means to provide a marketable and renewable resource to the City. This alternative was selected for analysis due to the amount of agricultural land in close proximity to the City of Woodland and to the successful poplar tree planting/harvesting/re-planting recently completed by the Fort James Paper Company just north of the City's industrial park.

In general, the dry season is defined as any time when the ground is not saturated or frozen. The hydraulic loading rate for this alternative would need to be determined through a detailed water balance analysis.

Treated and disinfected effluent must meet Class D Reclaimed Water Standards to be suitable for irrigation of trees or other non-food crops. Class D Reclaimed Water Standards are defined as follows:

> *...at a minimum, is at all times an oxidized, disinfected wastewater. The wastewater shall be considered adequately disinfected if the median number of total coliform organisms in the wastewater after disinfection does not exceed 240 per 100 milliliters, as determined from the bacteriological results of the last 7 days for which analyses have been completed.*

Design criteria and cost analysis for this reuse alternative are presented under the technical analysis of alternatives later in this section.

### *Solids Stabilization*

Solids treatment or stabilization processes are the key to reliable performance of any WWTP. These processes treat the solids generated in the treatment of the water, converting them to a stable product for ultimate utilization or disposal. Solids stabilization also reduces pathogens in the solids, thus producing a safer and less odorous end product. The four most common stabilization processes used in the United States today are: 1) Aerobic Digestion, 2) Anaerobic Digestion, 3) Composting, and 4) Lime Stabilization. Of these four processes, anaerobic digestion is likely the most commonly used process, however, aerobic digestion is typically more common in smaller treatment plants (flows less than 5 MGD). Composting is often used where stabilized solids can be utilized as a soil amendment. Lime stabilization, like aerobic digestion, is most commonly used in smaller treatment facilities. Since the *503 Regulations* were published by EPA in 1993, increasing attention has been focused on a variation of aerobic digestion known as autothermal thermophilic aerobic digestion (ATAD). Brief descriptions of each of the processes are provided below as well as why they were either further evaluated for possible use at Woodland's WWTP, or eliminated from further consideration.

## Aerobic Digestion

Aerobic digestion is a sludge stabilization process in which the biological oxidation of degradable organic solids is accomplished by microorganisms utilizing air. The process is similar to and is often considered a continuation of the activated sludge wastewater treatment process. Aerobic digestion is most commonly utilized in plants with design flows of less than 5 MGD. The operating temperature of an aerobic digestion system greatly affects process performance. One of the major disadvantages of aerobic digestion processes is the change in process efficiency that results from changes in operating temperature. There are three temperature zones of bacterial action that apply to aerobic digestion, they are:

1) Cryophilic zone – liquid temperature is below 10 deg. C (<50 deg. F).
2) Mesophilic zone – liquid temperature is between 10-42 deg. C (50-108 deg. F).
3) Thermophilic zone – liquid temperature is higher than 42 deg. C (>108 deg. F).

Most aerobic digestion systems, including Woodland's existing system, operate within the mesophilic range. Historically aerobic digesters have been designed based mainly on a detention time of 20-30 days. Relative advantages and disadvantages of mesophilic aerobic digestion are listed in Table VII-13.

| Table VII-13<br>Advantages and Disadvantages of Mesophilic Aerobic Digestion | |
|---|---|
| *Advantages* | *Disadvantages* |
| • Relatively lower capital costs<br>• Supernatant less objectionable than anaerobic digestion supernatant<br>• Simple operational control<br>• Low odor potential with proper design/operation<br>• Reduces total solids mass | • High energy costs associated with aeration/mixing equipment<br>• Less VSS reduction than anaerobic digestion<br>• Reduced pH and alkalinity<br>• May experience foaming<br>• Biosolids are typically difficult to dewater by mechanical means<br>• Performance adversely affected by cold temperatures therefore tankage volume is increased to provide adequate detention time. |

Aerobic digestion is the stabilization process currently utilized at the Woodland WWTP, and has historically been utilized by WWTP's with flows similar to Woodland's projected flows. It is considered a viable alternative for the proposed WWTP upgrade if the liquid treatment process is converted to activated sludge utilizing sequencing batch reactors.

