser Site	A10	348.5 ft (351.86 ft)	353.0 ft (356.36 ft)	355.0 ft (358.36 ft)

<sup>1</sup> NGVD 29 = National Geodetic Vertical Datum of 1929

<sup>2</sup> NAVD 88 = North American Vertical Datum of 1988

<sup>3</sup> Flood elevation given for the River Drive site is dependent upon lot location. The range provides flood elevation starting from the west boundary of the site and increases to the east boundary.

## Code Requirements

Regulations for new construction in floodplain zones are provided at the national, county, and city levels. The floodplain codes that were reviewed are as follows: Linn County Floodplain Management Code, the City of Lebanon Draft Development Code (October 2008), and Executive Order 11988.

The Linn County Floodplain Management Code (Chapter 870) requires a development permit when development (buildings, filling, grading, excavation) is to occur in an area of special flood hazard. Areas of special flood hazard include areas in Zones A and V (areas within the 100-year floodplain). Structures are required to have the “lowest horizontal structural member of the lowest floor” be elevated at least 18 inches above base flood (100-year flood) elevation. The “lowest horizontal structural member” would generally be interpreted as the bottom elevation of a floor slab, if the construction consists of a slab on grade (which is typical for WTP facilities). If the floor slab for a building or basin is assumed to be 6-inches in thickness, the floor elevation must be set at least 24 inches above the 100-year flood elevation.

In addition, the county code requires that any buried utilities and parts of the structure below the 100-year flood elevation level are to be flood-proofed. The code states that all fill placed at or below the 100-year flood elevation shall be balanced with at least an equal amount of material removed either on site or from an approved nearby area at or below the base flood elevation in the same drainage basin. Therefore, development of the Weyerhaeuser site would require mitigation.

The 2008 Development Code for the City of Lebanon was only available in draft form, and has not yet been adopted by the city. The code has the same restrictions as the Linn County code, and also states, “Where base flood elevations have been provided but floodways have not [been provided] ... the cumulative effect of any proposed development, when combined



with all other existing and anticipated development, shall not increase the water surface elevation of the base flood more than one foot at any point." This regulation only applies to development in areas in the 100-year floodplain. Its intent is to prevent new construction from causing formerly flood-free areas to become flooded.

FEMA's interpretation of Executive Order 11988 (and 44 CFR 9.4 for critical facilities) states "Federal agencies funding and/or permitting critical facilities are required to avoid the 0.2 percent (500-year) floodplain or protect the facilities to the 0.2 percent chance flood level." This regulation is in place so that the facility can continue to function and provide service after a flood. This requirement would be interpreted similar to the one of the Linn County code. The federal code dictates that the lowest horizontal structural member of the lowest floor shall be 18 inches above the 500-year flood elevation. Therefore, the federal floodplain requirement results in the need to construct the bottom elevation of the lowest floor slab 18 inches above the 500-year flood elevation, rather than the 100-year flood elevation as required by the county. For an assumed floor slab thickness of 6 inches, this results in a minimum finished floor elevation that is at least 24-inches above the 500-year flood elevation.

Executive Order 11988 applies to "federalized projects." The definition (or application of the definition) of federalized projects has some ambiguity. The broadest application is that this executive order would apply for projects that include any federal funding (including federal funding that is allocated through state agencies such as the State Revolving Loan Fund) or require any federal permitting such as a Joint 404 Permit or a wetlands permit. In practice, however, there are occasions in which some federal agencies do not invoke Executive Order 11988 on the basis of federal permitting requirements. Assuming the broadest application during the conceptual design phase of the city's project is prudent.

### **Flood Plain Evaluation of Tree Farm Site**

As previously stated, the Tree Farm site is located in the city limits of Lebanon and therefore, the codes and regulations of the City of Lebanon apply. The site is located in Zone B (500-year floodplain), which is not considered to be an area of special flood hazard. However, the use of federal money or the need for federal permits would invoke the need to comply with the 500-year flood elevation requirements of Executive Order 11988.

