Wastewater Treatment Facility Value Analysis Study Final Report

Prepared for

City of Sutherlin

October 20, 2014

Value Management Consulting

Bremmer Consulting LLC

Final Report for Wastewater Treatment Facility Improvements Value Analysis Study

COVER LETTER

To: City of Sutherlin
Community Development Department
126 East Central Avenue
Sutherlin, OR 97479

Attn.: Attn: Vicki Luther, Community Development Director

Date: October 20, 2014

Re: Final Report for Wastewater Treatment Facility Improvements Value Analysis Study

Dear Vicki,

Enclosed in this single PDF is the entire final report, including value proposals and all other appendixes. It also includes the Disposition of Value Study Team Proposals and Design Suggestions in Appendix I.

On behalf of Anna and myself, we wish the City a successful project and hope that this VA effort will help the project move forward. We are happy that the City may be able to use a number of the team's ideas. Please be sure to let me know how things evolve on the project and how implementation of the ideas progresses.

Also, thank you so much for all of your support on this study and thanks again for your hospitality and cooperation with the study while we were in Sutherlin!

Sincerely,

Michael R. Morrison

Michael R. Morrison, CCP, FAACEI,
Founder and President

Contents

Glossary[1]

Average Dry Weather Flow (ADWF)—The average flow measured during a dry weather season, usually May 1 to October 31, and during low groundwater levels that occur on a daily basis. During periods of little or no precipitation, wastewater flow is composed primarily of sanitary sewage and commercial and/or industrial wastes. Base infiltration may be present.

Average Wet Weather Flow (AWWF)—The average flow measured during the wet season, usually November 1 to April 30. This value may be utilized as a basis for higher winter mass load limits.

Base Infiltration—Water that enters the sewage system from the surrounding soil during periods of low groundwater levels.

Biochemical Oxygen Demand (BOD)—A measure of wastewater strength in terms of the quantity of oxygen required for biological oxidation of the organic matter contained in wastewater. The BOD loading imposed on a treatment plant influences both the type and degree of treatment, which must be provided to produce the required effluent quality. All references to BOD in this report are with respect to five-day BOD and 20° Celsius.

BOD—biochemical oxygen demand

Comminutor—The terms "sewage Grinder" and "communitor" are two terms for a device used for reducing the size of sewage solids.

CCP—Certified Cost Professional

Class A recycled water—For a comprehensive definition, please see DEQ Regulations for Recycled Water, immediately before the Study Timing, Focus, and Goals section in this report.

Class B recycled water— For a comprehensive definition, please see DEQ Regulations for Recycled Water, immediately before the Study Timing, Focus, and Goals section in this report.

Class C recycled water—For a comprehensive definition, please see DEQ Regulations for Recycled Water, immediately before the Study Timing, Focus, and Goals section in this report.

CVS®—Certified Value Specialist = The Highest Level of Certification Attainable Through SAVE International®. Designation is reserved for value specialists and value program managers who have demonstrated expert-level experience and knowledge in the practice of the value methodology.[2]

DEQ—Oregon Department of Environmental Quality.

Discharge Monitoring Report (DMR)—The standard form required by the DEQ for the recording and reporting of influent and effluent volumes and characteristics along with other data pertaining to the wastewater system.

EPA—U.S. Environmental Protection Agency

Excessive Infiltration and Inflow (I/I)—The portion of infiltration and/or inflow which can be removed from the sewage system through rehabilitation at less cost than continuing to transport or treat that portion of I/I.

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[1] Edits and Significant Additions Have Been Made to the Glossary from City of Sutherlin Wastewater Facilities Plan Amendment Draft, October 2013—The Dyer Partnership Engineers & Planners, Inc.
[2] SAVE International® Value Standard, pp. 28 and 31

FAACEI—Fellow of the Association for the Advancement of Cost Engineering, International

Headworks—Any structure at the head or diversion point of a waterway. It is smaller than a barrage and is used to divert water from a river into a canal or from a large canal into a smaller canal.[3]

ILO—in lieu of

Industrial Waste—Waterborne waste produced as the result of manufacturing or processing operations.

Infiltration—Water that enters the sewage system from the surrounding soil. Common points of entry include broken pipe and defective joints in pipe and manhole walls. Although generally limited to sewers laid below the normal groundwater level, infiltration also occurs as a result of rain or irrigation water soaking into the ground and entering mains, manholes, and even shallow house sewer laterals with defective joints or other faults.

Inflow—Water that enters the sewage system from surface runoff. Inflow may enter the sewer system through manhole covers, exposed broken pipes and defective pipe joints, cross connections between storm sewers and sanitary sewers, and illegal connections of roof and area drains.

Maximum Monthly Dry Weather Flow (MMDWF)—The monthly average flow that has only twenty-percent probability of being experienced during May to October in any given year. In other words, this flow represents the wettest dry weather season monthly average flow that is anticipated to have a five-year recurrence interval. For western Oregon, May is usually the month, which has the highest dry weather flow.

Maximum Monthly Wet Weather Flow (MMWWF)—The monthly average flow that has only twenty-percent probability of being experienced during November to April in any given year. This flow represents the wettest wet season monthly average flow that is anticipated to have a five-year recurrence interval. For western Oregon, January is usually the month that has the highest wet weather flow.

mg/l—milligrams per liter

MLSS—mixed liquor suspended solids: the concentration of suspended solids, in an aeration tank during the activated sludge process.[4]

NPDES—EPA's National Pollutant Discharge Elimination System

NTU—nephelometric turbidity units

Parshall flume—A fixed hydraulic structure used in measuring volumetric flow rate in surface water, wastewater treatment plant, and industrial discharge applications. The Parshall flume accelerates flow though a contraction of both the parallel sidewalls and a drop in the floor at the flume throat. Under free-flow conditions the depth of water at specified location upstream of the flume throat can be converted to a rate of flow.[5]

Peak Instantaneous Flow (PIF)—The highest hourly flow measured during wet weather. The addition of increased I/I during periods of high groundwater levels and rainfall may produce flows several times greater than the ADWF. This value determines the hydraulic capacity of major process units, sewers, channels, and pumps.

Rain Induced Infiltration—The portion of infiltration due to leakage of percolating rainwater into collection system defects that lie near the ground surface.

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[3] Wikipedia: http://en.wikipedia.org/wiki/Headworks
[4] Wikipedia: http://en.wikipedia.org/wiki/Mixed_liquor_suspended_solids
[5] Wikipedia: http://en.wikipedia.org/wiki/Parshall_flume

Residual—The amount of chlorine, expressed in mg/l left in treated effluent at discharge.

SBR—Sequencing Batch Reactor: An industrial processing tank for the treatment of wastewater. SBRs treat wastewater such as sewage or output from anaerobic digesters in batches. Oxygen is bubbled through the wastewater to reduce biochemical oxygen demand (BOD) and chemical oxygen demand (COD), which makes the effluent suitable for discharge to surface waters or for use on land.[6]

Sanitary Sewage—Waterborne wastes principally derived from the sanitary conveniences of residences, business establishments, and institutions.

SAVE International®—The professional organization that maintains value methodology (VM) standards and oversees professional certification in VM. Additional information can be found at http://www.value-eng.org/.

TMDL—total maximum daily load limitations

Total Suspended Solids (TSS)—A measure of the quantity of suspended material contained in the wastewater. The quantity of TSS removed during treatment influences the sizing of sludge handling and disposal processes, as well as the effectiveness of disinfection with chlorine.

VA—Value Analysis = The application of value methodology to an existing project, product, or service to achieve value improvement.[7]

VE—Value Engineering = "The application of a value methodology to a planned or conceptual project or service to achieve value improvement."[8]

VM—Value Methodology = "A systematic process used by a multidisciplinary team to improve the value of projects through the analysis of functions."[9] It follows the SAVE International® Job Plan, consisting of six steps followed sequentially in the following order.

1. Information
2. Function Analysis
3. Creativity
4. Evaluation
5. Development
6. Presentation

WAS—Waste Activated Sludge

Wastewater—The total fluid flow in a sewerage system. Wastewater may include sanitary sewage, industrial wastes, and I/I.

[6] Wikipedia: http://en.wikipedia.org/wiki/Sequencing_batch_reactor
[7] SAVE International® Value Standard, 2007 Edition, p. 31
[8] SAVE International® Value Standard, 2007 Edition, p. 31
[9] SAVE International® Value Standard, 2007 Edition, p. 31

Executive Summary

VA Study Goals, Objectives, Methodology, and Results

VA Study Goals and Objectives

The VA study team's objective was to develop recommendations that support the City of Sutherlin and The Dyer Partnership Engineers & Planners, Inc. in making informed decisions that will yield the best value for the project. The value analysis (VA) study identified alternate ways to effectively treat wastewater in accordance with current DEQ, NPDES, and TMDL requirements as compared to the baseline described in the Facilities Plan Amendment[10]

Goals

The primary goal of the VA study is to help the project move forward.

Objectives

- Evaluate preliminary treatment, secondary treatment, bio-solids treatment, effluent disposal, treatment alternatives, and disinfection options.
- Provide constructive input and feedback on these items and coordinate with the City to create evaluation criteria that can be based on factors such as impacts to neighbors, cost, land use, expandability, flexibility with respect to winter and summer flows (based on inflow and infiltration), etc.
- Review requirements of current MAO and NPDES permit.
- Evaluate and/or recommend other treatment recommendations or treatment plant expansion/upgrades.
- Evaluate and/or recommend energy efficient options that may provide savings over the life of the project.
- Compare pros and cons of Class A vs. Class B level of recycled water.
- Provide the Sutherlin City Council with sufficient detail of the VA team's proposed ideas such that it can make informed decisions and confidently select options that are the best for the city in order to move the project forward.

Value Methodology

The VA team followed SAVE International's value methodology—using the SAVE Job Plan, which includes six steps of analysis. The SAVE methodology is covered in detail throughout the VA Study Activities section of this report.

[10] City of Sutherlin Wastewater Facilities Plan Amendment Draft, October 2013—The Dyer Partnership Engineers & Planners, Inc.

Value Study Results

Creative Ideas

The VA study team **generated 131 creative ideas, and developed 6 value proposals and 9 design suggestions** to improve the project.

A list of all of the creative ideas generated is included in Appendix F—Performance-Criteria-Based Evaluation of Creative Ideas.

Value Proposals

Six of the creative ideas that best met performance criteria established for the project were selected for development into **value proposals** that range from $297,000 to $887,000 and **average $522,800 in cost savings**. The balance of enhancing project performance while saving money is the foundation of the value methodology. Please see the Value Proposals section in the main body of this report as well as the detailed analysis for each in Appendix A.

Design Suggestions

Nine of the creative ideas that best met performance criteria, and which the VA team felt were ideas the design team may want to consider as the design moves forward, were developed into design suggestions.

Overall Options Presented

Key Finding: The City of Sutherlin can produce Class A recycled water. With class A, not as much chlorine required to achieve regulations. To achieve disinfection, this can reduce a $1.6 million capital cost to realize $300,000 in total life-cycle cost savings.

Option 1. Flow Management: This option would take 9 million gallons per day (MGD) through plant; 4 MGD to secondary system, and 4 MGD to UV, such that it is sized for 5 MGD per day, which prevents over-dilution. When flows are greater than 5 MGD, effluent that will meet NPDES for TSS and coliform. The concept of splitting the flow after primary treatment is discussed further within specific options shown in Value Proposals in Appendix A.

Option 2: Primary Treatment Using the Center of the Existing Donuts as Secondary Clarifiers: This option uses secondary clarifiers in lieu of a new filter system. This option provides acceptable digestion capacity. In summer, hypochlorite must be used to disinfect and what doesn't go to the golf course must be stored at Fords pond. In November, you can discharge from the pond to the river per baseline (a good approach). There are other options that are presented in detail as shown in Value Proposals in Appendix A.

Disposition of Value Study Team Proposals and Design Suggestions

The following table is included in Appendix I.

On October 2, 2014 city staff reviewed proposals from the value analysis. Steve Major of The Dyer Partnership Engineers & Planners, Inc. and Jon Gasik of DEQ were present. The following findings are listed.

Idea Number	Title	Disposition	Reason/Comment
GB-03	Use Existing Donuts for Sequencing Batch Reactor (SBR) with Peak-Flow Wet Weather Treatment	Reject	Existing clarifiers would need to be reconstructed to meet the minimal depth of 18'.
GB-05	Use Two New SBRs With Peak Wet Weather Flow Treatment to Reduce From Four Trains to Two	Reject	Only allowed when using existing Treatment Facility.
GB-11	Convert Donut Clarifiers to Primary Clarifiers for Treatment Prior to the New SBRs	Reject	Missing pump station that would pump effluent from primary clarifiers to SBRs. Cost is estimated at $382,000.00. Also there would cost resulting from primary sludge and issues with odors.
RD-03	Add Submersible Pumps to Pump to the New Screening Facility Following the Pump Station	Reject	Current vault not deep enough; would need to construct a new wet well.
RT-01	Accept Class C Reuse Without Using Filters	Reject	Not cost-effective to go with Class C recycled water. Umpqua Golf Resort and Fords Pond would require controlled access, which means both pieces of property would need to have a 6' cyclone fence. Ford's Pond is estimated at $522,000.00 and the golf course is estimated at $830,000.
RT-02	Accept Class B Reuse Without Using Filters	Reject	Not cost-effective to go with Class B recycled water. Umpqua Golf Resort and Ford's Pond would require controlled access, which means both pieces of property would need to have a 6' cyclone fence. Ford's Pond is estimated at $522,000.00 and the golf course is estimated at $830,000. Also Class B requires a 10-acre reliability pond estimated at $300,000.
DW-04	Use Sodium Hypochlorite for Summer Disinfection and UV for Winter Disinfection	Accept	Will be considered in design.
M-01	Retain Geotechnical Engineer to Analyze Site Soils	Accept	
M-02	Monitor Peiziometric Levels on the Site During Dry Weather and Wet Weather	Accept	
M-06	Use Independent SCADA System Integrator That is a Direct and Prequalified Contractor with the City [ILO of a Subcontractor]	[Accept]	Will consider.

Idea Number	Title	Disposition	Reason/Comment
M-10	Investigate Securing a Temporary Lease Adjacent to the Plant for Staging Area	Accept	
M-08	Utilize Dispatchable Power to Make the Auxiliary Generator Part of the Electric Utility Provider Incentive Program.	Accept	Will discuss with Douglas Electric.
TS-17	Compost Class A Solids with Yard Debris	Reject	Expense and lack of land for storage.
RD-01	Put Screens in Existing Channels	Accept With Modifications	Add manual bar screens behind each mechanical screens.

Conclusion

Class A discharge at less money is possible through the ideas being proposed by the VA team.

Pros and Cons of Class A, B, and C Recycled Wastewater

Please refer to the section including DEQ Regulations for Recycled Water[11], which can be found on pages 11–15 of this report. Based on these regulations and the Teleconference re: Clarifying DEQ Requirements for the Facility, (notated on pages 10–11), the VA team has prepared the following list of pros and cons to aid the City of Sutherlin in choosing its strategy to target Class A, B, or C recycled wastewater.

Class A Recycled Wastewater

Pros	Cons
Can water golf course without use restrictions	Requires filtration
Unrestricted access to Fords Pond will provide recreational opportunities for the facility.	Requires careful monitoring of water quality
Popeye's Girlfriend Olive Orchard can use without restriction	
Provides for the greatest number of opportunities to expand reclaimed wastewater program to new users due to the unrestricted access.	
Reclaimed water can replace potable water uses lowering the stress during peak use periods of the potable water system.	

Class B Recycled Wastewater

Pros	Cons
No investment in filtration required.	Requires additional chemicals for disinfection
	Requires careful monitoring of water quality
	Public must be restricted from direct contact with recycled water at golf course.
	Must restrict access to Fords Pond
	Olive Orchard cannot use recycled water from Fords Pond
	Minimizes potential for future uses due to restricted access requirements

Class C Recycled Wastewater

Pros	Cons
No investment in filtration required	Requires additional chemicals for disinfection
	Requires careful monitoring of water quality
	Public must be restricted form direct contact with recycled water at golf course
	Must restrict access to Fords Pond
	Olive Orchard cannot use recycled water from Fords Pond
	Minimizes potential for future uses due to restricted access requirements

[11] DEQ Regulations for Recycled Water: http://arcweb.sos.state.or.us/pages/rules/oars_300/oar_340/340_055.html

VA Study Overview

A VA study sponsored by the City of Sutherlin was conducted for the Wastewater Treatment Facility to be constructed in Sutherlin, Oregon. The study included a four-day workshop from August 19–August 22, 2014 and a site visit on August 19, 2014. The VA study was co-facilitated by Mike Morrison, CCP, FAACEI of Value Management Consulting, Inc. and Anna M. Bremmer, CVS, LEED AP of Bremmer Consulting LLC.

This report documents the results of the study and includes an overview of the project, key findings, and a detailed description of what was accomplished during the study.

Strategic Project Considerations

Purpose and Need[12]

Background

The City of Sutherlin's wastewater system was originally constructed in 1956 for a design population of 3,500 people. Prior to this time, treatment consisted of individual septic tank and drain field systems. Percolation rates are poor in the Sutherlin area of the Umpqua Valley due to the preponderance of heavy clays, shale, and rock. Due to population growth, it was necessary to construct a new wastewater treatment facility in 1977, which is located near the intersection of Highway 138 and Stearns Lane. It consists of an activated sludge process operated in contact stabilization mode.

Regulatory Compliance Issues

The wastewater treatment plant provides secondary level treatment. During the wet weather season plant effluent is discharged to Calapooya Creek. During the dry season plant effluent is recycled and land-applied. Many basic components of the wastewater system have reached the end of their design life. The condition of the plant is such that it is not possible to meet current U.S. Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) limits, particularly with regard to total maximum daily load limitations (TMDL). In addition, during dry periods, effluent is irrigated (recycled) on the Umpqua Golf Resort. At times the land application exceeds the capacity of the golf course greens and surface runoff occurs.

Although the design population for the plant was theoretically sized for 8,000 users, inflow and infiltration (I/I), more stringent regulatory requirements, and age of the facility have led to treatment facility deficiencies. These deficiencies exist for each major element of the treatment process, including the headworks, secondary treatment units, biosolids treatment and disposal, and effluent reuse. The city entered into a Mutual Agreement and Order (MAO) with Oregon Department of Environmental Quality (DEQ) on June 13, 2004 to set a schedule and interim compliance standards while the city worked to resolve the compliance issues. Specified compliance issues include failure of wastewater effluent to meet Class A reuse regulations and the discharge of recycled water from the golf course to Cook Creek.

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[12] Purpose and Need Edited and Based upon Sections ES.1 Background and Purpose, ES.2 Population and Flow Projections, ES.3 Collection System, ES.4 Treatment System, and WWTP Condition from City of Sutherlin Wastewater Facilities Plan Amendment Draft, October 2013—The Dyer Partnership Engineers & Planners, Inc. The text included herein does not include the entire Executive Summary and is furnished for readers of the VA study for background information only. For additional information, please refer to the Facilities Plan.

Improvements and Additional Restriction-Related Delays

Since the beginning of work on the Wastewater Facilities Plan (WWFP), the city has completed a series of significant collection system improvements and has reduced the infiltration and inflow into the collection system. Mid-way through the plan, which began in 2004, DEQ delayed the plan until it completed a study of the effluent outfall into Calapooya Creek. This study led to further restrictions for effluent discharge from May through October [2004], which will require significant storage volume of treated effluent until stream flows reach minimum flow levels.

Meeting Future Demand and Regulations

The City of Sutherlin has experienced relatively steady growth since it originally constructed the Wastewater Treatment Facility for the community. Sutherlin's location in the I-5 corridor, and available industrial and commercial lands lends itself to a steady population growth over the next 25 years.

The State of Oregon's 303(d) list for 2006 for water quality limited waters shows Calapooya Creek as Water Quality Limited (WQL). The Umpqua Basin TMDL was issued on October 31, 2006 and approved by the EPA on April 12, 2007. There is general consensus among stakeholders that TMDL requirements for Sutherlin's level of effluent phosphorus concentrations cannot be met with any practical method or technology other than storage or additional reuse areas. The effluent phosphorus level as required by the TMDL is zero between May through October, with conditional discharge in October based upon the minimum stream flow requirement.