## Autothermal Thermophilic Aerobic Digestion (ATAD)

ATAD optimizes, through containment, the heat (energy) released by the biochemical oxidation of organic substances by microorganisms utilizing air, and uses the heat to operate the process in the thermophilic zone of biological activity, (temperatures greater than 42 degrees C). Digestion tanks are typically covered to further increase the amount of heat retained within the system. Some ATAD systems being marketed have received an EPA rating as a Process to Further Reduce Pathogens (PFRP), and are advertised as being able to guarantee Class A final biosolids in regards to pathogen concentrations. These systems may offer significant operational cost advantages over traditional aerobic digester systems (which are only capable of producing Class B final biosolids) due to reduced record keeping requirements associated with Class A biosolids utilization.

Nitrification is normally inhibited at the operating temperatures employed by ATAD systems. This inhibition of nitrification reduces the total oxygen requirement and eliminates pH depression which can occur in standard aerobic digesters due to alkalinity consumption, however, digester supernatant returned to the liquid treatment process can have high concentrations of ammonia which can be detrimental to WWTP performance if this sidestream is not adequately considered during design.

Volatile Suspended Solids (VSS) concentrations in the range of 2.5-5.0 percent are required to provide sufficient energy to maintain the elevated digester operating temperature. This may require thickening of blended primary and secondary sludge prior to feeding to the digester, and will require thickening of waste activated sludge (WAS) if an SBR secondary treatment process is utilized. Digester tankage size requirements are decreased due to the reduction of sludge volumes being fed to the system.

ATAD is a relatively new digestion technology. The first ATAD facility went into service in Germany in 1977. Currently, there are approximately 60 operating ATAD systems in the world. Reported keys to proper ATAD performance include adequate thickening of feed sludge, efficient aeration, sufficient tank insulation, good mixing and foam control, and good odor control. Table VII-14 lists some of the reported advantages and disadvantages of ATAD systems.

**Table VII-14**
**Advantages and Disadvantages of ATAD Systems**

| *Advantages* | *Disadvantages* |
|---|---|
| • Ability to achieve Class A biosolids without external heat supply<br>• Reduced SRT required to achieve a given level of VSS reduction<br>• Good to excellent pathogen inactivation<br>• Process stability | • Lack of long-term operational data<br>• Relatively small number of operating facilities<br>• Requirement for thickening of feed sludge<br>• Serious potential for odor<br>• Odor control equipment required<br>• Requirement for foam control equipment<br>• Requirement for feed sludge and stabilized biosolids storage facilities<br>• High polymer cost for dewatering stabilized biosolids<br>• Potential for high annual O&M costs<br>• Requires skilled operators |

ATAD was eliminated as a viable alternative for the Woodland WWTP due to concerns related to odor, high costs associated with dewatering stabilized biosolids and the relative complexity of process operation.

## Anaerobic Digestion

Anaerobic digestion is a relatively complex process which requires both proper design and careful operation and maintenance. It is one of the most widely utilized processes for stabilizing wastewater treatment plant sludge. Anaerobic digestion has been used for plants having average wastewater flows of less than 1 MGD to more than 200 MGD. Anaerobic digestion is most applicable to WWTP sludges that; 1) have a high concentration of biodegradable organics, 2) are free from any materials present in high enough concentrations to be toxic, and 3) are relatively uniform in characteristics from day to day. Primary sludges are the most easily anaerobically digested and yield the largest amount of methane gas per pound of sludge stabilized. Secondary biological sludges are more difficult to digest, due to less biodegradable material being present, and because of the low suspended solids concentrations and difficulty in thickening above 3 percent without polymer addition. Typical digester feed sludge solids concentrations for anaerobic digestion are 4-6 percent. Volatile solid (VS) loading rates vary between 0.03-0.10 pounds per day per cubic foot of volume (lbs/day-$ft^3$) for standard rate digesters with hydraulic detention times of 30-90 days. VS loading rates for high rate digesters range between 0.10-0.30 lbs/day-$ft^3$ with hydraulic detention times of 10-20 days. Thickening a combination of primary and secondary sludge will be required to achieve a solids concentration in the feed sludge in this range. WAS will also need to be thickened, utilizing polymers, to achieve this range of solids concentration. Thicker feed sludge provides for a longer HRT and minimizes the amount of water which must be heated during the digestion process. Table VII-15 lists advantages and disadvantages of anaerobic digestion.