The site elevations range from approximately 357 to 362 feet (NAVD 88) compared to the 500-year flood elevation of 358.36 feet (NAVD 88) for this area. Using the 24-inch criterion as previously described, the finished floor elevations would need to be at least 360.36 feet. Therefore, the building and basin floor elevations may need to be slightly raised above the natural grade at some locations on the site.

### **Flood Plain Evaluation of River Drive Site**

The River Drive site is located outside of the city limits and urban growth boundary of Lebanon. The Linn County Code applies to this site. It is not considered to be an area of special flood hazard because it is located in Zone B.

There is some question about the accuracy or reliability of the last FEMA mapping effort. When the River Drive area was initially mapped in 1986, the road that separates the South Santiam River from the River Drive properties was most likely considered to act as a levee. Title 44 of the Code of Federal Regulations part 65.10 states that FEMA will only recognize



levee systems that meet the standards and provide a level of protection that is consistent with the criteria found under 44 CFR 60.3. A September 2008 memorandum from the U.S. Department of Transportation states, "Recent FEMA map modernization and levee certification initiatives have revealed that for many years some highway embankments may have been either inadvertently or incorrectly designated as levees or other flood control structures." If and when the area is re-studied, it may be deemed to be in Zone A because the roadway embankment separating the site from the river may not be considered a flood control structure (levee).

The elevations for the properties along River Drive vary from approximately 358 to 362 feet (NGVD 29). Based on the 1986 mapping, the 100-year flood elevation ranges from 354.5 to 358.5 feet (NGVD 29) and the 500-year flood elevation ranges from 358 to 363 feet (NGVD 29) for these properties. Assuming that the existing FEMA mapping may be used, the River Drive properties would not require fill material to raise floor elevations above the natural grade except for minor amounts in the lowest areas.

### **Flood Plain Evaluation of Weyerhaeuser Site**

The Weyerhaeuser site is located outside the city limits of Lebanon, but is within the urban growth boundary of the city. This means that the city may eventually annex the area, but currently Linn County Code applies to this site. A portion of the Weyerhaeuser site is in an area of special flood hazard, floodplain Zone A10. Site elevations range from approximately 343 to 357 feet (NAVD 88) compared to the 100-year flood elevation of 351.86 feet (NAVD 88) and the 500-year flood elevation of 356.36 feet (NAVD 88). Therefore, some of the property is below the 100-year flood elevation and nearly all of the property is below the 500-year flood elevation.

All fill placed in areas below the 100-year floodplain will require compensatory removal of material in other areas within the 100-year floodplain (but above the ordinary river water surface level). Hydrologic analyses will be required to confirm that the improvements combined with the mitigation result in no adverse effect on the base flood elevation. These factors add uncertainty and costs to development of this site.

### **Floodplain Summary**

1. Portions of the Tree Farm and River Drive sites are located within Zone B, the 500-year flood elevation. This may result in the need to slightly elevate some buildings and basins above the natural grade.
2. A significant portion of the Weyerhaeuser site is located within Zone A10, the 100-year flood elevation. The use of this site would require significant mitigation and permitting efforts.
3. Future flood mapping of the River Drive site may place some of this area within the 100-year floodplain because FEMA may not consider the River Drive embankment to provide flood protection.



## Transmission Pipeline Needs

The analysis and findings for the transmission pipeline needs are presented in Section 4, Transmission Pipe Evaluation. The Tree Farm site has the least transmission piping needs and therefore, the lowest cost for this aspect of site development. The piping needs for the Weyerhaeuser property are similar but slightly higher. The costs for piping from the River Drive site to the city's distribution system are significantly higher than for the other two sites.

## Site Costs

**Exhibit 2-7** presents a breakdown of costs for the three site options. Cost categories include property purchase price, frontage road improvements, site work, wetlands mitigation, electrical service upgrades, and transmission pipelines. The costs presented are budget-level, and are relative costs that are presented for comparison and selection among the alternatives. They do not include a contingency. The actual costs will vary depending on market conditions, site-specific findings, the scope of the final design, and other factors. The background for the transmission pipeline cost estimates is presented in Section 4 of this report.