Wastewater planning is for a 20-year period from the expected project completion date. The WWTP is beyond its design life and the treatment capacity for biosolids is inadequate. This is partly due to rules that have changed during the 1990s and to recent changes in the regulatory environment.

[The Facilities Plan] addressed the inability of the existing wastewater system to effectively treat wastewater in accordance with current NPDES and TMDL requirements, and the improvements that are necessary to meet the specified requirements. Wastewater planning is for a 20-year period from the expected project completion date. The WWTP is beyond its design life and the treatment capacity for bio-solids is inadequate. This is partly due to rules that have changed during the 1990s and to recent changes in the regulatory environment. Continuing I/I rehabilitation projects are addressed in the study as well.

Population and Flow Projections

Population

In 2013, Sutherlin had a full-time resident population of approximately 7,950. Census data indicates that there is an average of 1.85 people per household, although [The Dyer Partnership's] calculations showed there were approximately 2 people per wastewater equivalent dwelling unit (EDU). Projected population for the year 2040 is 12,100 people. Based on historical averages in the study area, a 1.5% per year growth rate was selected for the residential population for use in [the] Facilities Plan over the next 25 years.

Flows and Loads

Recent WWTP Daily Monitoring Report (DMR) records were analyzed to provide the existing wastewater flows and loads. Existing users are estimated to have a higher average-per-capita flow than newer users, due to higher infiltration. Current flows exceed the WWTP design hydraulic capacity. A disciplined I/I rehabilitation program has been implemented and applied to the system, with special focus on areas identified in the February 2004 I/I study. These efforts have reduced peak daily average flows by about 30%. Projected flows and loads for 2040 exceed the WWTP hydraulic and bio-solids treatment capacity.

Collection System

The Sutherlin wastewater conveyance system currently consists of approximately 141,000 linear feet (lf) (27 miles) of gravity sewer pipe (6-inch to 27-inch diameter), an estimated 700 manholes, and 15,000 lf of pressure piping (2-inch to 10-inch diameter). The system also has five collection system pump stations (Everett Avenue, Church Road, Airport, Page Street, and Quail Run) in addition to the plant influent pump station.

The city has executed annual I/I rehabilitation projects from 2004 through 2011, and has completed improvements to Airport Pump Station and Everett Avenue Pump Station. I/I repair projects included approximately 9,000 lf of inversion lining, lateral repairs, and 30 sanitary sewer manhole repairs. Smoke testing was performed in 2012 to identify potential inflow areas and areas to concentrate on for ongoing I/I repair projects.

Treatment System

Raw wastewater arrives at the treatment facility via a 27-inch-diameter asbestos cement gravity sewer and flows to a Rotamat mechanical screen, and then through the influent flow meter. Then influent flows to the influent pump station wet well. From the influent pump station, the liquid stream is lifted to the headworks, which includes a grit separator, comminutor, and Parshall flume. Flow is split from the headworks and continues by gravity to the north and south treatment units commonly referred to as "donut units." The units each have a contact zone, stabilization zone, decant zone, return activated sludge (RAS), and center clarifier. The north treatment unit includes the irrigation holding reservoir and the south unit includes the chorine contact tank and the filter sump.

WWTP Condition

Much of the equipment is sound and operable, and the buildings and tanks are structurally sound. There is some surface corrosion of steel components, due to age and environment. The biological process provides treatment and experiences minimal upsets. The hydraulic flow for the plant regularly exceeds the flow capacity of the mechanical screen chamber in the winter, and the plant is operating at capacity for mass loads. Each component of the treatment plant was examined for condition, capacity, and operability. Details for each component are discussed briefly in the paragraphs below.

The existing mechanical screen is undersized for current wet-weather peak flow and commonly is bypassed into the treatment process, due to excessive flows and mechanical clogging from solids. The influent pump station does not meet redundancy or peak flow requirements and solids that bypass the mechanical screen settle into the wet well. The pumps' performance has decreased from design capability into the treatment process; regardless, they must be upsized to meet existing and future demand requirements. The existing degritting system is no longer functioning, and allows solids and grit to settle into the treatment processes. Flow is measured at the Parshall flume, but not after the flow is split. This may affect operational flexibility between the basins due to sludge wasting limitations.

WWTP operators are often required to hold upwards of 8,800 mg/L mixed liquor suspended solids (MLSS). Inadequate mixing results in operational difficulty in maintaining necessary levels of dissolved oxygen in the aeration processes. Existing clarification capacity is inadequate to treat current WWTP flows and loads. The tertiary filter has not been operable for the last twenty years. The existing digester only allowed for approximately 20 days detention, based upon a hydraulic detention time calculation—yet 60 days is the requirement at 15° Celsius. Oxygenation and mixing limit the operational capacity of digestion. Deliverable oxygen is calculated to be only 55 percent of what is required for optimal efficiency and the mixing system is below the fluid level, which results in a lack of surface agitation and, thereby, negates the maximum benefit of mixing for aeration in the digesters. During the wet season, the city periodically pays a local hauler to remove excess biosolids. The existing disinfection system consists of a chlorine gas system. This type of system has become more expensive due to regulatory and supply-chain issues.

Discharge from the Sutherlin WWTP is regulated under a NPDES permit. In order to protect aquatic life, the permit prohibits the discharge of effluent that violates water quality standards. In addition, Calapooya Creek is located in the Umpqua Basin, which is water-quality-limited for several parameters, including temperature (summers), pH (summers), fecal coliform (year-round), and phosphorus. Due to these restrictions, discharge to Calapooya Creek is not allowed between June 1 and October 31, unless approved by DEQ. May and November discharges may be allowed if stream flow conditions listed in the NPDES permit are met. Effluent is pumped to the Umpqua Golf Resort course from June through September for irrigation (recycled water). The City is considering replacement of the existing chlorine gas system with a new mixed-oxidant, on-site generation system. This will decrease cost and mitigate safety issues. The system will be used to provide chlorine residuals during summertime reuse and a new UV system will be used for disinfection prior to discharge into Calapooya Creek in the winter months. In October, the effluent discharge is conditionally allowed depending upon the minimum streamflow requirement in Calapooya Creek.

The City applies the treated sludge from the digesters on agricultural land for soil enhancement utilizing a 3,200-gallon truck which spreads the bio-solids directly on four sites: the Reddekopp site (80 acres); the Rust site (80acres); the Williams site (80 acres); and the Crouch site (35 acres). In addition, sludge is hauled to a private facility (Heard Farm).

WWTP Improvements

The WWTP is deficient in preliminary treatment, secondary treatment, bio-solids treatment, and effluent disposal. Each area was reviewed with a minimum of three alternatives. The alternatives were examined based on initial capital costs, operation and maintenance (O&M) expenses, and salvage valve. The alternative with the lowest life-cycle cost was chosen for each item. A summary of the Phase 1 improvements is described as follows:

- Provide two new mechanical bar screens.
- Construct new influent pump station.
- Add new grit removal system.
- Update influent flow metering.
- Replace existing secondary treatment system with new sequencing batch reactors (SBR).
- Replace existing tertiary filter with new tertiary filter system.
- Construct effluent storage pond.
- Convert existing secondary treatment units to biosolids digesters and improve mixers.
- Add bio-solids process facility for dewatering and storage of dried sludge.

Project Cost

Capital improvements cost for the Everett Avenue Pump Station is $925,000 and for the WWTP is $20,317,000, for a total of $21,242,000.

Project Goals

The overall goals for the project include:

- Minimizing treatment costs
- Meeting or exceeding all NPDES requirements (EPA and DEQ) for the treatment process selected,
- Preparing for future requirements
- Making the facility expandable
- Optimizing and providing cost-effective utilization and discharge of treated wastewater and solids
- Minimizing O&M cost
- Minimizing energy consumption, e.g., using energy-efficient practices
- Facilitating public acceptance

Project Constraints

Time, Regulations, and Related Cost Impact

The project has been under study and in design since 2004. As described above, increasing regulatory requirements have required additional study and caused project delays. As time passes, civil infrastructure projects become more expensive to construct—based on inflation, and increasing cost of materials and equipment. Time is of the essence. Getting the project built to meet current regulations is simply less expensive than waiting for future regulations to impact the construction cost.

Teleconference re: Clarifying DEQ Requirements for the Facility

August 21, 2014, 9:00-9:15 a.m.

Teleconference Facilitator

- Mike Morrison, CCP, FAACEI, Value Management Consulting, Inc., VA Project Manager/Facilitator

Participants

- Anna M. Bremmer, Bremmer Consulting LLC
- Dick Day, R.O. Day
- Dale Richwine, Richwine Environmental
- Brian Elliott, City of Sutherlin
- Vicki Luther, City of Sutherlin
- Jon Gasik, Oregon Department of Environmental Quality (DEQ)

Key Clarification

The use of flow management process alternatives to minimize the sizing of the secondary process for peak flow treatment was discussed with Jon Gasik of DEQ. Previously, it was suggested that screened raw wastewater at flows higher than the peak week flows receive treatment from a dedicated peak flow facility without receiving secondary treatment. Jon had stated that this process would not be allowed by DEQ or EPA. It was then suggested that a primary treatment or equivalent primary treatment process be added and the primary effluent at flows greater than peak week flows bypass secondary treatment and go directly to disinfection (blending). Jon stated that this was acceptable as there would be a dedicated primary treatment process for all flows. The difference being that the primary treatment process would be operational as part of the main flow stream and not a dedicated peak wet weather treatment process.

DEQ Regulations for Recycled Water

The following definitions can be found at
http://arcweb.sos.state.or.us/pages/rules/oars_300/oar_340/340_055.html.

Class C Recycled Water

(5) The following requirements apply to Class C recycled water.

(a) Beneficial Purposes. Class C recycled water may be used only for the following beneficial purposes and only if the rules of this division are met:

(A) Any beneficial purpose defined in subsection (4)(a) of this rule;

(B) Irrigation of processed food crops;

(C) Irrigation of orchards or vineyards if an irrigation method is used to apply recycled water directly to the soil;

(D) Landscape irrigation of golf courses, cemeteries, highway medians, or industrial or business campuses;

(E) Industrial, commercial, or construction uses limited to: industrial cooling, rock crushing, aggregate washing, mixing concrete, dust control, nonstructural fire fighting using aircraft, street sweeping, or sanitary sewer flushing;

(F) Water supply source for landscape impoundments; and

(G) Any beneficial purpose authorized in writing by the department pursuant to OAR 340-055-0016(6).

(b) Treatment. Class C recycled water must be an oxidized and disinfected wastewater that meets the numeric criteria in subsection (c) of this section.

(c) Criteria. Class C recycled water must not exceed a median of 23 total coliform organisms per 100 milliliters, based on results of the last seven days that analyses have been completed, and 240 total coliform organisms per 100 milliliters in any two consecutive samples.

(d) Monitoring. Monitoring for total coliform organisms must occur once per week at a minimum.

(e) Setback Distances.

(A) Where an irrigation method is used to apply recycled water directly to the soil, there must be a minimum of 10 feet from the edge of the site used for irrigation and the site property line.

(B) Where sprinkler irrigation is used, there must be a minimum of 70 feet from the edge of the site used for irrigation and the site property line.

(C) There must be a minimum of 100 feet from the edge of an irrigation site to a water supply source used for human consumption.

(D) Where sprinkler irrigation is used, recycled water must not be sprayed within 70 feet of an area where food is being prepared or served, or where a drinking fountain is located.

(f) Access and Exposure.

(A) When irrigating for a beneficial purpose defined in subsection (4)(a) of this rule, the access and exposure requirements defined in subsection (4)(f) of this rule must be met.

(B) During irrigation of a golf course, a cemetery, a highway median, or an industrial or business campus, the public must be restricted from direct contact with the recycled water.

(C) If aerosols are generated when using recycled water for an industrial, commercial, or construction purpose, the aerosols must not create a public health hazard.

(D) When using recycled water for an **agricultural** or horticultural purpose where sprinkler irrigation is used, or an industrial, commercial, or construction purpose, the public and personnel at the use area must be notified that the water used is recycled water and is not safe for drinking. The recycled water use plan must specify how notification will be provided.

(g) Site Management.

(A) When irrigating for a beneficial purpose defined in subsection (4)(a) of this rule, the site management requirements defined in subsection (4)(g) of this rule must be met.

(B) When using recycled water for a landscape impoundment or for irrigating a golf course, cemetery, highway median, or industrial or business campus, signs must be posted at the use area and be visible to the public. The signs must state that recycled water is used and is not safe for drinking.

(C) Irrigation of processed food crops is prohibited for three days before harvesting.

(D) When irrigating an orchard or vineyard, the edible portion of the crop must not contact the ground, and fruit or nuts may not be harvested off the ground.

(E) When using recycled water for a landscape impoundment, aerators or decorative fixtures that may generate aerosols are allowed only if authorized in writing by the department.

Class B Recycled Water

(6) The following requirements apply to Class B recycled water.

(a) Beneficial Purposes. Class B recycled water may be used only for the following beneficial purposes and only if the rules of this division are met:

(A) Any beneficial purpose defined in subsection (5)(a) of this rule;

(B) Stand-alone fire suppression systems in commercial and residential buildings, non-residential toilet or urinal flushing, or floor drain trap priming;

(C) Water supply source for restricted recreational impoundments; and

(D) Any beneficial purpose authorized in writing by the department pursuant to OAR 340-055-0016(6).

(b) Treatment. Class B recycled water must be an oxidized and disinfected wastewater that meets the numeric criteria in subsection (c) of this section.

(c) Criteria. Class B recycled water must not exceed a median of 2.2 total coliform organisms per 100 milliliters, based on results of the last seven days that analyses have been completed, and 23 total coliform organisms per 100 milliliters in any single sample.

(d) Monitoring. Monitoring for total coliform organisms must occur three times per week at a minimum.

(e) Setback Distances.

(A) Where an irrigation method is used to apply recycled water directly to the soil, there are no setback requirements.

(B) Where sprinkler irrigation is used, there must be a minimum of 10 feet from the edge of the site used for irrigation and the site property line.

(C) There must be a minimum of 50 feet from the edge of the irrigation site to a water supply source used for human consumption.

(D) Where sprinkler irrigation is used, recycled water must not be sprayed within 10 feet of an area where food is being prepared or served, or where a drinking fountain is located.

(f) Access and Exposure.

(A) During irrigation of a golf course, the public must be restricted from direct contact with the recycled water.

(B) If aerosols are generated when using recycled water for an industrial, commercial, or construction purpose, the aerosols must not create a public health hazard.

(C) When using recycled water for an agricultural or horticultural purpose where sprinkler irrigation is used, or an industrial, commercial, or construction purpose, the public and personnel at the use area must be notified that the water used is recycled water and is not safe for drinking. The recycled water use plan must specify how notification will be provided.

(g) Site Management.

(A) When irrigating for a beneficial purpose defined in subsection (4)(a) of this rule, the site management requirements defined in subsection (4)(g) of this rule must be met.

(B) When using recycled water for a landscape impoundment or for irrigating a golf course, cemetery, highway median, or industrial or business campus, signs must be posted at the use area and be visible to the public. The signs must state recycled water is used and is not safe for drinking.

(C) Irrigation of processed food crops is prohibited for three days before harvesting.

(D) When irrigating an orchard or vineyard, the edible portion of the crop must not contact the ground, and fruit or nuts may not be harvested off the ground.

Class A Recycled Water

(7) The following requirements apply to Class A recycled water.

(a) Beneficial Purposes. Class A recycled water may be used only for the following beneficial purposes and only if the rules of this division are met:

(A) Any beneficial purpose defined in subsection (6)(a) of this rule;

(B) Irrigation for any agricultural or horticultural use;

(C) Landscape irrigation of parks, playgrounds, school yards, residential landscapes, or other landscapes accessible to the public;

(D) Commercial car washing or fountains when the water is not intended for human consumption;

(E) Water supply source for non-restricted recreational impoundments;

(F) Artificial groundwater recharge by surface infiltration methods or by subsurface injection in accordance with OAR chapter 340, division 44. Direct injection into an underground source of drinking water is prohibited unless allowed by OAR chapter 340, division 44; and

(G) Any beneficial purpose authorized in writing by the department pursuant to OAR 340-055-0016(6).

(b) Treatment. Class A recycled water must be an oxidized, filtered and disinfected wastewater that meets the numeric criteria in subsection (c) of this section are met.

(c) Criteria. Class A recycled water must not exceed the following criteria:

(A) Before disinfection, unless otherwise approved in writing by the department, the wastewater must be treated with a filtration process, and the turbidity must not exceed an average of 2 nephelometric turbidity units (NTU) within a 24-hour period, 5 NTU more than five percent of the time within a 24-hour period, and 10 NTU at any time, and

(B) After disinfection, Class A recycled water must not exceed a median of 2.2 total coliform organisms per 100 milliliters, based on results of the last seven days that analyses have been completed, and 23 total coliform organisms per 100 milliliters in any single sample.

(d) Monitoring.

(A) Monitoring for total coliform organisms must occur once per day at a minimum.

(B) Monitoring for turbidity must occur on an hourly basis at a minimum.

(e) Setback Distances. Where sprinkler irrigation is used, recycled water must not be sprayed onto an area where food is being prepared or served, or onto a drinking fountain.

(f) Access and Exposure. When using recycled water for an agricultural or horticultural purpose where spray irrigation is used, or an industrial, commercial, or construction purpose, the public and personnel at the use area must be notified that the water used is recycled water and is not safe for drinking. The recycled water use plan must specify how notification will be provided.

(g) Site Management. **When using recycled water for** a landscape impoundment, restricted recreational impoundment, non-restricted recreational impoundment, or for **irrigating a golf course**, cemetery, highway median, industrial or business campus, park, playground, school yard, residential landscape, or other landscapes accessible to the public, **signs must be posted** at the use area or notification must be made to the public at the use area indicating recycled water is used and is not safe for drinking. The recycled water use plan must specify how notification will be provided.

Stat. Auth.: ORS 468.020, 468.705 & 468.710. Stats. Implemented: ORS 468B.030 & 468B.050. Hist.: DEQ 32-1990, f. & cert. ef. 8-15-90; Renumbered from 340-055-0015, DEQ 6-2008, f. & cert. ef. 5-5-08

Study Timing, Focus, and Goals

Study Timing

The study was conducted during conceptual planning with the Facilities Plan produced by the Dyer Partnership as the primary reference for the study.

Study Focus

The VA study focused on preliminary plans[13] and presentations provided by the City of Sutherlin and their design consultant, The Dyer Partnership Engineers & Planners, Inc.

The VA study team considered

- overall project goals, including optimizing facility design to meet current and future regulations, minimizing cost, and gaining public acceptance of the value of the project relative to rates to be charged.
- materials, products, and methods used in the design; and
- meeting the scheduled completion date of 2018.

VA Study Goals and Objectives

The VA study team's objective was to develop recommendations that support the City and design team in making informed decisions that will yield the best value for the project. The study team brought to bear their expertise and experience to generate ideas and analyze those ideas that best met performance criteria—to develop informative, side-by-side comparisons to the baseline design that examine benefits, risks, initial and life-cycle cost, quality, and schedule.

The value analysis (VA) study identified alternate ways to effectively treat wastewater in accordance with current DEQ, NPDES, and TMDL requirements as compared to the baseline described in the Facilities Plan Amendment[14]

[13] City of Sutherlin Wastewater Facilities Plan Amendment Draft, October 2013—The Dyer Partnership Engineers & Planners, Inc.
[14] City of Sutherlin Wastewater Facilities Plan Amendment Draft, October 2013—The Dyer Partnership Engineers & Planners, Inc.

Goals

The primary goal of the VA study is to help the project move forward.

Objectives

- Evaluate preliminary treatment, secondary treatment, bio-solids treatment, effluent disposal, treatment alternatives, and disinfection options.
- Provide constructive input and feedback on these items and coordinate with the City to create evaluation criteria that can be based on factors such as impacts to neighbors, cost, land use, expandability, flexibility with respect to winter and summer flows (based on inflow and infiltration), etc.
- Review requirements of current MAO and NPDES permit.
- Evaluate and/or recommend other treatment recommendations or treatment plant expansion/upgrades.
- Evaluate and/or recommend energy efficient options that may provide savings over the life of the project.
- Compare pros and cons of Class A vs. Class B level of recycled water.
- Provide the Sutherlin City Council with sufficient detail of the VA team's proposed ideas such that it can make informed decisions and confidently select options that are the best for the city in order to move the project forward.