| Table VII-15<br>Advantages and Disadvantages of Anaerobic Digestion | |
|---|---|
| *Advantages* | *Disadvantages* |
| • VSS destruction between 40-60 percent<br>• Lower operational costs if methane gas produced is utilized for heat exchangers<br>• Stabilized biosolids suitable for agricultural use<br>• Good pathogen reduction<br>• Reduced total biosolids volume<br>• Production of biosolids free of objectionable odors when fully digested<br>• Long term operational data and numerous installations with successful operation<br>• Required cleaning of facilities is infrequent | • Requires skilled operators<br>• May experience foaming<br>• Methane formers are slow growing, i.e., "acid digester" may occur<br>• Recovers slowly from upset<br>• High initial capital cost<br>• Cleaning is difficult (scum & grit)<br>• Supernatant strong in $BOD_5$, COD, TSS & $NH_3$<br>• Potential for mineral deposits in pipelines<br>• Safety issues regarding flammable gas |

If the current liquid treatment process capacity is increased anaerobic digestion is a viable alternative for consideration at the Woodland WWTP for the average design flow of the treatment plant, due to proven reliability of the process and the ability to consistently achieve Class B biosolids. The existing aerobic digester may be able to be utilized as a storage tank for either unstabilized feed sludge or the stabilized biosolids.

## Composting

Composting is the aerobic decomposition by bacteria and fungi of the organic material in dewatered sludge, with the end result being stabilized biosolids. The transformations which occur during composting are irreversible, and therefore a fully stabilized compost product cannot generate objectionable odors, even if wetted or stored for a long time period. Typically composting systems utilize the following steps:

1) Dewatered sludge is mixed with a bulking agent, such as wood chips, to increase porosity, reduce the bulk moisture content, and supply additional carbon.
2) Heat generated by microbial decomposition of sludge solids evaporates excess water and neutralizes many of the pathogens in the sludge.
3) The compost mixture is aerated for 15 to 30 days either by blowers or periodic remixing. This step provides oxygen, controls temperature, and removes water vapor.
4) The bulking agent is recovered by screening for reuse.

5) Compost is cured for an additional time period to complete the stabilization process.

Table VII-16 presents advantages and disadvantages of composting as a stabilization method.

| **Table VII-16<br>Advantages and Disadvantages of Composting** | |
|---|---|
| *Advantages* | *Disadvantages* |
| • High-quality, potentially salable product suitable for agricultural use<br>• Can be combined with other processes<br>• Low initial capital cost for some variations | • Requires 40-60 percent solids<br>• Requires bulking agent<br>• Requires either forced air or turning<br>• May require significant land area<br>• Requires carbon source<br>• Potential for odors associated with incomplete stabilization<br>• Potential for high operational cost – power, labor, and/or chemical |

Due to the requirement for high solids concentrations and a relatively large land area, composting is not a viable alternative for improving Woodland's biosolids stabilization and handling efficiency, and the alternative was eliminated from further consideration.

If the City would like to further consider composting as a solids stabilization method it is recommended that it explore if there is regional interest in a developing a composting facility. A regional facility may be a possibility if communities such as Kalama, Castle Rock, Toutle, and the Longview-Kelso area are interested in the composting stabilization method. A review of a regional facility such as this is beyond the scope of this planning report.