The sum of the costs for the River Drive and the Tree Farm sites are similar and at this level of analysis are considered equal to one another. The actual cost for use of either of these sites could vary substantially depending on property purchase cost, charges from Pacific Power for extending electrical transmission power lines, and other factors. The cost for using the Weyerhaeuser site is substantially greater than the other two sites because of the excavation and fill and wetlands mitigation requirements.

## Recommendations

Regardless of site, setting the finished floor elevations of buildings or basins at least 24 inches above the 500 year flood elevation is recommended.

The recommended site location is either the River Drive site or the Tree Farm site. Both cost and not-cost factors indicate that these two sites are nearly equal and are recommended above the Weyerhaeuser site.

The River Drive and Tree Farm sites have ready access to a canal intake, appear to require minimal site work, and are expected to have nearly equal costs. The Tree Farm site is slightly preferred of the two because more of the site development cost will be invested in making road improvements (turning lane, wider traffic lanes, sidewalks, and drainage) that provide benefits to city residents. The largest portion of the River Drive site cost is devoted to transmission piping which does not provide the same secondary benefits as road improvements. In addition, the longer transmission pipeline needed for the River Drive site results in slightly higher energy costs for pumping.

The Weyerhaeuser site is not recommended because of the significant excavation and fill that will be needed, because it is located within the 100-year floodplain, because access is limited, and because it is located farther from the canal.



**EXHIBIT 2-7**  
**Water Treatment Plant Site Costs**  
*City of Lebanon Water Improvement*  
*Lebanon, OR*

Item	River Drive	Weyerhaeuser	Tree Farm	Explanation
Purchase Price	\$400,000	\$0	\$400,000	Purchase costs are uncertain. Unit costs for Tree Farm and River Drive sites are shown as \$40,000 per acre, but actual cost may be higher or lower. Tree Farm site is approximately 10 acres in size. River Drive may be similar or slightly larger in size depending on lot configuration. Allowance is included for 10 acres. City hoping to make trade of services for Weyerhaeuser property so this property cost is shown as zero.
Frontage Road Improvements	\$0	\$500,000	\$1,200,000	City estimated frontage road improvements at \$1.2 mil for Tree Farm site. River Drive site is outside of the UGB and does not require frontage road improvements. Unknown for Weyerhaeuser--but will require some improvements to allow for access--maybe road to the north so that primary access is not through neighborhood.
Extra Excavation/Preparation	\$0	\$3,200,000	\$0	Weyerhaeuser estimate: over-excavation of 700' x 400' x 3' at \$23/CY = \$700K. Plus fill of 10' over same area at \$25/CY = \$2.5 mil. Total = \$3.2 mil. Tree Farm does not appear to need any extra costs for site work. River Drive property is unknown--will depend on which site(s) is selected.
Wetlands Mitigation	\$82,000	\$410,000	\$82,000	City indicated that unit mitigation cost is \$82,000 per acre. Allowances of the following were included: 1 acre for River Drive and Tree Farm; 5 acres for Weyerhaeuser. Preliminary site plans developed for the Tree Farm site, particularly for the membrane filtration option, indicate that it may be possible to avoid potential wetland areas.
Electrical Power Service	\$400,000	\$400,000	\$400,000	Pacific Power provided estimates of \$360,000-400,000 for transmission line improvements to bring 1,500 kVA, three-phase power to the River Drive and Tree Farm sites (personal communication, December 2008). Their estimate was "very preliminary" and was based on providing approximately 2,700 feet of overhead, three-phase power line together with necessary poles, cross arms, hardware, and permits. Pacific Power indicated that they did not anticipate the need to upgrade substation facilities. Pacific Power did not provide a cost for the Weyerhaeuser site--the same cost has been used in the absence of specific information.
Transmission Pipeline	\$1,750,000	\$990,000	\$770,000	See transmission pipeline chapter of the report.
<b>Total</b>	<b>\$2,600,000</b>	<b>\$5,500,000</b>	<b>\$2,900,000</b>	