The VA Study Team

The VA study team included the following individuals:

Copy Name, Organization, and Role on VE Team from Sign-In Sheet

Name	Organization Name	Role, Technical Discipline
Mike Morrison, CCP, FAACEI	Value Management Consulting, Inc.	VA Project Manager/Facilitator
Anna M. Bremmer, CVS, LEED AP	Bremmer Consulting LLC	VA Study Co-Facilitator
Dale Richwine	Richwine Environmental	VA Team Member—Process Engineering
Dick Day	R.O. Day	VA Team Member—Civil Engineering, Constructability
Brian Elliott	City of Sutherlin	VA Team Member—Plant Management
Jeff Nelson	City of Sutherlin	VA Team Member—City Management (part-time attendee due to other commitments)
John Bachman	City of Sutherlin	VA Team Member—Operations (part-time attendee due to other commitments)
Vicki Luther	City of Sutherlin	VA Team Member--City of Sutherlin Community Development

VA Study Results

Creative Ideas

The VA study team **generated 131 creative ideas, and developed 6 value proposals and 9 design suggestions** to improve the project.

A list of all of the creative ideas generated is included in **Appendix F—Performance-Criteria-Based Evaluation of Creative Ideas**.

Detailed Analyses

VA team goal in developing the creative ideas and value proposals was to provide thorough analysis that can help the City make informed decisions, rather than develop a larger number of proposals with minimal information.

Please see **Appendix A—Value Proposal Workbooks**, which includes detailed analyses of value proposals with cost information included. Additional information about the content of the workbooks is included in the Development subsection of the VA Study Activities section of this report.

Please see **Appendix B—Design Suggestion Workbooks**, which includes detailed analyses of design suggestions that have no associated cost impacts. Additional information about the content of the workbooks is included in the Development subsection of the VA Study Activities section of this report.

Value Summary

Value Proposals

The following is a summary of cost savings or additional cost associated with Value Proposals.

Idea #	Value Proposal Title	Savings or Cost	Percent Improvement Relative to Baseline
GB-03	Use Existing Donuts for Sequencing Batch Reactor (SBR) with Peak- Flow Wet Weather Treatment	$442,000	18%
GB-05	Use Smaller or Fewer New SBRs with Peak Wet Weather Flow Treatment to Reduce the Number of SBRs	$387,000	9%
GB-11	Convert Donut Clarifiers to Primaries Prior to New SBRs	$887,000	20%
RD-03	Add Submersible Pumps in Existing Screenings Channel to Pump to New Screening Facility Following Pump Station	$297,000	21%
RT-01	Produce Class C Reuse Without Using Filters	Initial: $920,000 LCC: -$119,366 Total: $800,634	46%
RT-02	Produce Class B Reuse Without Using Filters	Initial: $920,000 LCC: -$596,829 Total: $323,171	18%

Design Suggestions

The following is a summary of design suggestions. Design suggestions are ideas that may not merit a value proposal, because they are not a radical change—just things the City and design team can consider as the detailed design for the plant evolves.

Idea #	Design Suggestion Title
DW-04	Use Sodium Hypochlorite for Summer Disinfection and UV for Winter Disinfection
DW-08	Use UV Year-Round With Sodium Hypochlorite for Reuse
M-01	Retain Geotechnical Engineer to Analyze Site Soils
M-02	Monitor Peiziometric Levels on the Site During Dry Weather and Wet Weather
M-06	Use Independent SCADA Systems Integrator That is a Direct and Prequalified Contractor With the City in Lieu of a Subcontractor
M-08	Utilize Dispatchable Power to Make the Auxiliary Generator Part of the Electric Utility Provider Incentive Program

Idea #	Design Suggestion Title
M-10	Investigate Securing a Temporary Lease Adjacent to the Plant for a Staging Area
RD-01	Put Screens in Existing Channels
TS-17	Compost Class A Solids With Yard Debris

VA Study Activities

The methodology used for this study is based on the SAVE International® Value Engineering Job Plan. It includes six phases: information, function analysis, creativity, evaluation, development, and presentation. Please see **Appendix C—VA Study Job Plan** for a summary of job plan activities and results typically realized.

Information Phase

During the Information phase of the VA study, available project documents were reviewed prior to the study and discussed among the VA study team on the first day of the study. The first day of the study included a presentation by the design team and discussion of concepts including the following

Information Phase Purpose

- Develop an understanding of the project, including its purpose, challenges, and constraints
- Develop a set of performance criteria by which the project will be deemed successful
- Examine cost and risk information
- Develop goals and objectives for the VA study

Project Documents

The following project documents were provided to the VA study team for review prior to and use during the VA study.

- City of Sutherlin Wastewater Facilities Plan Amendment Draft, October 2013—The Dyer Partnership Engineers & Planners, Inc.
- PowerPoint Presentation: City of Sutherlin Wastewater System Facilities Plan Amendment, Council Workshop, October 28, 2013—The Dyer Partnership Engineers and Planners
- PowerPoint Presentation: City of Sutherlin Wastewater Treatment Facility (Undated)—DEQ
- PowerPoint Presentation: City of Sutherlin Wastewater Facilities Plan Workshop, April 2010—The Dyer Partnership Engineers and Planners

Performance Criteria

Project performance criteria were identified by study sponsor the City of Sutherlin; their design consultant, The Dyer Partnership Engineers & Planners, Inc.; and Orenco Systems®, Inc. The VA study team identified additional criteria, refined the list, then prioritized the performance criteria for the purpose of guiding the VA study as illustrated in **Appendix F— Performance Criteria Prioritization via Paired Comparison**. A more thorough discussion of performance criteria development and usage is provided in the Evaluation Phase subsection of the Value Analysis Study Activities section of this report.

Project Cost Summary

An early estimate of total project cost was used to identify the cost associated with major construction elements. It is common that a small percentage of the major construction elements represent a high percentage of the project cost. Identifying these elements helped the VA study team correlate high-cost elements with functions identified during function analysis, in order to prioritize functions for study.

Total Project Cost[15]

Item	Cost	
Influent Pump Station	$	816,000
Headworks with Influent Screen	$	1,247,000
SBR	$	4,487,000
Tertiary Filtration	$	1,004,000
UV Disinfection	$	529,000
Recycled Water Disinfection System	$	250,000
Convert Existing Tanks to Digestions	$	775,000
Biosolids Processing Facility	$	1,160,000
Site Structures	$	555,000
Recycled Water Storage Pond	$	742,000
Misc. Equipment	$	380,000
Site Improvements and Yard Piping	$	723,000
Basic WWTP Construction Total	**$**	**12,568,000**
Engineering – Design – Bidding Services	$	1,267,000
Engineering – Construction Services	$	1,267,000
Value Engineering	$	85,000
Contingency 15%	$	1,900,000
Environmental Report	$	45,000
Fords Pond Land Acquisition	$	3,000,000
Review Fees	$	10,000
Admin / Legal	$	75,000
WWTP Project Total	**$**	**20,317,000**
Everett Avenue Pump Station Improvements	$	925,000
Project Total	**$**	**21,242,000**

Due to the preliminary nature of the budget information, a cost model was not developed for this study. However, cost estimates were referenced to correlate high cost with functions.

Risk

A simplified risk exercise was conducted by the VA study team to assign risk to functions.

[15] PowerPoint Presentation: City of Sutherlin Wastewater System Facilities Plan Amendment, Council Workshop, October 28, 2013—The Dyer Partnership Engineers and Planners

VA Study Team's Observations, Issues, and Concerns

Following their review of the project information, the kickoff meeting, and site visit, the VA study team generated the following list of their observations, issues, and concerns about the project baseline.

Current Recycled Water Application Requires Class B and Needs Class A

Another issue is that, although effluent is currently being applied, Class A recycled water is currently needed for discharge to Fords Pond, located at the public Golf Course. Users of the golf course enter Fords Pond to retrieve golf balls and traverse the grounds. There are currently no barriers to prevent users from exposure to Class C recycled water. In addition, Class A recycled water for Fords Pond opens up new avenues for the community. **Below Class A may not be acceptable to the community.**

Figure 1—Traditional Olive Harvest Method, Southeastern Italy

Other key reuse challenges include:

- If Class A recycled water is required for public acceptance, it will drive filter selection.
- To meet DEQ regulations, the Golf course may need to be fenced if using Class C (Level 2) effluent. (Level 2 is part of contract between City and golf course.)
- Class C recycled water requires multiple barriers—the balance is where the barriers are located. If using Class B, fences will not be required. Placing barriers would nullify the contract with the golf course. If the golf course does not use correct application, the contract would also be nullified.
- Popeye's Girlfriend[16] olive orchard requires Class A recycled water, as spray irrigation covers the leaves and fruit of the trees and the standard method of olive harvesting requires shaking of branches and catching ripe olives in nets set on the ground—where olives come in contact with treated surfaces.

Funding and Public Perception

- Rates are going to become some of the highest in the state—$63. Current rate is $34.10.
- Must meet the requirements of public, including allowance for population growth—can be phased.
- Going to Class A without educating the public on its benefits relative to the cost and relative to Classes B and C would be unacceptable.
- Treatment plant expansion must be done within current confines of plant property.

Regulatory Discharge Requirements

- Must manage infiltration and inflow (I/I).
- Must meet strict permit requirements—plant must be designed to manage ammonia, including no discharge May through October.
- Must be able to manage the solids produced.

[16] Popeye's Girlfriend Website: http://popeyesgirlfriend.com/

Function Analysis Phase

Function analysis is the distinguishing technique that sets value analysis apart from all other project and process improvement methodologies. For the VA study, the following activities comprised the Function Analysis phase.

Function Analysis Phase Purpose

- Further develop project understanding and identify areas of the project or process with the greatest opportunity for value improvement

Function Identification and Classification

The VA study team randomly generated functions the project must perform comprised of active verbs and measurable nouns and then classified them based on SAVE International principles:

Function Classifications

Higher-Order Function (HO)

The specific goal(s)…for which the basic function(s) exists; outside scope of study; what the user wants; an effect resulting from the project; not necessarily the highest importance.

Basic Function (B)

The specific purpose for which a product, facility, or service exists and conveys a sense of "need"; what the project/product must do; satisfies only the users' needs, not desires.

Required Secondary Function (RS)

A function that must be performed in order to support the basic function.

Secondary Function (S)

A function that supports the basic function and results from the specific design approach used to achieve the basic function; what else the project can do; defines performance features other than those that must be performed; may not have an associated value.

Lower-Order (Causative or Assumed) Function (LO)

The function selected to initiate the project and is outside the study scope; *not* what the project, itself does; the cause, *not* a result of the project; not necessarily the lowest importance.

Design Objective

Defines a performance feature that must be obtained; design requirement; standard.

One-Time Function

A function that happens at a discrete time during the life of the project or process.

All-the-Time Function

A function that continues to happen throughout the life of the project or process.

Functions Identified and Classified During the VA Study

Brainstorming was used to identify the following functions, which were initially classified. Additional functions identified and classification changes that took place during FAST diagramming are indicated in **Appendix E—FAST Diagram**.

Function	Initial Classification
Reduce Maintenance	ATT
Remove Grit	S
Dewater Bio solids	S
Treat Wastewater	B
Convey Wastewater	RS
Meet MAO	DO
Remove Ammonia	RA
Disinfect Wastewater	S
Stabilize Solids	S
Remove BOD	S
Remove TSS	S
Dewater Solids	S
Meet NPDES Permit	DO
Manage Summer Flows	DO
Obtain Funding	OT
Remove Debris	S
Gain Public Acceptance	OT
Enhance Operator Comfort	ATT
Minimize Maintenance	ATT
Maximize Energy Efficiency	DO
Minimize Chemical Use	DO
Meet OSHA Regulations	DO
Store Effluent	S
Meet Growth Projections	DO
Manage pH	S
Manage Dissolved O_2	S
House Processes	S
House Equipment	S
Analyze Wastewater	RS

Function	Initial Classification
Discharge Wastewater	B
Settle Solids	S
Remove Grease	S
Grow Biomass	S
Filter Solids	S
Flocculate Solids	S
Construct Plant	LO
Control Process	S
Automate Equipment	S
Interface Automation	S
Manage Data	S
Maintain Power	S
Manage Alarms	S
Monitor Process	S

FAST Diagram

A Function Analysis System Technique (FAST) Diagram (please see **Appendix E—FAST Diagram**) was produced that revealed relationships among functions the project will perform and, in some cases, reclassified and refined the titles of some functions. The FAST Diagram identified a significant number of functions. This analysis provided a greater understanding of the whole project and how its performance, cost, time, and risk characteristics are related to the various functions identified.

The FAST diagram arranges the functions into logical relationships, such that when read from left to right or right to left, the functions answer the following questions:

- **How**: "How does it (function)…?" is answered "…by (function to the right of that function)"
- **Why**: "Why does it (function)?" is answered "…to (function to the left of that function)"

The FAST diagram also includes a correlation of high cost and high risk elements to the functions. Although a risk assessment was not performed as part of the Information Phase of the VA Study, The VA team was asked to rate each function for high, medium, and low cost, as well as high, medium, and low risk.

Cost Rating

Based on the available cost information related to various systems within the plant, the team was able to allocate cost to each function. Cost was rated as follows:

- Greater than $2 million = High Cost
- Between $1 million and $1.999 million = Medium Cost
- Less than $1 million = Low Cost

Risk Rating

Ms. Bremmer discussed with the team that risk can be both positive and negative—including potential opportunities and cost. She explained that risk is a combination of two factors relating to an occurrence: (1) the level of impact and (2) the probability of the occurrence. For example, if something was catastrophic if it occurs (high impact), but rarely ever occurs (low probability), it would be a medium risk. Each function on the FAST diagram was discussed in this regard and was rated high, medium, or low.

Functions Selected for Creativity Phase Brainstorming

Functions were prioritized for brainstorming based on factors including VA study goals and objectives, high associated cost, high associated risk. Although some of the Design Objectives and One-Time Functions were noted to be high-cost and high risk or high-cost and medium risk, they were of a high level of abstraction and many of the Required Secondary and Secondary functions support them. Therefore, it was these supporting functions located on the critical logic path, which had high cost and/or high risk associated with them that were selected for brainstorming.

These functions are listed in the section immediately below.

Creativity Phase

The objective of the Creativity Phase is to generate a large quantity of ideas on alternate ways to perform each function selected for study. It uses common brainstorming techniques, including ideation that is unconstrained by habit, tradition, negative attitudes, assumed restrictions, and specific criteria. No judgment takes place during this phase of the study, though ideas are discussed for clarification purposes.

What makes the Creativity Phase of value analysis successful is for the team not to conceive ways to design a project, but to develop **ways to perform the functions** selected for study. Past experience is combined and recombined to form new combinations that will perform the desired functions, regardless of what is included in the original project concept, and improve the value of the project compared to what was originally considered attainable.

Creativity Phase Purpose

- Generate as many improvement ideas as possible

Functions Studied

The functions selected for study and the number of ideas generated for each function are indicated below. As the team prioritized the selected functions, it was decided that two functions on the FAST diagram, "Filter Solids and "Settle Solids," which were both high cost and high risk, could be combined to form "Treat Solids." In addition, it was decided that "Grow Biomass" would be inclusive of "Remove BOD," which was high cost and high risk.

Function Code	Function	Cost	Risk	Ideas Generated
CW	Convey Wastewater	Medium	High	15
DW	Disinfect Wastewater	Low	High	10
GB	Grow Biomass (and Remove BOD)	High	High	14
MSF	Manage Summer Flows	High	High	11
RA	Remove Ammonia	High	High	5
RD	Remove Debris	Medium	Medium	10
RT	Remove TSS (and Turbidity)	High	High	4
TS	Treat Solids	High	High	21
FS	Filter Solids	Med	High	11
SS	Settle Solids	High	High	7
M	Miscellaneous	N/A	N/A	23
Total Ideas Generated				**131**

Evaluation Phase

Performance Criteria

City representatives, representatives from Orenco, and the VA study team defined performance criteria, identified additional criteria, and refined the entire list to clarify meaning, then worked as a group to prioritize all of the criteria using a paired comparison (please see **Appendix F—Performance Criteria Prioritization via Paired Comparison**). These prioritized criteria were used to evaluate each creative idea in order to prioritize ideas for development with the greatest potential for project performance improvement.

Evaluation Phase Purpose

- Rate ideas relative to performance criteria and rank them to prioritize which ideas should be developed

Criterion Number	Title and Description	Weighted Importance
1	Operability—Ease of operations and maintenance; matches technology to the staff; flexible and efficient	20%
2	Meets Regulatory Requirements—MAO, NPDES Permit	40%
3	Supports Future Options—Economic Growth, Industry development; development fees, expandability	10%
4	Facilitates Public Acceptance—Rates; Perception of Pond; Educate Public re cost of alternatives	30%
5	Sustainability—energy usage reduction; conservation	0%

Evaluation Method—Performance Evaluation Matrix

Creative ideas were rated by evaluating each idea against each weighted performance criterion as illustrated in **Appendix K— Performance-Criteria-Based Evaluation of Creative Ideas.** Using the ratings, a total score ranging from 1.0 to 5.0 was calculated for how well the idea supports each criterion: 5=Highly Agree, 3=Neutral; 1=Highly Disagree.

During this process, the facilitator asked the value team to volunteer ratings via a show of hands with ratings indicated by the number of fingers held up. Supporting discussion was used to refine the ratings of each idea against each criterion via consensus. The total scores were calculated via multiplying each rating by its weight to get a score and adding the scores together. The total scores were used to prioritize ideas for development.

Development Phase

The objective of the Development Phase is to credibly document the details of those ideas selected during the Evaluation Phase as having the most potential to improve the value of the project. Ideas that received the highest scores were developed into value proposals as were ideas determined to be useful design suggestions.

Development Phase Purpose

- Credibly document the details of value proposals to facilitate informed decision making.
- Provide side-by-side analysis of the baseline compared to the idea relative to
  - performance and cost;
  - benefits, risks, and challenges;
  - detailed discussion of the idea; and
  - what will be needed to implement the idea.

Value Strategy

Value studies result in the development of a number of individual value proposals. While it is possible for each to be implemented, typically there are value proposals that, when used in combination, may not provide the best solution for the project. This can be attributed to the fact that individual value proposals may present competing ideas or different ways to address the same issue. Some alternatives are developed to answer a question raised by a decision maker or resolve an open issue—and may be found non-beneficial to the project overall.

As a result of these factors, the VA study team develops a value strategy that represents their opinion of the best combination of Featured Value Proposals to assist the decision makers in their evaluation of the value proposals as they consider them for implementation. The value strategy is based on factors that include improved performance, cost avoidance, likelihood of implementation, and other considerations.

Value Proposal Documentation

Presenting Featured Value Proposals is not intended to reject the other value proposals from project stakeholder consideration. The results of this study are presented as individual value proposals that differ from the original "baseline" concept. Please see **Appendix A—Value Proposal Workbooks**, which includes detailed analyses of all value proposals with cost information included. Each value proposal workbook consists of a

- description of the baseline concept,
- description of the proposed alternative,
- side-by-side performance improvement analysis (if applicable),
- listing of the benefits and risks/challenges of both the baseline and proposed idea,
- discussion and justification of the idea,
- description of implementation considerations associated with it,
- set of baseline and proposed sketches (if applicable),
- side-by-side comparison of initial cost for the baseline and the proposed alternative, and a
- side-by-side life-cycle cost analysis (if applicable).

Design Suggestion Documentation

During the study, some ideas were developed that have no cost impact on the project, but which may improve its performance. Please see **Appendix B—Design Suggestion Workbooks**, which includes detailed analyses of design suggestions that have no associated cost impacts. Each design suggestion workbook consists of a

- description of the baseline concept,
- description of the proposed alternative,
- side-by-side performance improvement analysis (if applicable),
- listing of the benefits and risks/challenges of both the baseline and proposed idea,
- discussion and justification of the idea,
- description of implementation considerations associated with it, and a
- set of baseline and proposed sketches (if applicable),

Presentation Phase

The objective of the presentation phase is to put forward the results of the VA study. This involves a live oral presentation to the study stakeholders and decision makers followed by a complete written report documenting the study. During the live presentation, the VA study team highlighted aspects of featured value proposals, providing an opportunity for discussion and/or clarification of the concepts presented. This report has been created to document the VA study.