## Lime Stabilization

The effectiveness of lime stabilization depends on maintaining the pH at a high enough level for a sufficient period of time to inactivate the microorganism populations in the sludge. This stops the microbial reactions that can otherwise lead to odor production and vector attraction. Lime stabilization can also inactivate viruses, bacteria, and other microorganisms that are present. Generally, stabilization is achieved if a pH of 12 is maintained for at least 2 hours. The effects of lime stabilization on some of the physical and chemical characteristics of wastewater sludges include:

1) A reduction of the VSS concentration of the sludge by 10-35 percent.
2) An increase in the TSS concentration due to the addition of inert solids and excess lime and the precipitation of dissolved solids.
3) A reduction in the nitrogen content of sludge because of the volatilization of ammonia.
4) An increase in the alkalinity of the sludge.
5) A reduction of the mobility of heavy metals, they are precipitated as hydroxides.

Lime stabilization consists of two main tasks; 1) lime handling, and 2) the mixing of lime and sludge. Lime handling includes receiving, storing, transferring, and delivering lime to a lime and sludge mixing unit. In the mixing unit lime, as either a slurry or in dry form, is added to the sludge.

Lime stabilization is sometimes used as either a backup for existing stabilization facilities, or as an interim stabilization process. This is because lime stabilization can be started or stopped quickly. Table VII-17 lists advantages and disadvantages of lime stabilization methods.

**Table VII-17**
**Advantages and Disadvantages of Lime Stabilization**

| *Advantages* | *Disadvantages* |
|---|---|
| • Low capital cost<br>• Fairly easy operation<br>• Good as emergency or interim stabilization method | • Chemical intensive<br>• Volume of biosolids to be disposed of is increased<br>• Drop in pH after treatment can lead to odors and biological growth |

Lime stabilization is not a viable alternative for the City of Woodland due to the increased amount of solids the process would generate, and because there are no other lime stabilization facilities in close proximity to Woodland.

## *Solids Thickening*

With aerobic and anaerobic digestion being the two solids treatment processes that will be evaluated further, thickening of the feed sludge will be required prior to the sludge entering the digester facility. Common thickening processes utilized by WWTP's treating flows in the range of Woodland's design flows are: 1) Gravity Thickening, 2) Gravity Belt Thickening, 3) Rotary Drum Thickening, and 4) Centrifugal Thickening. Of these four processes, the last three are mechanical. Gravity belt thickening (GBT) and rotating drum thickening (RDT) require the use of polymers, while centrifugal thickening often utilizes polymers. Brief descriptions of each of the processes are provided below as well as why they were either further evaluated for possible use at Woodland's WWTP or eliminated from further consideration.

## Gravity Thickening

If the secondary treatment process continues to utilize both primary and secondary clarifiers, gravity thickening is an acceptable option for further thickening of the digester feed sludge. In gravity thickening the sludge is concentrated by gravity induced settling and compaction of sludge solids. The process is very similar to that used in sedimentation/clarification basins. Gravity thickening provides two benefits: 1) solids concentration and 2) equalization and storage of sludges, which improve performance of subsequent processes. Advantages and disadvantages of gravity thickening are summarized in Table VII-18.

**Table VII-18**
**Advantages and Disadvantages of Gravity Thickening**

| *Advantages* | *Disadvantages* |
|---|---|
| • Simple operational theory<br>• Low operating cost<br>• Low operator attention required<br>• Provides some storage as well as thickening<br>• Conditioning chemicals not required<br>• Minimal power requirements | • Odor potential |

Gravity thickening is a viable alternative for consideration at the Woodland WWTP if the wastewater treatment process continues to utilize primary clarification, due to the relatively simple operation and satisfactory performance at numerous WWTP's on blended primary/secondary sludges. The existing aerobic digester may be able to be converted to serve as a gravity thickener basin. If it is not suitable as a thickener basin it may be utilized as a storage tank for either unstabilized feed sludge or the stabilized biosolids.

The form of aerobic digestion examined in conjunction with an SBR treatment process utilizes a gravity thickener and a pre-mix basin as part of a closed loop flow scheme with the digestion basins.

## Gravity Belt Thickening

In GBT the solids concentration of a sludge increases as its free water drains by gravity through a porous horizontal belt. Successful GBT requires chemical conditioning, typically using a polymer. GBT is particularly suitable for thickening of WAS prior to further processing and for thickening stabilized biosolids before transportation for utilization/disposal. WAS sludge can typically be thickened to solids concentrations of 4-8 percent. Increased operator attention is required with GBT when compared to gravity thickening due to the addition of a polymer and the mechanized equipment utilized in the process. Table VII-19 shows advantages and disadvantages of the GBT process.

**Table VII-19**
**Advantages and Disadvantages of Gravity Belt Thickeners**

| *Advantages* | *Disadvantages* |
|---|---|
| • Space requirements<br>• Control capability for process performance<br>• Relatively low capital cost<br>• Relatively low power consumption<br>• High solids capture & minimum polymer application<br>• High thickened solids concentrations | • Maintenance requirements<br>• Polymer dependent<br>• Moderate operator attention required<br>• Odor potential |

GBT is an alternative that may fit well for the Woodland WWTP capacity expansion, particularly for thickening/dewatering of stabilized biosolids prior to utilization.

## Rotary Drum Thickening

RDT units operate in a manner similar to GBT units in that free water from a sludge drains through a porous media with sludge solids being retained on the media, and chemical/polymer conditioning of feed sludge is required to induce thickening. Typical RDT's utilize a rotating drum with wedge wires, perforations, stainless steel or polyester fabric as the porous media. An RDT typically rotates at 5-20 revolutions per minute (rpm) using a variable-speed drive unit. Washwater periodically flushes the inside and outside of the drum to clear the screen openings of solids. The success of RDT units in thickening WAS is variable and highly dependent on actual sludge characteristics. The potential of high conditioning chemical/polymer requirements can be a concern in RDT thickening due to floc sensitivity and shear potential in the rotating drum. Relative advantages and disadvantages of RDT's are presented in Table VII-20.

**Table VII-20**
**Advantages and Disadvantages of Rotary Drum Thickening**

| *Advantages* | *Disadvantages* |
|---|---|
| • Space requirements<br>• Low capital cost<br>• Relatively low power consumption<br>• High solids capture | • Polymer dependent<br>• Sensitivity to polymer type<br>• Housekeeping<br>• Moderate operator attention required<br>• Odor potential |

RDT was eliminated from further consideration for the Woodland WWTP due to the sensitivity of the process to polymer type and due to the documented variability in thickening municipal WAS.

## Centrifugal Thickening

Separation of the liquid-solid slurry in a centrifuge is similar to a gravity thickener, however, the applied force is centrifugal rather than gravitational and is typically between 500-3,000 times the force of gravity. Centrifuges are commonly utilized in thickening WAS. They can also be utilized to reduce the volume of stabilized biosolids to minimize costs associated with transportation for final utilization. Solid bowl conveyor centrifuge technology is most often utilized and has proven to be widely successful. As with GBT and RDT methods of thickening chemical/polymer conditioning is typically utilized with centrifuges to provide better solids capture efficiencies. It is recommended that effective degritting, screening or grinding equipment precede the centrifuge to avoid plugging problems and excessive wear. WWTP's with centrifuge thickeners generally have degritting or screening equipment prior to the headworks of the treatment plant. Due to relatively high equipment capital costs and sophistication, centrifuges are most commonly found in medium to large WWTP's (plants with design flows of 2 MGD or greater). Advantages and disadvantages of centrifugal thickening are presented in Table VII-21.