Presentation Phase Purpose

- Aid the owner and design team in making informed decisions to move the project forward

Presentation to City on August 22, 2014

Vicki Luther Introduced Mike Morrison. Mike introduced himself and thanked Vicki Luther and Brian Elliott of the City for their help during the study. Then value team introduced themselves. Vicki and Brian thanked the team for their work.

Mike spoke briefly about VA and VE, noting that the value of making a change decreases as the cost of the change increases. At VA, you have the greatest opportunity to improve the outcome of the project.

Overview

What we learned this week is that we can produce Class A recycled water.

Nine MGD liquid flow can be achieved while downsizing some components.

Mike spoke about the VA process—that all of what is presented today does not represent even conceptual engineering; it will be further developed for report.

Presentation of Value Options

Previously, Dyer looked at blending. Some of the time flows become extremely high. DEQ will not approve the drawings because EPA is being challenged by this approach.

Flow management within the facility adding primary treatment as a continuous process can manage flows in the plant—size at 5 MGD, optimizing use of funds.

Regulatory criteria for water reuse—class A (highest) to Class C, is based on the level of treatment. Pro: Class A can provide beneficial use in public areas. Removing the filters and producing same level of disinfection gets Class B. Con: Wherever you use class B, the public must be restricted from the area. The golf course irrigation must take place when golfers are not present and set back distances from fountains, etc. must be provided. The use of Fords pond for summer flows was money well-spent. With Class B, the pond must be fenced. The olive orchard cannot use Class B, because the harvesting technique results in fruit contacting the ground. They also have to spray foliage, where class B is also not allowed. With class A, not as much chlorine required to achieve regulations. To achieve disinfection, this can reduce a $1.6 million capital cost to realize $300,000 in total life-cycle cost savings.

The Pros and Cons of providing Class A, Class B and Class C recycled water were discussed briefly.

Option 1. Flow Management: This option would take 9 million gallons per day (MGD) through plant; 4 MGD to secondary system, and 5 MGD to UV, such that it is sized for 5 MGD per day, which prevents over-dilution. When flows are greater than 5 MGD, effluent will meet NPDES for TSS and coliform. The concept of splitting the flow after primary treatment is discussed further within specific options shown in Value Proposals in Appendix A.

Option 2: Primary Treatment Using the Center of the Existing Donuts as Secondary Clarifiers: This option uses secondary clarifiers in lieu of a new filter system. This option provides acceptable digestion capacity. In summer, hypochlorite must be used to disinfect and what doesn't go to the golf course must be stored at Fords pond. In November, you can discharge from the pond to the river (per baseline), a good approach. There are other options that are presented in detail as shown in Value Proposals in Appendix A.

Conclusion

The report will include everything that was talked about, regardless of whether it is formally presented in Value Proposals. The VA team generated roughly 131 ideas. The VA team has also prepared Design Suggestions, which may not merit a Value Proposal, because they are not a radical change—just things the City and Design team can consider as the detailed design for the plant evolves.

Anecdotal Note

In 1988, Dukakis lost the presidential election because his opponent showed 30 years of Boston's inaction to prevent pollution and clean up its harbor. Mike finds it distressing that this project has languished to the degree it has. This plant will only cost more as time passes. The City needs to move forward and get this problem resolved.

The VA team does not find fault with facilities planning effort. Using blending (VA Study) will make parts smaller. **Class A discharge at less money is possible through the ideas being proposed by the VA team.** We wish you success.

Implementation

Post-study activities include determining the disposition of the value proposals at an implementation meeting. It is generally scheduled after dissemination and review of the written alternatives by all participating agencies and organizations and their design consultants. Responses to the ideas are indicated, e.g., acceptance, partial acceptance, rejection, or tasking for further study and an implementation plan is developed. Assignments may be made either to individuals within the VA study team or by management to other individuals, to complete the tasks associated with the approved implementation plan.

Administrative Information

For information about the timing of the VA study activities and participants who attended each day, please see **Appendix G—VA Study Agenda** and **Appendix H—Meeting Attendees**.

Appendix A—Value Proposal Workbooks

Introduction to Appendixes A and B—Basis of Calculations

The following pages entitled, “Activated Sludge Model” show wastewater engineering calculations used for various Value Proposals and Design Suggestions in this study.

Activated Sludge Capacity Model

Operating Scenarios

Table 1	Dry Weather Flow	Table R-1	
Table 2	Dry Season Flow	Table R-2	
Table 3	Dry Season MM Load	Table R-3	
Table 4	Wet Season Flow	Table R-4	
Table 5	Wet Season MM Load	Table R-5	
Table 6	Peak Day Flow	Table R-6	
Table 7	Wet Season Flow w/ Kellogg Centrate	Table R-7	

Plant Definition

Table 1: VE G8-06

Influent Wastewater Characteristics

Parameter	Variable	Units
Biochemical Oxygen Demand	135	mg/L
Total Suspended Solids	150	mg/L
TKN-N (mg/L)	45	mg/L
T-PO4	6.0	mg/L
Alkalinity	150	mg/L

Recycle Streams

Parameter	Variable	Units
Recycle Flow	0.000	mgd
Recycle BOD	200	mg/L
Recycle TSS	1750	mg/L
Recycle TKN	850	mg/L
Recycle Alkalinity	3000	mg/L
Recycle Total-P	10	mg/L

Input Operating Parameters

Parameter	Variable	Units
Secondary Effluent TSS	10	mg/L
Temperature	18.0	°C
Sludge Volume Index (SVI)	200	mg/g
Sludge Age	8.0	Days
Primary Sludge Concentration	45000	mg/L
Dissolved Oxygen	2.0	mg/L
pH	7.0	Units
RAS Recycle Ratio	40	%
MLSS Recycle Ratio	200	%
Desired Effluent Alkalinity	90	mg/L

Primary Clarifier	Percent	Aeration Basin	Volume (mgal)	Secondary Clarifiers	
		Total Volume	0.568		Feet
BOD Removal	0.0				
TSS Removal	0.0	Anaerobic Zone	0.000	Quantity	2
TKN Removal	0.0	Anoxic Zone	0.114	Diameter	40
		Aerobic Zone	0.454		

Table 2: Dry Season Flow

Influent Wastewater Characteristics					Input Operating Parameters		
	Parameter	**Variable**	**Units**		**Parameter**	**Variable**	**Units**
	Biochemical Oxygen Demand	273	mg/L		Secondary Effluent TSS	10	mg/L
	Total Suspended Solids	321	mg/L		Temperature	18.0	°C
	TKN-N (mg/L)	45	mg/L		Sludge Volume Index (SVI)	200	mg/g
	T-PO4	6.0	mg/L		Sludge Age	5.0	Days
	Alkalinity	120	mg/L		Primary Sludge Concentration	45000	mg/L
Recycle Streams					Dissolved Oxygen	2.0	mg/L
	Parameter	**Variable**	**Units**		pH	7.0	Units
	Recycle Flow	0.060	mgd		RAS Recycle Ratio	40	%
	Recycle BOD	200	mg/L		MLSS Recycle Ratio	200	%
	Recycle TSS	1750	mg/L		Desired Effluent Alkaliinity	90	mg/L
	Recycle TKN	850	mg/L				
	Recycle Alkalinity	3000	mg/L				
	Recycle Total-P	10	mg/L				
Primary Clarifier		**Percent**	**Aeration Basin**		**Volume (mgal)**	**Secondary Clarifiers**	
	BOD Removal	48.0	Total Volume		2.555		**Feet**
	TSS Removal	61.0	Anaerobic Zone		0.000	Quantity	2
	TKN Removal	10.0	Anoxic Zone		0.511	Diameter	120
			Aerobic Zone		2.044		

Table 3: Dry Season MM Load

Influent Wastewater Characteristics

Parameter	Variable	Units
Biochemical Oxygen Demand	330	mg/L
Total Suspended Solids	413	mg/L
TKN-N (mg/L)	45	mg/L
T-PO4	6.0	mg/L
Alkalinity	120	mg/L

Recycle Streams

Parameter	Variable	Units
Recycle Flow	0.060	mgd
Recycle BOD	200	mg/L
Recycle TSS	1750	mg/L
Recycle TKN	850	mg/L
Recycle Alkalinity	3000	mg/L
Recycle Total-P	10	mg/L

Input Operating Parameters

Parameter	Variable	Units
Secondary Effluent TSS	10	mg/L
Temperature	17.0	°C
Sludge Volume Index (SVI)	200	mg/g
Sludge Age	5.0	Days
Primary Sludge Concentration	45000	mg/L
Dissolved Oxygen	2.0	mg/L
pH	7.0	Units
RAS Recycle Ratio	40	%
MLSS Recycle Ratio	100	%
Desired Effluent Alkaliinity	90	mg/L

Primary Clarifier	Percent	Aeration Basin	Volume (mgal)	Secondary Clarifiers	
BOD Removal	38.0	Total Volume	2.555		Feet
TSS Removal	59.0	Anaerobic Zone	0.000	Quantity	2
TKN Removal	10.0	Anoxic Zone	0.511	Diameter	120
		Aerobic Zone	2.044		

Table 4: Wet Season Flow

Influent Wastewater Characteristics

Parameter	Variable	Units
Biochemical Oxygen Demand	173	mg/L
Total Suspended Solids	203	mg/L
TKN-N (mg/L)	40	mg/L
T-PO4	6.0	mg/L
Alkalinity	120	mg/L

Recycle Streams

Parameter	Variable	Units
Recycle Flow	0.060	mgd
Recycle BOD	200	mg/L
Recycle TSS	1750	mg/L
Recycle TKN	850	mg/L
Recycle Alkalinity	3000	mg/L
Recycle Total-P	10	mg/L

Input Operating Parameters

Parameter	Variable	Units
Secondary Effluent TSS	10	mg/L
Temperature	15.0	°C
Sludge Volume Index (SVI)	200	mg/g
Sludge Age	5.0	Days
Primary Sludge Concentration	45000	mg/L
Dissolved Oxygen	2.0	mg/L
pH	7.0	Units
RAS Recycle Ratio	40	%
MLSS Recycle Ratio	100	%
Desired Effluent Alkalinity	90	mg/L

Primary Clarifier	Percent	Aeration Basin	Volume (mgal)	Secondary Clarifiers	
BOD Removal	40.0	Total Volume	2.555		Feet
TSS Removal	55.0	Anaerobic Zone	0.000	Quantity	2
TKN Removal	10.0	Anoxic Zone	0.511	Diameter	120
		Aerobic Zone	2.044		

Table 5: Wet Season MM Load

Influent Wastewater Characteristics

Parameter	Variable	Units
Biochemical Oxygen Demand	209	mg/L
Total Suspended Solids	262	mg/L
TKN-N (mg/L)	45	mg/L
T-PO4	6.0	mg/L
Alkalinity	120	mg/L

Recycle Streams

Parameter	Variable	Units
Recycle Flow	0.060	mgd
Recycle BOD	200	mg/L
Recycle TSS	1750	mg/L
Recycle TKN	1500	mg/L
Recycle Alkalinity	3000	mg/L
Recycle Total-P	10	mg/L

Input Operating Parameters

Parameter	Variable	Units
Secondary Effluent TSS	10	mg/L
Temperature	15.0	°C
Sludge Volume Index (SVI)	200	mg/g
Sludge Age	5.0	Days
Primary Sludge Concentration	45000	mg/L
Dissolved Oxygen	2.0	mg/L
pH	7.0	Units
RAS Recycle Ratio	40	%
MLSS Recycle Ratio	100	%
Desired Effluent Alkaliinity	90	mg/L

Primary Clarifier	Percent	Aeration Basin	Volume (mgal)	Secondary Clarifiers	
BOD Removal	40.0	Total Volume	2.555		Feet
TSS Removal	55.0	Anaerobic Zone	0.000	Quantity	2
TKN Removal	10.0	Anoxic Zone	0.511	Diameter	120
		Aerobic Zone	2.044		

Table 6: Peak Day Flow

Influent Wastewater Characteristics

Parameter	Variable	Units
Biochemical Oxygen Demand	45	mg/L
Total Suspended Solids	45	mg/L
TKN-N (mg/L)	10.0	mg/L
T-PO4	2.0	mg/L
Alkalinity	100	mg/L

Recycle Streams

Parameter	Variable	Units
Recycle Flow	0.060	mgd
Recycle BOD	200	mg/L
Recycle TSS	1750	mg/L
Recycle TKN	1500	mg/L
Recycle Alkalinity	3000	mg/L
Recycle Total-P	10	mg/L

Input Operating Parameters

Parameter	Variable	Units
Secondary Effluent TSS	10	mg/L
Temperature	13.0	°C
Sludge Volume Index (SVI)	200	mg/g
Sludge Age	5.0	Days
Primary Sludge Concentration	45000	mg/L
Dissolved Oxygen	2.0	mg/L
pH	7.0	Units
RAS Recycle Ratio	40	%
MLSS Recycle Ratio	100	%
Desired Effluent Alkaliinity	90	mg/L

Primary Clarifier	Percent	Aeration Basin	Volume (mgal)	Secondary Clarifiers	
BOD Removal	25.0	Total Volume	2.555		Feet
TSS Removal	40.0	Anaerobic Zone	0.000	Quantity	2
TKN Removal	10.0	Anoxic Zone	0.511	Diameter	120
		Aerobic Zone	2.044		

Table 7: Wet Season Flow w/ Kellogg Centrate

Influent Wastewater Characteristics

Parameter	Variable	Units
Biochemical Oxygen Demand	173	mg/L
Total Suspended Solids	203	mg/L
TKN-N (mg/L)	40	mg/L
T-PO4	6.0	mg/L
Alkalinity	120	mg/L

Recycle Streams

Parameter	Variable	Units
Recycle Flow	0.120	mgd
Recycle BOD	200	mg/L
Recycle TSS	1750	mg/L
Recycle TKN	850	mg/L
Recycle Alkalinity	3000	mg/L
Recycle Total-P	10	mg/L

Input Operating Parameters

Parameter	Variable	Units
Secondary Effluent TSS	10	mg/L
Temperature	15.0	°C
Sludge Volume Index (SVI)	200	mg/g
Sludge Age	5.0	Days
Primary Sludge Concentration	45000	mg/L
Dissolved Oxygen	2.0	mg/L
pH	7.0	Units
RAS Recycle Ratio	40	%
MLSS Recycle Ratio	100	%
Desired Effluent Alkaliinity	90	mg/L

Primary Clarifier	Percent
BOD Removal	40.0
TSS Removal	55.0
TKN Removal	10.0

Aeration Basin	Volume (mgal)
Total Volume	2.555
Anaerobic Zone	0.000
Anoxic Zone	0.511
Aerobic Zone	2.044

Secondary Clarifiers	Feet
Quantity	2
Diameter	120

Title	**Use Existing Donuts for Sequencing Batch Reactor (SBR) with Peak-Flow Wet WeatherTreatment**
Function	**Grow Biomass**

Value Summary

Baseline Assumption

The current plan is to construct a seperate structure for the SBR reactors, The structure is 100 ft long, 33 ft wide and 21.5 ft in depth, and is divided into four trains that run the length of the structure. The flow from the clarification process feeds each train by gravity. The flow from the SBRs is then pumped to the filtration process.

Proposed Alternative

The proposed modification is to use the existing donut structure to contain the SBR process. This concept will retain the existing clarification process in the center of the donut structure, limiting the SBR process to the annular of the structure. New biosolids digestors will be required and new a chlorine contact basin will be required to replace the displaced process currently in the donut structures.

The savings for this proposal will be in the capital costs. It is not anticipated that there are any additional cost savings attributable to LCC.

Cost Summary

	Baseline	Proposed	Baseline Less Proposed
Initial Cost	$5,447,000	$5,005,000	$442,000
Life-Cycle Cost	$0	$0	$0
Total Cost Including LCC	$5,447,000	$5,005,000	**$442,000**
		8%	**Savings**

Title	**Use Existing Donuts for Sequencing Batch Reactor (SBR) with Peak-Flow Wet WeatherTreatment**
Function	**Grow Biomass**

Benefits and Risks

Baseline Assumption

Benefits	Risks and Challenges
New SBR Facility	

Proposed Alternative

Benefits	Risks and Challenges
Less Cost	Reduces the number of SBR trains to two.
Eliminates new SBR structure.	
Simplifies rehabilitation of Donut structures	
Meets Regulations.	

Title	**Use Existing Donuts for Sequencing Batch Reactor (SBR) with Peak-Flow Wet WeatherTreatment**
Function	**Grow Biomass**

Discussion

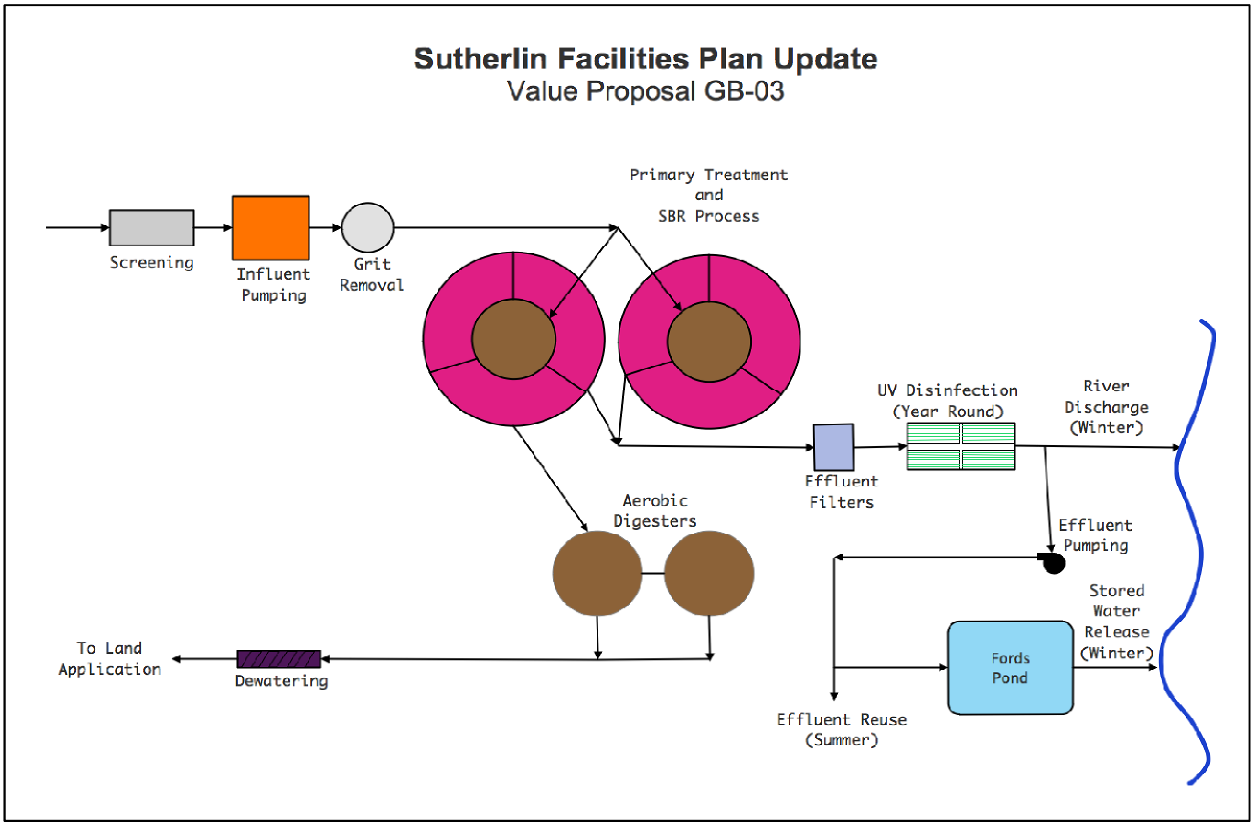
The concept is an opportunity make better use of existing facilities. It has been assumed that the SBR for the donuts will be equivalent to that shown in the pre-design. The proposed concept also assumes that 66.7% of the non-structural elements of the pre-design will be required. The proposed new digesters are designed to hold a total volume of 750,000 cf. The new chlorine contact basins provide an equivalent volume to that provided today by the donuts.

Implementation Considerations

This concept will be limited to construction during the summer months in order to take advantage of the lowest possible flows through the reactors. The construction of each of the two trains will also need to sequenced, in order to provide continuous treatment during construction.

Title	Use Existing Donuts for Sequencing Batch Reactor (SBR) with Peak-Flow Wet WeatherTreatment
Function	Grow Biomass

Sketch of Proposed Alternative



Title	**Use Existing Donuts for Sequencing Batch Reactor (SBR) with Peak-Flow Wet WeatherTreatment**
Function	**Grow Biomass**

Initial Cost

Design Element		Markup		Baseline Assumption			Proposed Alternative		
#	**Description**	**%**	**Unit**	**Qty**	**Unit Cost**	**Total Cost**	**Qty**	**Unit Cost**	**Total Cost**
1	SBR Process		LS			$4,487,000			
2	SBR Process		LS			$0			$2,240,000
3	Refurbish Donuts		LS			$960,000			$200,000
4	Chlorine Contact Tanks		LS			$0			$165,000
5	Digestors		LS						$2,400,000
6						$0			$0
7						$0			$0
8						$0			$0
9						$0			$0
10						$0			$0
	Total Initial Cost					**$5,447,000**			**$5,005,000**
	Total Savings (Baseline Less Proposed)								**$442,000**
									Savings

Assumptions and Notes re: Calculations

Title	**Use Smaller or Fewer New SBRs with Peak Wet Weather Flow Treatment to Reduce the Number of SBRs**
Function	**Grow Biomass**

Value Summary

Baseline Assumption

DESIGN CRITERIA

The design criteria is to treat a peak flow of 9.0-mgd. All of this flow is treated through the secondary treatment process. The design criteria is provided in the Design Basis.

BASE DESIGN

The base case process consists of screening, influent pumping, grit removal for pretreatment. The flow then goes to the SBRs for secondary treatment and ammonia removal. During the winter permit season, the secondary effluent goes through UV disinfection and is discharged to the Calapooya Creek. During the summer permit season, the effluent is disinfected with sodium hypochlorite (chlorine) and pumped to the Oak Hill Golf Course. Flow in addition to that needed to irrigate the golf coarse will be sent to Fords Pond for storage. The stored effluent will then be discharged during the winter permit season under the plants NPDES permit.

Solids handling will be done by aerobic digestion. The capacity of the existing aerobic digestion system will be increased by converting the existing secondary process space in the existing units into aerobic digestion space.

Proposed Alternative

This alternative adds the equivalent to primary treatment using a Salsnes Filter to treat the total plant flow. The effluent from the unit then goes to a splitter box. Flow up to 5-mgd, the Maximum Week Design Flow is 4.07-mgd) go to the SBR Secondary treatment process. Flows in excess of 5 mgd (5-mgd to 9-mgd) are sent directly to the SBR process effluent where it is blended with the secondary effluent prior to disinfection. The total volume is then discharged within the concentration and mass limits of the NPDES permit for BOD, TSS and ammonia.

Cost Summary

	Baseline	Proposed	Baseline Less Proposed
Initial Cost	$4,487,000	$4,100,000	$387,000
Life-Cycle Cost	$0	$0	$0
Total Cost Including LCC	$4,487,000	$4,100,000	**$387,000**
		9%	**Savings**

Title	**Use Smaller or Fewer New SBRs with Peak Wet Weather Flow Treatment to Reduce the Number of SBRs**
Function	**Grow Biomass**

Benefits and Risks

Baseline Assumption

Benefits	Risks and Challenges
	If the option for blending is stopped by EPA, then the 4th MBR unit will need to be constructed.

Proposed Alternative

Benefits	Risks and Challenges
Reduce the size of the SBR secondary treatment process.	

Title	Use Smaller or Fewer New SBRs with Peak Wet Weather Flow Treatment to Reduce the Number of SBRs
Function	Grow Biomass

Discussion

The Salsnes Filter will provide for >20% BOD removal and >50% TSS removal. This filter will be sized for a flow of 5-mgd. The system will operate as follows:

- Flows 0 - 5-mgd ==> All flow through filter, All effluent to SBR
- Flows 5 - 9-mgd ==> Up to 4-mgd of flow from filter goes to SBR effluent, 5-mgd of pretreatment effluent goes directly to SBR. Flow splitting is done by a splitter box on the filter effluent or SBR influent and filter influent.

The SBR treatment process is then sized for a peak flow of 5-mgd instead of a peak flow of 9-mgd. The organic loading design to the SBR process is reduced by 20%. The WAS production from the SBR is reduced by 30%, minimum. The TSS removed from the Salsnes Filter is sent to the aerobic digesters.

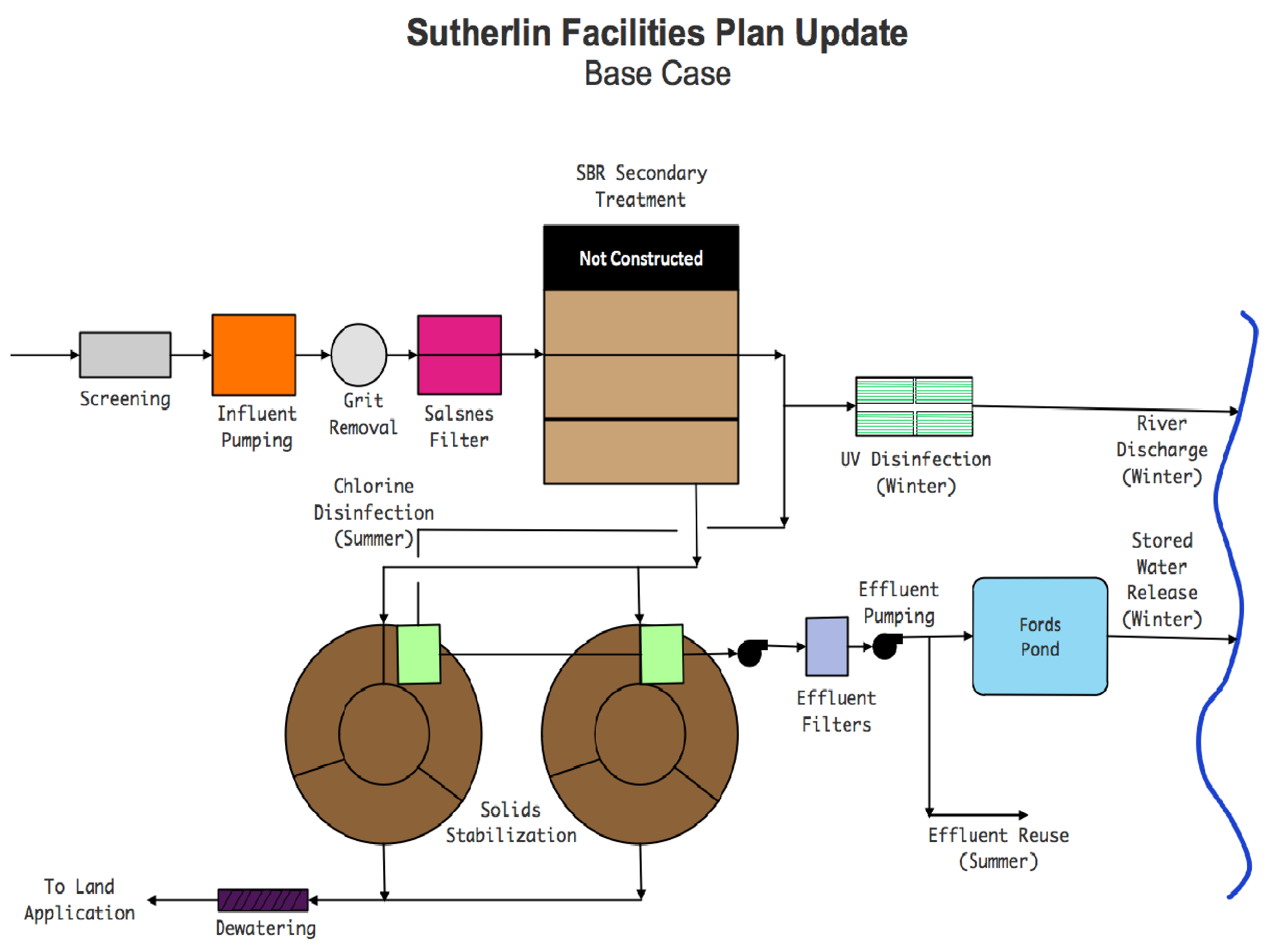
Implementation Considerations

DESIGN BASIS

	FLOW		BOD		TSS	
Parameter	2012	2040	(Conc)	(lbs/day)	(Conc)	(lbs/day)
Population	7905	12,100				
ADWF	0.72	1.11				
MMDWF	1.23	1.88	135	2120	150	2350
AWWF	1.37	2.10				
MMWWF	1.70	2.70	110	2460	117	2640
MWF	2.94	4.07				
PDAF	5.57	7.00				
PIF	7.30	9.00				

Title	**Use Smaller or Fewer New SBRs with Peak Wet Weather Flow Treatment to Reduce the Number of SBRs**
Function	**Grow Biomass**

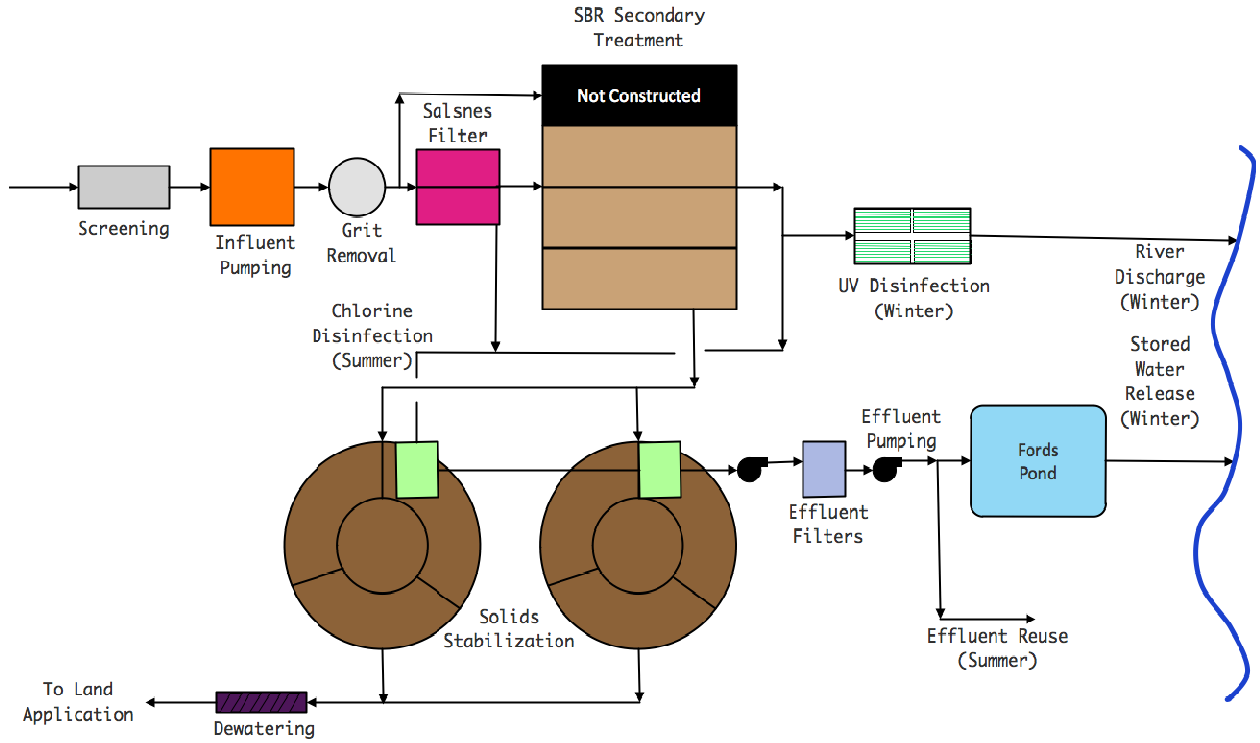
Sketch of Baseline Assumption



Title	Use Smaller or Fewer New SBRs with Peak Wet Weather Flow Treatment to Reduce the Number of SBRs
Function	Grow Biomass

Sketch of Proposed Alternative

Sutherlin Facilities Plan Update
Value Proposal GB-05



Title	**Use Smaller or Fewer New SBRs with Peak Wet Weather Flow Treatment to Reduce the Number of SBRs**
Function	**Grow Biomass**

Initial Cost

Design Element		Markup		Baseline Assumption		Proposed Alternative		
#	**Description**	**%**	**Unit**	**Qty**	**Unit Cost**	**Qty**	**Unit Cost**	**Total Cost**
1	Primary Treatment			0	$0	1	$1,000,000	$1,000,000
2	SBR Process			1	$4,487,000	1	$3,100,000	$3,100,000
3								$0
4								$0
5								$0
6								$0
7								$0
8								$0
9								$0
10								$0
	Total Initial Cost				**$4,487,000**			**$4,100,000**
	Total Savings (Baseline Less Proposed)							**$387,000**
								Savings

Assumptions and Notes re: Calculations

Title	**Convert Donut Clarifiers to Primaries Prior to New SBRs**
Function	**Grow Biomass**

Value Summary

Baseline Assumption

DESIGN CRITERIA
The design criteria is to treat a peak flow of 9.0-mgd. All of this flow is treated through the secondary treatment process.
BASE DESIGN
The base case process consists of screening, influent pumping, grit removal for pretreatment. The flow then goes to the SBRs for secondary treatment and ammonia removal. During the winter permit season, the secondary effluent goes through UV disinfection and is discharged to the Calapooya Creek. During the summer permit season, the effluent is disinfected with sodium hypochlorite (chlorine) and pumped to the Oak Hill Golf Course. Flow in addition to that needed to irrigate the golf coarse will be sent to Fords Pond for storage. The stored effluent will then be discharged during the winter permit season under the plants NPDES permit.

Solids handling will be done by aerobic digestion. The capacity of the existing aerobic digestion system will be increased by converting the existing secondary process space in the existing units into aerobic digestion space.

Proposed Alternative

This alternative adds the equivalent to primary treatment using the existing secondary clarifiers in the donuts to treat the total plant flow. The effluent from the unit then goes to a splitter box. Flow up to 5-mgd, the Maximum Week Design Flow is 4.07-mgd) go to the SBR Secondary treatment process. Flows in excess of 5 mgd (5-mgd to 9-mgd) are sent directly to the SBR process effluent where it is blended with the secondary effluent prior to disinfection. The total volume is then discharged within the concentration and mass limits of the NPDES permit for BOD, TSS and ammonia.

Cost Summary

	Baseline	Proposed	Baseline Less Proposed
Initial Cost	$4,487,000	$3,600,000	$887,000
Life-Cycle Cost	$0	$0	$0
Total Cost Including LCC	$4,487,000	$3,600,000	**$887,000**
		20%	**Savings**

Title	**Convert Donut Clarifiers to Primaries Prior to New SBRs**
Function	**Grow Biomass**

Benefits and Risks

Baseline Assumption

Benefits	Risks and Challenges
No primary treatment	

Proposed Alternative

Benefits	Risks and Challenges
Reduces size of secondary treatment, thus the SBR process will be sized at 65% of the existing size.	The existing primary clarifiers are hydraulically limited as secondary clarifiers. The piping to and from the clarifiers will need to be upsized to provide 5-mgd of capacity.

Title	**Convert Donut Clarifiers to Primaries Prior to New SBRs**
Function	**Grow Biomass**

Discussion

The existing secondary clarifiers will be converted to primary clarifiers. This will require upsizing the feed and effluent piping on the secondary clarifiers. The existing mechanisms will need to be recoated.

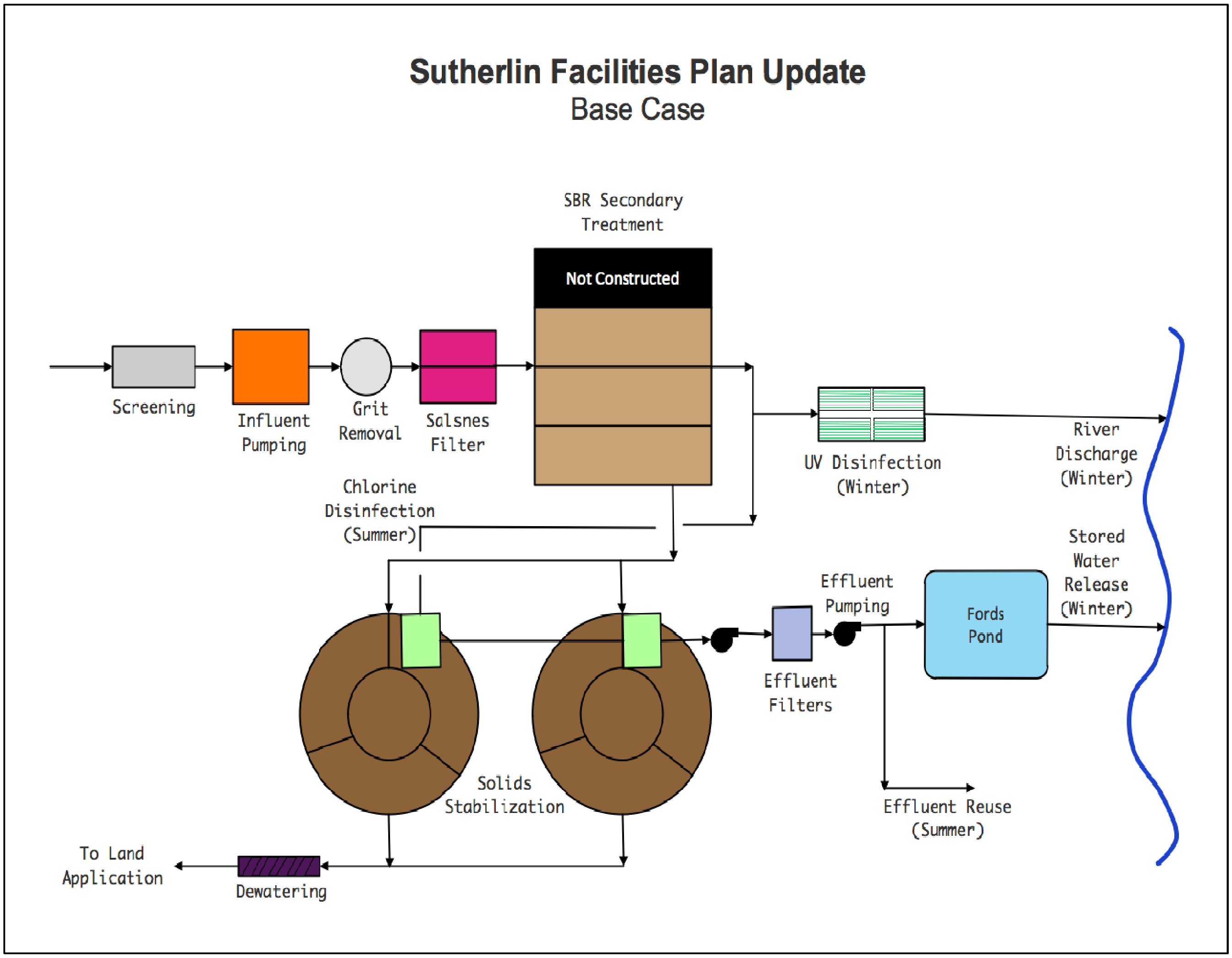
The digester volume in the base case is 1.55-million gallons (mg). The GB-11 case lowers the aerobic digestion volume to 1.27-mg. The plant is projected to produce 1,269,000 gallons of 2% solids per year based on the DRAFT Facilities Plan. This is 105,750 gallons per month. With a minimum 60-days SRT required, assume to be HRT by ignoring decanting, this means that there is a need for at least 211,500 gallons required to meet the 60-days SRT. Without decanting, this would be twice that much or 423,000 gallons. There will be a need to provide storage during the winter months when solids cannot be land applied. Assuming a 5-month land application period, the system will need 7 months storage, which is 740,250 gallons. This is less than the 1.27-mg that is available in this option. Therefore, with the removal of digestion volume by keeping the clarifiers, there is still adequate aerobic digestion volume.