**Table VII-21**
**Advantages and Disadvantages of Centrifugal Thickening**

| *Advantages* | *Disadvantages* |
|---|---|
| • Space requirements<br>• Control capability for process control<br>• Effective for WAS<br>• Contained process minimizes housekeeping and odor considerations<br>• High thickened solids concentration | • Relatively high capital cost and power consumption<br>• Sophisticated maintenance requirements<br>• Best suited for continuous operation<br>• Moderate operator attention required |

Centrifugal thickening was eliminated from further consideration as a viable alternative for the Woodland WWTP based on: 1)higher estimated capital and annual operation and maintenance costs; 2)more sophisticated operation and maintenance requirements of centrifugal thickening compared to GBT; and 3)the intermittent wasting of sludge associated with the various treatment processes being reviewed for Woodland.

***Stabilized Biosolids Utilization/Disposal***

Utilization alternatives evaluated for Woodland's stabilized biosolids are all land application alternatives. Land application is defined as any beneficial use pertaining to the application of biosolids to land. These include application of biosolids on tree farms, pasture land, and agricultural land, as well as, application of biosolids in large quantities to aid in reclaiming land such as old mining sites. The *503 Regulations* control the type of application practice which can be practiced based on ten pollutant concentrations and the level of pathogen reduction achieved and documented during stabilization. Biosolids that meet both "clean" biosolid and Class A biosolid requirements can be land applied to any type of approved site without restriction. Biosolids that meet "clean" biosolid and Class B biosolid requirements have site restrictions to limit or omit human contact with the biosolids for a predetermined period of time.

The City of Woodland currently utilizes land application for beneficial reuse of stabilized biosolids. While Class B biosolids contain site restrictions, application to forest land and non-food cropland will continue to be a viable beneficial use alternative. Land application will also be a beneficial reuse if Class A biosolids are produced. It is therefore recommended that the City of Woodland continue to utilize stabilized biosolids in liquid form for land application at permitted sites at proper agronomic nitrogen rates.

## EVALUATION OF TREATMENT ALTERNATIVES

### *WWTP Design Criteria*

Ultimate design criteria, developed in Section V of this report, is summarized in Table VII-22.

**Table VII-22**
**Summary of Ultimate WWTP Design Criteria (Phase II)**

| *Design Criteria* | *Design Value* |
|---|---|
| Year 2023 Population | 12,089 |
| Average Dry Weather Flow (105 gpcd) | 1.28 MGD |
| Average Wet Weather Flow (126 gpcd) | 1.52 MGD |
| Maximum Month Flow (165 gpcd) | 2.0 MGD |
| Peak Day Flow (265 gpcd)[1] | 3.2 MGD |
| $90^{th}$ Percentile Influent BOD5 Concentration | 291 mg/l[2] |
| Influent $BOD_5$ Wasteload | 3,107 lbs/day[3] |
| Influent $BOD_5$ Wasteload per Person | 0.257 lbs/day-capita |
| $90^{th}$ Percentile Influent TSS Concentration | 296 mg/l[2] |
| Influent TSS Wasteload | 3,160 lbs/day[3] |
| Influent TSS Wasteload per Person | 0.261lbs/day-capita |

1: Peak Day Flow based on a Peaking Factor of 2.5 applied to Ave. Dry Weather Flow
2: Influent $BOD_5$ & TSS concentrations are based on the City successfully reducing loads from high strength dischargers.
3: Influent Wasteloads calculated using Ave. Dry Weather Flow

The City of Woodland has determined that the WWTP capacity required for the 25 year planning period should be constructed utilizing a phased approach. The first phase will consist of providing adequate capacity for approximately a 10 year period at which time the second phase will be implemented to provide the community with capacity through the year 2023. As shown in Table VII-22, the 2023 projected Maximum Month Flow (MMF) is 2.0 MGD, and the projected PDF is 3.2 MGD. The projections are based on an estimated 2023 population of 12,089 people as discussed in Section V of this report.

Current plant capacity is 0.48 MGD (AWWF) and 1.2 MGD (PDF). It is recommended that WWTP capacity be increased during the Phase I expansion to provide for an MMF of 1.0 MGD and a PDF of 1.6 MGD. This will provide adequate capacity to serve the City through the year 2009 based on an annual growth rate of 5%. In 2009, the Phase II capacity expansion to provide adequate capacity for a MMF of 2.0 MGD and a PDF of 3.2 MGD will need to be completed if growth occurs as projected. This will provide adequate capacity for an ultimate population of 12,089 people. At a 5% annual growth rate this will provide the City with adequate WWTP capacity through the year 2023. The recommended capacity increases will allow WWTP capacity to be doubled, in terms of MMF, during each expansion through the construction of modular treatment units. This may allow the existing treatment units to remain in use and minimize the cost associated with both the Phase I and Phase II expansions. Table VII-23 shows the Phase I upgrade design criteria based on existing influent wastewater characteristics.

**Table VII-23**
**Summary of Phase I WWTP Design Criteria**

| *Design Criteria* | *Design Value* |
|---|---|
| Year 2009 Population | 6,111 |
| Average Dry Weather Flow (105 gpcd) | 0.64 MGD |
| Average Wet Weather Flow (126 gpcd) | 0.77 MGD |
| Maximum Month Flow (165 gpcd) | 1.01 MGD |
| Peak Day Flow (265 gpcd)[1] | 1.62 MGD |
| 90th Percentile Influent BOD5 Concentration | 372 mg/l[2] |
| Influent $BOD_5$ Wasteload | 1,986 lbs/day[3] |
| Influent $BOD_5$ Wasteload per Person | 0.325 lbs/day-capita |
| 90th Percentile Influent TSS Concentration | 388 mg/l[2] |
| Influent TSS Wasteload | 2,071 lbs/day[3] |
| Influent TSS Wasteload per Person | 0.339 lbs/day-capita |

1: Peak Day Flow based on a Peaking Factor of 2.5 applied to Ave. Dry Weather Flow
2: 90th percentile $BOD_5$ & TSS concentrations are for all data between July 1996 through June 1998.
3: Influent Wasteloads calculated using Ave. Dry Weather Flow

*WWTP Siting*

Due to the relatively small land area available at the existing WWTP site for expansion, and the proximity of the WWTP to both I-5 and the City's business district, the Woodland City Council directed Gibbs & Olson to review alternative locations to determine if moving the WWTP to a new site is feasible. Two alternative sites were evaluated as part of this planning effort. Both of these sites are shown on Figure VII-2.

The first alternative site is located south of Horseshoe Lake and Pinkerton Drive. The City requested that this site be evaluated as a potential WWTP site. There is approximately 3.6 acres of private property that is currently undeveloped. Several developed residential lots are located to the west of the proposed site. The dike which provides flood protection from the Lewis River is constructed through the center of the property and runs generally in a north-south direction. In addition, a portion of the I-5 freeway right-of-way is immediately adjacent to the subject property. Figure VII-2 identifies this site as Alternative WWTP Site No. 1 and shows the location of the site. Approximate dimensions of the usable property located within the dike sideslope are 100 feet by 440 feet, or one acre of usable ground. This is less than what will be necessary to construct a WWTP with an ultimate capacity of 2.0 MGD. Due to the lack of land and potential complaints from adjacent residences this site was eliminated from further consideration as a feasible site for a new WWTP.

The second alternative area for siting a new WWTP evaluated as part of this study is the area along Caples Road which runs west of the City to the Columbia River. One alternative reviewed was construction of a new WWTP adjacent to the Columbia River. There is good access to the property adjacent to Caples Road and the river, however, all of the property is currently owned by private interests. Construction of a WWTP in this general area would provide the City with the opportunity to discharge treated effluent to the Columbia River rather than the North Fork of the Lewis River.