Implementation Considerations

The constructability of this option will need to be evaluated. The SBRs will need to be constructed first so that one of the existing units can be removed from service at a time for construction.

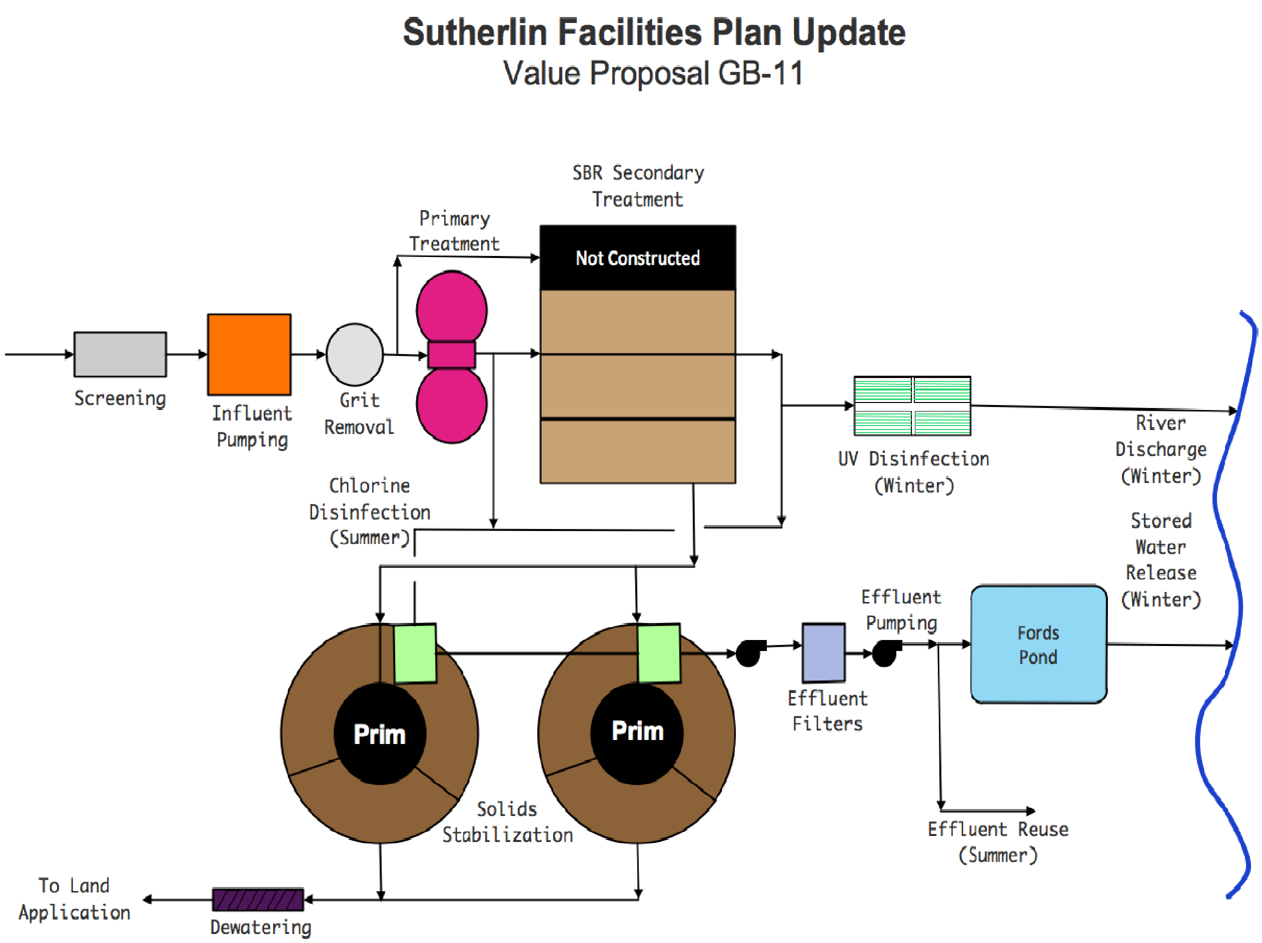
Title	Convert Donut Clarifiers to Primaries Prior to New SBRs
Function	Grow Biomass

Sketch of Baseline Assumption



Title	**Convert Donut Clarifiers to Primaries Prior to New SBRs**
Function	**Grow Biomass**

Sketch of Proposed Alternative



Title	**Convert Donut Clarifiers to Primaries Prior to New SBRs**
Function	**Grow Biomass**

Initial Cost

Design Element		**Markup**		**Baseline Assumption**		**Proposed Alternative**		
#	**Description**	**%**	**Unit**	**Qty**	**Unit Cost**	**Qty**	**Unit Cost**	**Total Cost**
1	Primary Treatment			0	$0	1	$500,000	$500,000
2	SBR Cost			1	$4,487,000	1	$3,100,000	$3,100,000
3								$0
4								$0
5								$0
6								$0
7								$0
8								$0
9								$0
10								$0
	Total Initial Cost				**$4,487,000**			**$3,600,000**
	Total Savings (Baseline Less Proposed)							**$887,000**
								Savings

Assumptions and Notes re: Calculations

Title	**Add Submersible Pumps in Existing Screenings Channel to Pump to New Screening Facility Following Pump Station**
Function	**Remove Debris**

Value Summary

Baseline Assumption

DESIGN CRITERIA
Peak Hour Flow - 9.0-mgd

INFLUENT PUMP STATION (IPS) DESIGN
A new IPS is being designed. The station has 2 pumps @ 750 gpm each and 3 pumps @ 2100 gpm each.

NOTE: The existing pumps will not provide 9.0-mgd of capacity with largest unit out of service. This does not meet DEQ redundancy criteria for influent pumping.

Proposed Alternative

Convert the existing screenings channel to the influent pump station by removing the screens and constructing new screenings facility. The existing screenings facility will be converted to the influent pump station using submersible pumps.

Cost Summary

	Baseline	Proposed	Baseline Less Proposed
Initial Cost	$1,397,000	$1,100,000	$297,000
Life-Cycle Cost	$0	$0	$0
Total Cost Including LCC	$1,397,000	$1,100,000	**$297,000**
		21%	**Savings**

Title	**Add Submersible Pumps in Existing Screenings Channel to Pump to New Screening Facility Following Pump Station**
Function	**Remove Debris**

Benefits and Risks

Baseline Assumption

Benefits	Risks and Challenges
	Depth of screenings channel must be adequate to allow for pump station wet well.
	Pumping will occur before screening. This may increase opportunity for pumps to clog. It is recommended that a non-clog pump such as a Flygt "N' impeller pump be used.

Proposed Alternative

Benefits	Risks and Challenges
This removes the screenings area from being a confined space entry.	Screenings channel be of depth that will provide adequate depth to the wet well.
No Difference in Life-Cycle Costs	A pump around will be required during construction.

Title	**Add Submersible Pumps in Existing Screenings Channel to Pump to New Screening Facility Following Pump Station**
Function	**Remove Debris**

Discussion

1. Convert screenings channel to wet well for submersible pumps.
2. Construct new screenings facility in front of grit basin.
3. Install pumps in new wet well.

Implementation Considerations

Title	**Add Submersible Pumps in Existing Screenings Channel to Pump to New Screening Facility Following Pump Station**
Function	**Remove Debris**

Initial Cost

Design Element		Markup		Baseline Assumption		Proposed Alternative		
#	**Description**	**%**	**Unit**	**Qty**	**Unit Cost**	**Qty**	**Unit Cost**	**Total Cost**
1	Influent Screening				$581,000			$750,000
2	Influent Pump Station				$816,000			$350,000
3								$0
4								$0
5								$0
6								$0
7								$0
8								$0
9								$0
10								$0
	Total Initial Cost				**$1,397,000**			**$1,100,000**
	Total Savings (Baseline Less Proposed)							**$297,000**
								Savings

Assumptions and Notes re: Calculations

Title	**Produce Class C Reuse Without Using Filters**
Function	**Remove TSS**

Value Summary

Baseline Assumption

The base case is to produce a Class A Reclaimed Wastewater using filters.

Proposed Alternative

In this option, filters will not be installed. The secondary effluent will be disinfected to a Class C level and sent to the Golf Course for irrigation. This will take about 30% of the summer flow on a average summer season. The remaining flow will go to Fords Pond. The reclaimed wastewater will be stored there until it can be discharged during the winter permit season. A local olive nursery uses the water from Fords Pond to irrigate the orchards. In addition, it used this water to spray the foliage.

Disinfection - Class C recycled water must not exceed a median of 23 total coliform organisms per 100 milliliters, based on results of the last seven days that analyses have been completed, and 240 total coliform organisms per 100 milliliters in any two consecutive samples.

The Oregon Administrative Rules Division 55 outline the requirements for the treatment of reclaimed wastewater. Class C wastewater is limited in its use and site must have restricted access. (SEE DOCUMENT REUSE PROS & CONS) Most notably, the access for Golf Courses is:

"During irrigation of a golf course, a cemetery, a highway median, or an industrial or business campus, the public must be restricted from direct contact with the recycled water."

Cost Summary

	Baseline	Proposed	Baseline Less Proposed
Initial Cost	$920,000	$0	$920,000
Life-Cycle Cost	$835,560	$954,926	-$119,366
Total Cost Including LCC	$1,755,560	$954,926	**$800,634**
		46%	**Savings**

Title	**Produce Class C Reuse Without Using Filters**
Function	**Remove TSS**

Benefits and Risks

Baseline Assumption

Benefits	Risks and Challenges
Less monitoring of use required.	Must operate Filter
Available to more users.	
Allows unrestricted access to reuse sites.	
Provides opportunity for a purple pipe system.	
Can be used by Olive Orchard	
Few restrictions in the use.	

Proposed Alternative

Benefits	Risks and Challenges
Do not need to operate filters and make capital outlay for filters.	Lower level of treatment provides more restrictions to use.
	Lower level of treatment requires restricted access for users.
	Cannot use Fords Pond due to irrigation requirements for Olive Orchard
	Cannot be used to irrigate Olive Orchard

Title	**Produce Class C Reuse Without Using Filters**
Function	**Remove TSS**

Initial Cost

Design Element		Markup		Baseline Assumption		Proposed Alternative		
#	Description	%	Unit	Qty	Unit Cost	Qty	Unit Cost	Total Cost
1	Replace existing filter with new filter Unit			1	$920,000			$0
2								$0
3								$0
4								$0
5								$0
6								$0
7								$0
8								$0
9								$0
10								$0
	Total Initial Cost				**$920,000**			**$0**
	Total Savings (Baseline Less Proposed)							**$920,000**
								Savings

Assumptions and Notes re: Calculations

Title	**Produce Class C Reuse Without Using Filters**
Function	**Remove TSS**

Life-Cycle Cost Analysis

A. INITIAL COST

	Life-Cycle Period (Years)	25		**Baseline**	**Proposed**
OMB	**Discount Rate (Interest)**	1.75%	**acility Useful Life (Years)**		
	Escalation Rate	0.00%	**Initial Cost**	$920,000	$0
	Note: Escalation shown as 0.00%, if using constant dollar LLC analysis			**Savings**	$920,000

B. RECURRENT ANNUAL COST

B **P** ← Place "x" in appropriate box below (**B**=Baseline, **P**=Proposed).

B	P		Expenditure Description	Notes and/or Calculations	Baseline Cost	Proposed Cost
x		1	Hypochlorite disinfection	Dose at 8 mg/L	$41,552	$47,488
	x	2				
		3				
		4				
		5				
		6				
		7				
		8				
		9				
		10				
				Total Annual Cost	$41,552	$47,488
				Present Worth Factor	20.1088	20.1088
				Present Worth of Recurrent Cost	$835,560	$954,926

C. SINGLE EXPENDITURES

B	P	#	Expenditure Description	Year	Cost	PW Factor	Baseline Present Worth	Proposed Present Worth
B	P	←	Place "x" in appropriate box below (**B**=Baseline, **P**=Proposed).					
x		1				1.0000	$0	$0
	x	2				1.0000	$0	$0
		3				1.0000	$0	$0
		4				1.0000	$0	$0
		5				1.0000	$0	$0
		6				1.0000	$0	$0
		7				1.0000	$0	$0
		8				1.0000	$0	$0
		9				1.0000	$0	$0
		10				1.0000	$0	$0

D. SALVAGE VALUE

B	P	#	Expenditure	Year	Value	PW Factor	Baseline Present Worth	Proposed Present Worth
B	P	←	Place "x" in appropriate box below(**B**=Baseline, **P**=Proposed). NOTE: Salvage value is usually a negative cost					
x		#				1.0000	$0	$0
	x	#				1.0000	$0	$0
						Present Worth of Single Expenditures	$0	$0

E. TOTAL RECURRENT COST AND SINGLE EXPENDITURES (B+C+D

	Baseline	Proposed
	$835,560	$954,926
Recurrent Cost and Single Expenditures	**Cost**	-$119,366
Total Present Worth Cost	$1,755,560	$954,926
Total Life-Cycle Cost	**Savings**	$800,634

Title	**Produce Class B Reuse Without Using Filters**
Function	**Remove TSS**

Value Summary

Baseline Assumption

The base case is to produce a Class A Reclaimed Wastewater using filters.

Proposed Alternative

In this option, filters will not be installed. The secondary effluent will be disinfected to a Class B level and sent to the Golf Course for irrigation. This will take about 30% of the summer flow on a average summer season. The remaining flow will go to Fords Pond. The reclaimed wastewater will be stored there until it can be discharged during the winter permit season. A local olive nursery uses the water from Fords Pond to irrigate the orchards. In addition, it used this water to spray the foliage.

Disinfection - Class B recycled water must not exceed a median of 2.2 total coliform organisms per 100 milliliters, based on results of the last seven days that analyses have been completed, and 23 total coliform organisms per 100 milliliters in any single sample.

The Oregon Administrative Rules Division 55 outline the requirements for the treatment of reclaimed wastewater. Class C wastewater is limited in its use and site must have restricted access. (SEE DOCUMENT REUSE PROS & CONS) Most notably, the access for Golf Courses is:

"During irrigation of a golf course, the public must be restricted from direct contact with the recycled water."

Cost Summary

	Baseline	Proposed	Baseline Less Proposed
Initial Cost	$920,000	$0	$920,000
Life-Cycle Cost	$835,560	$1,432,389	-$596,829
Total Cost Including LCC	$1,755,560	$1,432,389	**$323,171**
		18%	**Savings**

Title	**Produce Class B Reuse Without Using Filters**
Function	**Remove TSS**

Benefits and Risks

Baseline Assumption

Benefits	Risks and Challenges
Less monitoring of use required.	Must operate Filter
Available to more users.	Few restrictions in the use.
Allows unrestricted access to reuse sites.	Can be used by Olive Orchard
Provides opportunity for a purple pipe system.	

Proposed Alternative

Benefits	Risks and Challenges
Do not need to operate filters and make capital outlay for filters.	Lower level of treatment provides more restrictions to use.
	Lower level of treatment requires restricted access for users.
	Cannot use Fords Pond due to reuse needs for Olive Orchard

Title	**Produce Class B Reuse Without Using Filters**
Function	**Remove TSS**

Initial Cost

Design Element		Markup		Baseline Assumption		Proposed Alternative		
#	**Description**	**%**	**Unit**	**Qty**	**Unit Cost**	**Qty**	**Unit Cost**	**Total Cost**
1	Replace existing filter with new filter Unit			1	$920,000	0	$0	$0
2								$0
3								$0
4								$0
5								$0
6								$0
7								$0
8								$0
9								$0
10								$0
	Total Initial Cost				**$920,000**			**$0**
	Total Savings (Baseline Less Proposed)							**$920,000**
								Savings

Assumptions and Notes re: Calculations

Title	**Produce Class B Reuse Without Using Filters**
Function	**Remove TSS**

Life-Cycle Cost Analysis

A. INITIAL COST

				Baseline	Proposed
	Life-Cycle Period (Years)	25			
OMB	Discount Rate (Interest)	1.75%	acility Useful Life (Years)		
	Escalation Rate	0.00%	Initial Cost	$920,000	$0
	Note: Escalation shown as 0.00%, if using constant dollar LLC analysis		Savings		$920,000

B. RECURRENT ANNUAL COST

B **P** ← Place "x" in appropriate box below (**B**=Baseline, **P**=Proposed).

B	P	#	Expenditure Description	Notes and/or Calculations	Baseline Cost	Proposed Cost
x		1	Hypochlorite for disinfetion	Need to disinfect to get 2.2 Total Coliform without filtration. Assume a dose of 12 mg/L	$41,552	$71,232
	x	2				
		3				
		4				
		5				
		6				
		7				
		8				
		9				
		10				
				Total Annual Cost	$41,552	$71,232
				Present Worth Factor	20.1088	20.1088
				Present Worth of Recurrent Cost	$835,560	$1,432,389

C. SINGLE EXPENDITURES

B	P	#	Expenditure Description	Year	Cost	PW Factor	Baseline Present Worth	Proposed Present Worth
x		1				1.0000	$0	$0
	x	2				1.0000	$0	$0
		3				1.0000	$0	$0
		4				1.0000	$0	$0
		5				1.0000	$0	$0
		6				1.0000	$0	$0
		7				1.0000	$0	$0
		8				1.0000	$0	$0
		9				1.0000	$0	$0
		10				1.0000	$0	$0

B P ← Place "x" in appropriate box below (**B**=Baseline, **P**=Proposed).

D. SALVAGE VALUE

B P ← Place "x" in appropriate box below(**B**=Baseline, **P**=Proposed). NOTE: Salvage value is usually a negative cost

B	P	#	Expenditure	Year	Value	PW Factor	Baseline Present Worth	Proposed Present Worth
x		#				1.0000	$0	$0
	x	#				1.0000	$0	$0
						Present Worth of Single Expenditures	$0	$0

E. TOTAL RECURRENT COST AND SINGLE EXPENDITURES (B+C+D)

	Baseline	Proposed
E. TOTAL RECURRENT COST AND SINGLE EXPENDITURES (B+C+D)	$835,560	$1,432,389
Recurrent Cost and Single Expenditures	**Cost**	-$596,829
Total Present Worth Cost	$1,755,560	$1,432,389
Total Life-Cycle Cost	**Savings**	$323,171

Title	**Use Thickening Only Without Stabilization and Haul Thickened Solids to a Local Contractor**
Function	**Treat Solids**

DETERMINED AS NOT RECOMMENDED

Value Summary

Baseline Assumption

The solids are currently stabilized in aerobic digestion. The digested solids (biosolids) are hauled to agricultural land as a liquid during the summer months. Solids are stored during the winter (wet) months to the greatest extent possible. Additional solids that cannot be hauled to approved land application sites are hauled to a local facility (Heards Farm) for disposal at $0.07 per gallon. The cost for dewatered cake at 16% solids will be $30.00 per ton (Wet Ton).

Proposed Alternative

In this option, it was considered that the solids can be thickened and then hauled as a non-stabilized material and hauled to Heards Farm.

After review of this option, the facility will have stabilization facilities (aerobic digestion). **Therefore, there is no savings that bee realized from this option so this option was not reviewed further.**

Cost Summary

	Baseline	Proposed	Baseline Less Proposed
Initial Cost	$0	$0	$0
Life-Cycle Cost	$0	$0	$0
Total Cost Including LCC	$0	$0	**$0**
			No Change

Appendix B—Design Suggestion Workbooks

Title	Use Sodium Hypochlorite for Summer Disinfection and UV for Winter Disinfection
Function	<Function Under Which Brainstormed>

Value Summary

Baseline Assumption

The base alterative is to use hypochlorite for effluent disinfection of the reclaimed wastewater in the summer and use UV for effluent disinfection for river discharge in the winter season.

Proposed Alternative

The team would like to make a few design suggestions/comments on the base case:
1. UV disinfection for the winter season will need to be designed to pass a peak flow of 9.0-mgd with a dose of 30 mJ/cm2. This will require a large UV system that will not be used at its capacity very often. Flows will exceed the Max Week Wet Weather flow of 4.04-mgd rarely.

2. The large UV system can be used to disinfect FILTERED EFFLUENT for reuse at a dose of 100 mJ/cm2. Due to the fact that the system is designed for the high peak flow, there will be plenty of capacity to use the system to dose the Class A reuse water. The dosage required for Class A reclaimed wastewater is for a CT of 450-mg-min/L. With the Chlorine Contact Basin size being 105,500-gallons, this will require a residual of 5-mg/L for 90 minutes at MMDWF. The MMDWF is 1.88-mgd and will give a DT of 80-minutes. Therefore, the residual will need to be 5.6-mg/L for 80 minutes. It can be assumed that there will be a chlorine demand of 1.5-mg/L, therefore the dose will need to be 7.0 to 7.5-mg/L. This may make it cost effective to use the UV. Once disinfection is achieved with the UV, then the hypochlorite will only need to be added to get a residual of say 1.0-mg/L to keep a residual in the pipeline. The tradeoff will be the operation of the UV system to the purchase of 6.0 to 6.5-mg/L of sodium hypochlorite.

3. Peracetic Acid has been gaining acceptance as an alternative disinfect that can provide disinfection at low feed concentrations and detention times. A quick evaluation may be worthwhile due to the hauling cost for sodium hypochlorite. though peracetic acid is more costly, the dose is lower and the hauling cost will be less. In this situation, it may be worthwhile.

Cost Summary : Design Suggestion (No Cost Impact)

Title	**Use UV Year-Round With Sodium Hypochlorite for Reuse**
Function	**Disinfect Wastewater**

Value Summary

Baseline Assumption

Reuse effluent would be disinfected with hypochlorite.

Proposed Alternative

Reuse effluent would be disinfected with UV followed by addition of hypochlorite sufficient to create a chlorine residual.

Cost Summary : Design Suggestion (No Cost Impact)

Title	**Use UV Year-Round With Sodium Hypochlorite for Reuse**
Function	**Disinfect Wastewater**

Benefits and Risks

Baseline Assumption

Benefits	Risks and Challenges
Meets Regulations	
Inhibits Algae Growth	

Proposed Alternative

Benefits	Risks and Challenges
Meets Regulations	
Inhibits Algae Growth	
Reduction of Chemical Costs	

Title	**Use UV Year-Round With Sodium Hypochlorite for Reuse**
Function	**Disinfect Wastewater**

Discussion

Utilization of the UV equipment to disinfection the reuse flow is feasible since the UV process will be designed to accommodate peak flows through the plants in the winter months. As the reuse flows are significantly lower, the regulations for Class A effluent. The purpose of the addition of hypochlorite after the UV disinfection is to produce a chlorine residual to inhibit algae growth in the storage pond.

Implementation Considerations

No apparent implementation considerations.

Title	**Upgrade Existing Systems and Add SBR for Growth Capacity**
Function	**Grow Biomass**

DETERMINED AS NOT RECOMMENDED

Value Summary

Baseline Assumption

The base case is to convert the existing units to aserobic digesters and construct 4 new SBRs.

Proposed Alternative

A preliminary analysis was done on this concept. The existing systems are limited to a peak flow capacity of 1.88-mgd based on secondary clarifier overflow rate. A design value of 750-gpd/ft2 was used. With a required peak flow capacity of 9.0-mgd or even @ 5.0-mgd with some type of blending will not make the investment in upgrading these units worthwhile. The cost of constructing new anaerobic digestion process outweighs the benefit of 1.88-mgd of capacity.

Upon further examination, it was determined that this alternative should not be pursued.

Cost Summary : Design Suggestion (No Cost Impact)

Title	**Retain Geotechnical Engineer to Analyze Site Soils**
Function	**Miscellaneous**

Value Summary

Baseline Assumption

Geotechnical work at the plant site would be accomplished during the early stages of design.

Proposed Alternative

The proposed alternative is to start the geotechnical work as soon as possible.

Cost Summary : Design Suggestion (No Cost Impact)

Title	**Retain Geotechnical Engineer to Analyze Site Soils**
Function	**Miscellaneous**

Benefits and Risks

Baseline Assumption

Benefits	Risks and Challenges
Ability to coordinate of subsurface work with footprint of the proposed structures.	Unexpected expenses for unknown conditions
	Disruption of financing
	Potential project delays.

Proposed Alternative

Benefits	Risks and Challenges
Higher confidence of estimated costs	
Adverse impact of schedule delays caused by potential preloading of site	

Title	**Retain Geotechnical Engineer to Analyze Site Soils**
Function	**Miscellaneous**

Discussion

Knowledge of subsurface conditions is essential for the determination of how to establish the design parameters for the foundations of the plant structures. That knowledge is usually obtained by drilling test holes at the plant site and performing numerous tests. In some cases, adverse subsurface conditions are encountered that can lead to significant and unanticipated expenses. Needless to say, that in turn can create an adverse impact upon project financing. And in other cases subsurface conditions can result in project delays, for example preloading of the site for several months. To minimize the risk and potential impact resulting from such adverse conditions, it is prudent to secure the site geotechnical information as soon as possible.

Implementation Considerations

Site geotechnical reports often include specific recommendations on proposed structures whose foundations will support large loads. The location, size, and materials that will be used to construct the structure are occasionally not known until some of the initial design is completed. This could require the geotechnical work to be accomplished in two phases, one to drill the test holes and completed the testing, and if necessary, followed by a second phase to produce specific foundation recommendations.

Title	**Monitor Peizometric Levels on the Site During Dry Weather and Wet Weather**
Function	**Miscellaneous**

Value Summary

Baseline Assumption

There appears that no baseline has been developed on this project condition.

Proposed Alternative

Establishment of piezometric wells on the project site and areas where the construction of Lagoons is recommended. The piezometric wells should be equipped with recorders that will compile data on water levels for a period of at least one year.

Cost Summary : Design Suggestion (No Cost Impact)

Title	**Monitor Peizometric Levels on the Site During Dry Weather and Wet Weather**
Function	**Miscellaneous**

Benefits and Risks

Baseline Assumption

Benefits	Risks and Challenges
Baseline unknown.	

Proposed Alternative

Benefits	Risks and Challenges
Reduces risk of structural damage.	
Enhances design efficiency.	
Reduces risk of construction claims	
Provides contractors with design data for dewatering.	

Title	**Monitor Peizometric Levels on the Site During Dry Weather and Wet Weather**
Function	**Miscellaneous**

Discussion

Excessively high ground water can adversely impact the construction of underground structures. It also becomes a design parameter for underwater structures, both for leakage and for buoyancy on water-tight structures. For lagoons, dramatic changes in water level beneath the ground surrounding the lagoon, can make dramatic changes in the water level within the lagoon It therefore is prudent to secure date on site water levels and the changes that occur through out the year.

Implementation Considerations

There are no know implementation Considerations.

Title	**Use Independent SCADA Systems Integrator That is a Direct and Prequalified Contractor With the City**
Function	**Miscellaneous**

Value Summary

Baseline Assumption

Design and supply and installation of Supervisor Control and System (SCADA) will be the responsibility of the General Contractor awarded the job.

Proposed Alternative

The responsibility for the design and equipment selection of the SCADA system will become the responsibility of a prequalified separate contractor retained by the City of Sutherlin. Installation of the SCADA system will become the responsibility of the General Contractor awarded the job.

Cost Summary : Design Suggestion (No Cost Impact)

Title	**Use Independent SCADA Systems Integrator That is a Direct and Prequalified Contractor With the City**
Function	**Miscellaneous**

Benefits and Risks

Baseline Assumption

Benefits	Risks and Challenges
Less Administration	Sufficient experience and technical knowledge
	High maintenance, particularly with programming
	Low quality equipment
	Sufficient oversight of the product received
	Equipment is selected by low bid, not capability

Proposed Alternative

Benefits	Risks and Challenges
Better control of SCADA product received	Higher Administration
Work involved is assigned to those with the experience and knowledge necessary to produce their work.	
Significantly lower maintenance and operational costs	
Ability to tailor SCADA system to the specifics of the plant.	

Title	**Use Independent SCADA Systems Integrator That is a Direct and Prequalified Contractor With the City**
Function	**Miscellaneous**

Discussion

The normal practice of making a General Contractor responsible for the design, supply and installation of the SCADA system, usually means that the sub contractor hired is most likely to have accomplished that by submitting the lowest price. The subcontractor bases his bid largely by the Process And Integration Diagram (P&ID) and to a lesser extent by the project specifications. The problem with this approach is that it creates an opportunity for bidders who lack experience and sufficient knowledge of systems integration work to accomplish the necessary functions. And if successful in submitting the low bid and awarded the sub contract, everybody associated with project suffers. A potential solution is for the City of Sutherlin to award a separate contract for the design and equipment selection of the SADA system to a prequalified contractor. The prequalification information for potential bidders should include past projects, years of experience, financial references, current work load, resumes of key personnel and evaluation criteria that will be used to select potential bidders. Once the systems integration work has progressed to the point that the equipment has been selected, design is complete. The systems integration design and the selected equipment are included in the final design documents for the project, assigning the supply and installation of the equipment, material and labor to complete the SCADA system to the successful General Contractor.

Implementation Considerations

This proposed concept must be completed during the latter stages of the final design in order for the installation of the SCADA system to be included in the price bid for the General Contract.

Title	**Utilitze Dispatchable Power to Make the Auxillary Generator Part of the Electric Utility Provider Incentive Program**
Function	**Miscellaneous**

Value Summary

Baseline Assumption

A new standby generator will be installed that will provide backup power to the treatment plant.

Proposed Alternative

Portland General Electric has a program called the "Dispatchable Power Program" that they utilize to purchase power production capacity in a distributed manner. They will purchase part of the stanby generator, perform the maintenance and pay for the fuel costs to operate the generator. In return, they reserve the right to operate the generator from their main control room up to 100-hours per year as a peak shaving measure. The City needs to discuss this program with their local power provider to determine if such a program exists.

Cost Summary : Design Suggestion (No Cost Impact)

Title	**Investigate Securing a Temporary Lease Adjacent to the Plant for a Staging Area**
Function	**Miscellaneous**

Value Summary

Baseline Assumption

Baseline assumption is unknown.

Proposed Alternative

Securing a temporary lease on a site adjacent to the plant property to be used by the General Contractor as a staging area during construction of the plant modifications.

Cost Summary : Design Suggestion (No Cost Impact)

Title	**Investigate Securing a Temporary Lease Adjacent to the Plant for a Staging Area**
Function	**Miscellaneous**

Benefits and Risks

Baseline Assumption

Benefits	Risks and Challenges
Baseline unknown	

Proposed Alternative

Benefits	Risks and Challenges
Reduces transport expense and time requirements	May add to the capital cost
Easier to supply potable water and power	
Consolidation of on site facilities and storage in one location	
Allows immediate inspection of delivered equipment and material	
Affords better security because of plant proximity.	

Title	**Investigate Securing a Temporary Lease Adjacent to the Plant for a Staging Area**
Function	**Miscellaneous**

Discussion

There is not sufficient area within the plant property to accommodate the necessary area for the construction of the plant modifications. As both the city and the contractor would benefit from having the staging area adjacent to the plant site, it is recommended that the city secure a temporary lease on and adjacent parcel during construction. The size of the lease should range from 3 to 5 acres, dependent upon the treatment process selected. Since the contractor would use the area predominately for storage and field offices, there would be little impact upon the land, and the infrastructure added (power pole, water lines, etc.,) could easily be removed upon plant completion.

Implementation Considerations

The plans and specifications should identify the location and size of the area leased, so the cost impact (reduction or increase) can by included the bid received.

Title	**Put Screens in Existing Channels**
Function	**Remove Debris**

Value Summary

Baseline Assumption

The base case is to install new screens in the existing screen channel.

Proposed Alternative

The existing screen channel currently has one screen with the second channel used as a bypass channel. Putting a screen in both channels eliminates the bypass channel. The hydraulic requirement for the treatment plant is to be able to pass peak hour flow with the largest unit out of services. One channel cannot handle 9.0-mgd. The designer needs to consider how he will be handling the required redundancy requirements for passing flow in the screening facility.

Cost Summary : Design Suggestion (No Cost Impact)

Title	**Compost Class A Solids with Yard Debris**
Function	**Treat Solids**

Value Summary

Baseline Assumption

In the base case, the solids are aerobically digested and land applied on local agricultural land as a dewatered cake.

Proposed Alternative

Composting of yard debris leaves a material that is high in carbon and low in organic nitrogen, The production of a Class A biosolids at the treatment plant will open the doors to other utilization options. One such option is to haul to a local yard debris composting operation to mix with the finished or raw yard debris. This will provide a dependable reuse option for the dewatered cake and will provide a higher value compost with better nutrient value for the user.

Cost Summary : Design Suggestion (No Cost Impact)

Appendix C—VA study Job Plan

BREMMER
CONSULTING LLC

Value Study Job Plan

Phase	Activities	Results
Preparation (Pre-Study)	▪ Define study scope and objectives ▪ Identify participants, obtain time commitment ▪ Coordinate logistics, agenda, venue, etc. ▪ Gather and distribute project information: scope, designs, reports, estimate, cost models, project models, schedule, risks, and constraints	▪ Fosters understanding of study priorities ▪ Defines expectations ▪ Organizes the study ▪ Offers a thorough overview of the whole project
Information	▪ Review project information (team members and facilitator) ▪ Meet (kickoff) with client, designers, stakeholders, VE team members, and facilitator ▪ Define project performance metrics ▪ Visit site and discuss problems the project must solve; identify issues design may not address	▪ Brings all team members to a common understanding of the project, including its challenges and constraints ▪ Establishes the benchmark for which to identify alternatives ▪ Gains "real-world" perspective of the project and builds foundation for function analysis
Function Analysis	▪ Identify and classify project functions ▪ Model functional relationship via Function Analysis System Technique (FAST) ▪ Apply cost model data to determine function costs and worth relative to performance ▪ Correlate applicable risks with functions ▪ Select specific functions for study	▪ Provides a comprehensive project understanding by focusing on what the project does, rather than what it is ▪ Identifies what the project must do to satisfy customer needs and objectives ▪ Identifies value-mismatched functions and focuses on functions with the greatest opportunity for project improvement
Creativity	▪ Brainstorm to generate performance-focused ideas for alternative ways to perform functions ▪ Discuss, build-on, and clarify ideas	▪ VE team develops a broad array of ideas that provide a wide variety of possible alternative components or methods to improve project value
Evaluation	▪ Eliminate obvious "fatal flaw" ideas ▪ Rank ideas based on performance criteria and study goals ▪ Discuss conflicting rankings, further clarify ideas, and determine final rankings ▪ Discuss ideas with client and designers	▪ Prioritizes ideas for development—focusing on those with the highest potential performance improvement and cost savings ▪ Determines value: performance/cost ▪ Focuses team's effort to develop alternatives that best meet client study objectives
Development	▪ Validate and refine idea concepts ▪ Compare to original design concept ▪ Define implementation requirements	▪ Provides side-by-side comparison of baseline and alternative— concepts, initial costs, life cycle costs, drawings, and performance metrics
Presentation	▪ Present key developed ideas to client, designers, and stakeholders ▪ Draft report	▪ Ensures management and other key stakeholders understand the rationale of the value alternatives and design suggestions
Implementation (Post-Study)	▪ Obtain implementation commitments ▪ Produce Final report ▪ Follow up	▪ Involves those who will implement and increases likelihood of implementation ▪ Improves actual value of the project

Appendix D—Performance Criteria Prioritization via Paired Comparison

Performance Criteria Prioritization via Paired Comparison

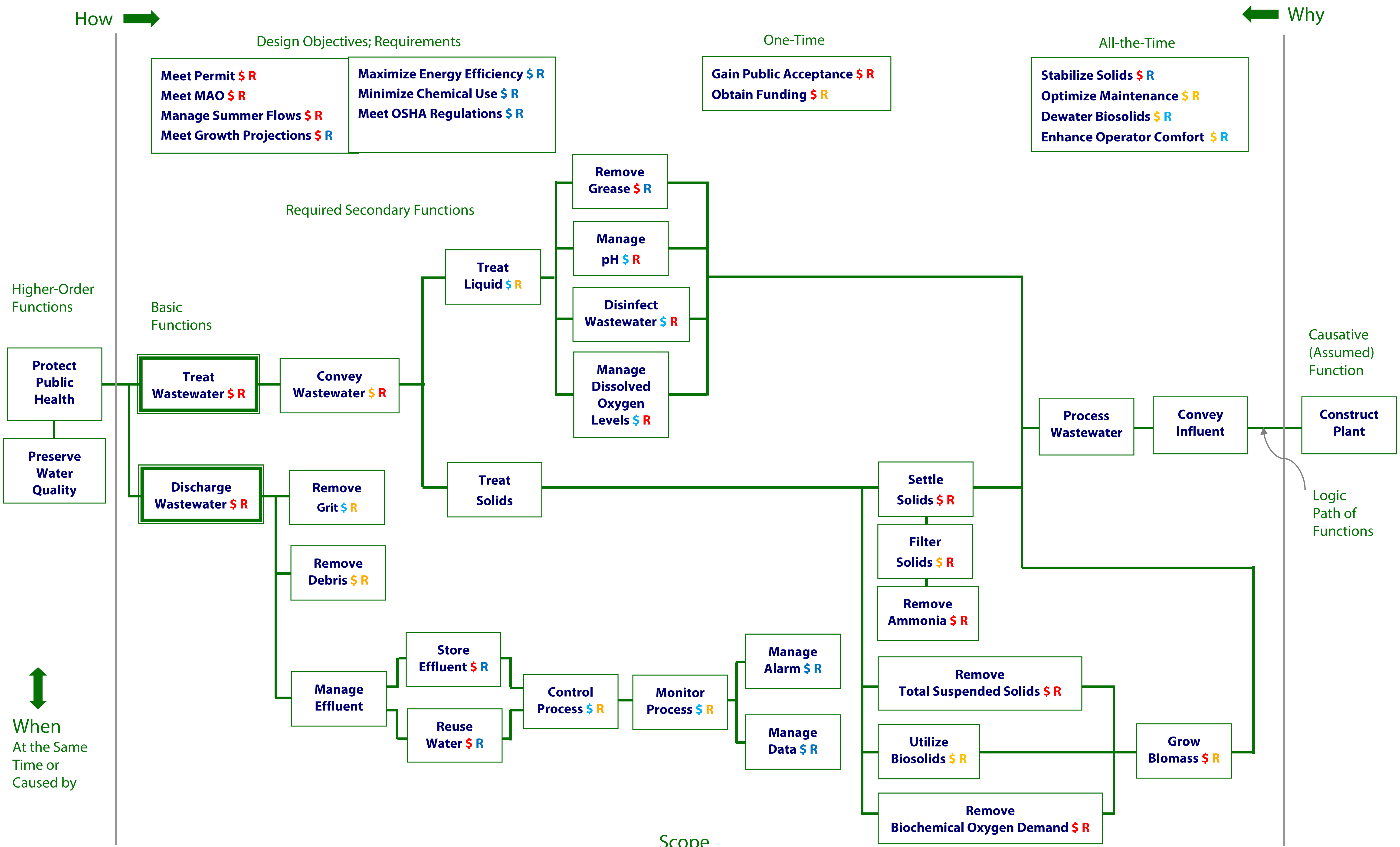
#	Performance Criterion	Which criterion is more important?								Total Occurrences for the Given Criterion (All Rows)	Weight of Importance (As %)
1	**Operability**—Ease of operations and maintenance; matches technology to the staff; flexible and efficient	2	1	4	1					2	20%
2	**Meets Regulatory Requirements**—MAO, NPDES Permit;		2	2	2					4	40%
3	**Supports Future Options**—Economic Growth, Industry development; development fees, expandability			4	3					1	10%
4	**Facilitates Public Acceptance**—Rates; Perception of Pond; Educate Public re cost of alternatives				4					3	30%
5	**Sustainability**—energy usage reduction; conservation									0	0%
									Sum of Occurrences of All Attributes	10	

Appendix E—FAST Diagram

VMC

Function Analysis System Technique (FAST) Diagram

Wastewater Treatment Facility Value Analysis Study—City of Sutherlin



Appendix F—Performance-Criteria-Based Evaluation of Creative Ideas

Performance-Criteria-Based Evaluation of Creative Ideas

Ratings Legend

Non-Numeric Ratings

DS=Design Suggestion; **DS***=Design Suggestion w/ Write-Up;
FF=Fatal Flaw; **OS**=Outside Scope; **EC**=Estimate Correction;
ABD=Already Being Done; **W/**=Contained Within Idea #___

Numeric Ratings

Supports Performance Criterion
5=Highly Agree, **3**=Neutral; **1**=Highly Disagree

Performance Criterion # →			1		2		3		4		5		Total Score for Idea
Weight of Importance of Performance Criterion →			20.0%		40.0%		10.0%		30.0%		0.0%		
Idea #	Idea Title	Non # Rating	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	
TS-01	Use Thickening Only Without Stabilization and Haul Thickened Solids to a Local Contractor		4	0.80	5	2.00	3	0.30	3	0.90	1	0.00	**4.00**
TS-02	Use Thickening With Stabilization to Class B With a Future Option to Class A		5	1.00	4	1.60	5	0.50	3	0.90	3	0.00	**4.00**
TS-03	Stabilize Liquid to a Class B With Dewatering and Future Option to go to Class A		5	1.00	4	1.60	3	0.30	3	0.90	3	0.00	**3.80**
TS-04	Use Thickening Prior to Stabilization	w/ TS-02		0.00		0.00		0.00		0.00		0.00	**0.00**
TS-05	Use Old Filter Space for Solids or Filtration	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
TS-06	Dewater Using Drying Beds		1	0.20	5	2.00	1	0.10	1	0.30	1	0.00	**2.60**
TS-07	Dewater Using Filter Bags		1	0.20	4	1.60	1	0.10	1	0.30	1	0.00	**2.20**
TS-08	Convert the Existing Donuts to Autothermic Aerobic Digestion (ATAD)		3	0.60	4	1.60	5	0.50	3	0.90	5	0.00	**3.60**
TS-09	Convert Existing Donuts and Cover to Use Anaerobic Digestion	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
TS-10	Dewater Solids and Incinerate	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
TS-11	Use a Belt Press	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
TS-12	Use Solids Cake Truck to Haul Biosolids to Agricultural Land	ABD		0.00		0.00		0.00		0.00		0.00	**0.00**
TS-13	Contract Removal of Solids (Privatize)	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
TS-14	Use Centrifuge for Dewatering	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
TS-15	Use Porteous Process to Cook Under Pressure to Facilitate Dewatering	FF		0.00		0.00		0.00		0.00		0.00	**0.00**

Performance Criterion # →			1		2		3		4		5		Total Score for Idea
Weight of Importance of Performance Criterion →			20.0%		40.0%		10.0%		30.0%		0.0%		
Idea #	Idea Title	Non # Rating	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	
TS-16	Utilize Cannibal Process (Side Stream Treatment on Activated Sludge) to Reduce Volume of Sludge Produced	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
TS-17	Compost Class A Solids With Yard Debris	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
TS-18	Use Alkaline Stabilization	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
TS-19	Use Facultative Sludge Lagoon	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
TS-20	Dry Sludge and Bag It for Use as Fertilizer	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
TS-21	Stabilize Class B Liquid or Cake With Future Expansion Capability for Class A		5	1.00	4	1.60	5	0.50	3	0.90	5	0.00	**4.00**
DW-01	Use Chlorine Gas for Summer Disinfection and UV for Winter Disinfection	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
DW-02	Use Mixed Oxidants for Disinfection	ABD		0.00		0.00		0.00		0.00		0.00	**0.00**
DW-03	Use Peracetic Acid for Disinfection	DS		0.00		0.00		0.00		0.00		0.00	**0.00**
DW-04	Use Sodium Hypochlorite for Summer Disinfection and UV for Winter Disinfection	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
DW-05	Keep Existing Chlorine System for Influent Odor Control	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
DW-06	Use Chlorine Gas for Year-Round Disinfection With Dechlorination	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
DW-07	Use Sodium Hypochlorite for Year-Round Disinfection With Dechlorination	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
DW-08	Use UV Year-Round With Sodium Hypochlorite for Reuse	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
DW-09	Purchase Hypochlorite vs. On-Site Generation	ABD		0.00		0.00		0.00		0.00		0.00	**0.00**
DW-10	Use Calcium Chlorite Tablets to Disinfect	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
GB-01	Use Extended Aeration to Grow Biomass	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
GB-02	Use Orbal Oxidation Ditch to Grow Biomass	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
GB-03	Use Existing Donuts for Sequencing Batch Reactor (SBR) with Peak-Flow Wet Weather Treatment		4	0.80	5	2.00	3	0.30	3	0.90	3	0.00	**4.00**
GB-04	Use Membrane Bio Reactor (MBR) With Peak-Flow Wet Weather Treatment		4	0.80	5	2.00	4	0.40	3	0.90	4	0.00	**4.10**

Performance Criterion # →			1		2		3		4		5		Total Score for Idea
Weight of Importance of Performance Criterion →			20.0%		40.0%		10.0%		30.0%		0.0%		
Idea #	Idea Title	Non # Rating	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	
GB-05	Use Two New SBRs With Peak Wet Weather Flow Treatment to Reduce From Four Trains to Two		5	1.00	5	2.00	5	0.50	3	0.90	5	0.00	**4.40**
GB-06	Upgrade Existing Systems and Add SBR for Growth Capacity		4	0.80	5	2.00	4	0.40	3	0.90	3	0.00	**4.10**
GB-07	Upgrade Existing Donuts by Using One for Liquid Digestion and the Other for Solids Digestion, and Add a Third Donut		2	0.40	4	1.60	3	0.30	3	0.90	3	0.00	**3.20**
GB-08	Purchase Additional Land and Add Lagoons for Liquids Treatment	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
GB-09	Keep Existing Donuts and Add Nitrification Filters	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
GB-10	Convert Donut Clarifiers to Chemically Enhanced Primaries Prior to New SBRs		3	0.60	4	1.60	3	0.30	3	0.90	3	0.00	**3.40**
GB-11	Convert Donut Clarifiers to Primaries Prior to New SBRs		4	0.80	5	2.00	4	0.40	3	0.90	4	0.00	**4.10**
GB-12	Keep Existing Plant for Liquids Process Followed by Tertiary Lagoon for Nitrification and Wet Weather Treatment	FF	0	0.00		0.00		0.00		0.00		0.00	**0.00**
GB-13	Add Integrated Fixed Film and Activated Sludge (IFAS) to Get More Treatment in Existing Basins	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
GB-14	Use Existing Clarifiers for Primary Treatment and Use Advantex for Secondary Treatment	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
FS-01	Use Membrane Filtration For Effluent		3	0.60	5	2.00	5	0.50	3	0.90	2	0.00	**4.00**
FS-02	Upgrade Existing Filter Tank With Underdrains and Mixed Media Filter		2	0.40	3	1.20	2	0.20	3	0.90	3	0.00	**2.70**
FS-03	Use Nova Filter for Summer Treatment for Reuse and for Winter Peak Flow Treatment	DS*	4	0.80	5	2.00	5	0.50	3	0.90	5	0.00	**4.20**
FS-04	Use Conventional Cloth Filter Media	DS		0.00		0.00		0.00		0.00		0.00	**0.00**
FS-05	Use Slow Sand Filters	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
FS-06	Use Trickling Filters	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
FS-07	Use Conventional Mixed Media Filters	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
FS-08	Use Fuzzy Filters	FF		0.00		0.00		0.00		0.00		0.00	**0.00**

Performance Criterion # →			1		2		3		4		5		Total Score for Idea
Weight of Importance of Performance Criterion →			20.0%		40.0%		10.0%		30.0%		0.0%		
Idea #	Idea Title	Non # Rating	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	
FS-09	Use Disk Filters	ABD		0.00		0.00		0.00		0.00		0.00	**0.00**
FS-10	Use Upflow Sand Filters	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
FS-11	Use Dynasand Filters	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
CW-01	Use Deep Pipe Storage to Store Peak Flows	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
CW-02	Manage Pump Station Flows via Storage in Wet Wells and Basins	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
CW-03	Use On-Site Equalization Basin for Peak Flow Storage	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
CW-04	Use Split-Flow Treatment	With GB W/03		0.00		0.00		0.00		0.00		0.00	**0.00**
CW-05	Use Wastewater Poaching to Take a Portion of the Waste to a Separate Treatment Facility		3	0.60	4	1.60	3	0.30	2	0.60	3	0.00	**3.10**
CW-06	Oversize the Influent Interceptor for Additional Storage	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
CW-07	Increase the Size of the Wet Wells for Storage	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
CW-08	Rent Trucks for Storage	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
CW-09	Convert Existing Screen Structure to Influent Pump Station		4	0.80	5	2.00	5	0.50	3	0.90	5	0.00	**4.20**
CW-10	Use Hydrostall Prerotation to Keep the Wet Well Clean, e.g., Rogue River	DS											**0.00**
CW-11	Build Satellite Plant at Location of Murphy's Pond	W/ CW-12											**0.00**
CW-12	Build Treatment Plant on East Side of City		3	0.60	5	2.00	4	0.40	3	0.90	4	0.00	**3.90**
CW-13	Use Lagoons Near Everett Pump Station for Satellite Treatment Plant	W/ CW-12											**0.00**
CW-14	Use Lagoons for Flow Equalization During Wet Weather at Pump Station		3	0.60	5	2.00	5	0.50	2	0.60	3	0.00	**3.70**
CW-15	Purchase North Douglas Log Pond and Sutherlin Log Pond and Use Lagoons With Intake and Aeration for Treatment on East Side of City	W/ CW-12											**0.00**
RD-01	Put Screens in Existing Channels	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
RD-02	Add Barmenuter to Reduce Debris Size	FF		0.00		0.00		0.00		0.00		0.00	**0.00**

Performance Criterion # →			1		2		3		4		5		Total Score for Idea
Weight of Importance of Performance Criterion →			20.0%		40.0%		10.0%		30.0%		0.0%		
Idea #	Idea Title	Non # Rating	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	
RD-03	Add Submersible Pumps to Pump to New Screening Facility Following Pump Station		4	0.80	5	2.00	5	0.50	3	0.90	5	0.00	**4.20**
RD-04	Add a Grit Removal Process After Screening	W/ RD-03	5	1.00	5	2.00	5	0.50	3	0.90	5	0.00	**4.40**
RD-05	Use a Cyclonic Grit Remover	W/ RD-03	3	0.60	5	2.00	4	0.40	3	0.90	3	0.00	**3.90**
RD-06	Clean Tanks Once Annually ILO Removing Grit	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
RD-07	Use Hydraulic Dredge to Remove Grit	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
RD-08	Use an Aerated Grit Process	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
RD-09	Hire a Frog Man With a Shop Vac to Remove Grit	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
RD-10	Modify Existing Channel to Settle Grit, Then Remove With Industrial Vacuum Equipment	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
SS-01	Construct Primary Treatment		2	0.40	5	2.00	4	0.40	3	0.90	4	0.00	**3.70**
SS-02	Use Primary Settling Lagoons	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
SS-03	Use Fine Screens	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
SS-04	Convert Ford Pond to a Treatment System	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
SS-05	Add Polymers to Chemically Settle Solids		2	0.40	4	1.60	3	0.30	3	0.90	1	0.00	**3.20**
SS-06	Pretreat With Actiflo		2	0.40	5	2.00	3	0.30	3	0.90	1	0.00	**3.60**
SS-07	Discharge Influent Flow Into a Lagoon Prior to Entering Headworks	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
RA-01	Use Activated Sludge With Modified Ludzack-Ettinger (MLE) Process to Create Anoxic Zone	ABD		0.00		0.00		0.00		0.00		0.00	**0.00**
RA-02	Use Activated Sludge With A2O Process to Remove Ammonia and Phosphorous	ABD		0.00		0.00		0.00		0.00		0.00	**0.00**
RA-03	Use Virginia Initiative Plant (VIP) Process to Remove Ammonia and Phosphorous	ABD		0.00		0.00		0.00		0.00		0.00	**0.00**
RA-04	Use High-Rate Annamox Bacteria	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
RA-05	Use Oxidation Ditch	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
MSF-01	Readdress With Oregon Department of Environmental Quality (DEQ) a Phosphorous Allocation from the (Total Maximum Daily Load) TMDL Reserve	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**

Performance Criterion # →			1		2		3		4		5		Total Score for Idea
Weight of Importance of Performance Criterion →			20.0%		40.0%		10.0%		30.0%		0.0%		
Idea #	Idea Title	Non # Rating	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	
MSF-02	Implement Purple Pipe Program (Using Recycled Water for Irrigation) for All New Residential Development	DS		0.00		0.00		0.00		0.00		0.00	**0.00**
MSF-03	Irrigate Neighboring Agricultural Property Using Recycled Water	OS		0.00		0.00		0.00		0.00		0.00	**0.00**
MSF-04	Irrigate Parks and Open Spaces Using Recycled Water	W/ CW-12		0.00		0.00		0.00		0.00		0.00	**0.00**
MSF-05	Build a Hybrid Poplar Farm, e.g., City of Woodburn	OS		0.00		0.00		0.00		0.00		0.00	**0.00**
MSF-06	Create an Upland Wetland Mitigation Bank (for Environmental Credit) at Fords Pond	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
MSF-07	Build a Wetland Park for Wildlife Refuge and Viewing at Fords Pond	OS		0.00		0.00		0.00		0.00		0.00	**0.00**
MSF-08	Build an Upland Wetland Treatment System at Fords Pond for Ammonia and Phosphorous Removal	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
MSF-09	Purchase Neighboring Wetlands and Build an Wetland Treatment System for Ammonia and Phosphorous Removal	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
MSF-10	Use Drip Dispersal Fields for the Golf Course, Olive Grove, and Other Sites	W/ RT-03		0.00		0.00		0.00		0.00		0.00	**0.00**
MSF-11	Use the Existing Ponds on the East Side of the City for Flow Equalization During Wet Weather	W/ CW-14		0.00		0.00		0.00		0.00		0.00	**0.00**
RT-01	Accept Class C Reuse Without Using Filters		5	1.00	3	1.20	3	0.30	3	0.90	4	0.00	**3.40**
RT-02	Accept Class B Reuse Without Using Filters		5	1.00	4	1.60	4	0.40	3	0.90	4	0.00	**3.90**
RT-03	Accept Class A Reuse Using Filters		4	0.80	5	2.00	5	0.50	3	0.90	4	0.00	**4.20**
RT-04	Add Filters for Grease Removal		3	0.60	5	2.00	5	0.50	3	0.90	3	0.00	**4.00**
M-01	Retain Geotechnical Engineer to Analyze Site Soils	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
M-02	Monitor Peiziometric Levels on the Site During Dry Weather and Wet Weather	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
M-03	Aggressively Eliminate Inflow by Sealing to Minimize Peak Flow Capacity of Plant	OS		0.00		0.00		0.00		0.00		0.00	**0.00**

Performance Criterion # →			1		2		3		4		5		Total Score for Idea
Weight of Importance of Performance Criterion →			20.0%		40.0%		10.0%		30.0%		0.0%		
Idea #	Idea Title	Non # Rating	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	
M-04	Implement a Homeowner Lateral Sealing Program	OS		0.00		0.00		0.00		0.00		0.00	**0.00**
M-05	Line Influent Pipe	FF		0.00		0.00		0.00		0.00		0.00	**0.00**
M-06	Use Independent SCADA Systems Integrator That is a Direct and Prequalified Contractor With the City ILO a Subcontractor	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
M-07	Make Auxiliary Power Generator Sufficient for Total Redundancy	ABD		0.00		0.00		0.00		0.00		0.00	**0.00**
M-08	Utilize Dispatchable Power to Make the Auxiliary Generator Part of the Electric Utility Provider Incentive Program	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
M-09	Sell the Plant to a Private Investor	OS		0.00		0.00		0.00		0.00		0.00	**0.00**
M-10	Investigate Securing a Temporary Lease Adjacent to the Plant for a Staging Area	DS*		0.00		0.00		0.00		0.00		0.00	**0.00**
M-11	Reconstruct Plant Access Road	DS		0.00		0.00		0.00		0.00		0.00	**0.00**
M-12	As Cost Estimate Develops, Take a Look at Headworks and Screen Cost	DS		0.00		0.00		0.00		0.00		0.00	**0.00**
M-13	Put Population Growth and System Development Charges (SDCs) into Rate Model	DS		0.00		0.00		0.00		0.00		0.00	**0.00**
M-14	Explore the System Development Charge (SDC) to be Utilized in the Future	DS		0.00		0.00		0.00		0.00		0.00	**0.00**
M-15	Add an Environmental Impact Room Tax for Lodging	OS		0.00		0.00		0.00		0.00		0.00	**0.00**
M-16	Add a Stormwater Fee to Utility Billings	OS		0.00		0.00		0.00		0.00		0.00	**0.00**
M-17	Change to Flow-Based User Charging	OS		0.00		0.00		0.00		0.00		0.00	**0.00**
M-18	Leave the System Development Charge (SDC) as Proposed in Facility Plan and Use Excess Growth as a Basis to Establish a Sinking Fund (Utility Fees From Growth Would Be Saved for Future Treatment)	OS		0.00		0.00		0.00		0.00		0.00	**0.00**
M-19	Purchase Land Application Sites	OS		0.00		0.00		0.00		0.00		0.00	**0.00**
M-20	Lease Land Application Sites (Long-Term)	OS		0.00		0.00		0.00		0.00		0.00	**0.00**

Performance Criterion # →			1		2		3		4		5		Total Score for Idea
Weight of Importance of Performance Criterion →			20.0%		40.0%		10.0%		30.0%		0.0%		
Idea #	Idea Title	Non # Rating	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	
M-21	Verify Tertiary Filter Cost Estimate	DS		0.00		0.00		0.00		0.00		0.00	**0.00**
M-22	Prepare Cost Estimate for Current Scope and Maintain Estimate as Scope Evolves	OS		0.00		0.00		0.00		0.00		0.00	**0.00**
M-23	Update the Wastewater Facilities/Master Plan	OS		0.00		0.00		0.00		0.00		0.00	**0.00**

Appendix G—VA study Agenda

Tuesday, August 19, 2014

Orientation Meeting

8:30–8:45 Introduction
- Opening Remarks from Mike Morison
- Attendee's Self-Introductions
- Review of Agenda
- Workshop Guidelines

8:45–8:50 Owner/Client Presentation
- Project Goals & Purpose
- Key Project Issues for VA Team
- Constraints on VA Team Recommendations

8:50 –11:15 Designer Presentation
- Overview-History
- Basis of Design
- Rationale for Design Choices
- Description of Project Elements

10:15-10:30 Break

11:15–11:30 Conclude Orientation Meeting (Excuse all but VA Team Members) Thanks from Mike for attending

VA Workshop (Times shown for the workshop are approximate and may be adjusted)

11:30 – 12:15 Team Review of Documents-(Anna assumes the role of facilitator for the workshop). [We may have a treatment plant tour after the Orientation Meeting.]

12:15–1:15 Lunch break

1:15–1:45 Team Review of Documents

1:45–4:00 Project Analysis/Function Analysis

4:00–5:00 Begin Creative Idea Generation

Wednesday, August 20, 2014

8:00–Noon Creative Idea Generation

Noon–1:00 Lunch Break

1:00–2:00 Evaluation of Ideas

2:30–5:00 Begin VA Recommendation Development

Thursday, August 21, 2014

8:00–Noon VA Recommendation Development (Cont.)

12:00–1:00 Lunch Break

1:00–5:00 VA Recommendation Development (Cont.)

Friday, August 22, 2014

8:00–10:00 Prepare for VA Team Presentation

Presentation Meeting

10:00–Noon VA Team Presentation of VA Recommendations

Noon Concluding remarks and thanks from Mike Morrison

Appendix H—Meeting Attendees

Meeting Attendees

Wastewater Treatment Facility Value Analysis Study—City of Sutherlin

August 2014									
19	20	21	22		Name	Organization Name Organization Address *(for all attendees)*	Role, Technical Discipline *(e.g., VA Team Member—Structural; Design Team—Civil)*	Telephone	E-Mail
✔	✔	✔	✔		Mike Morrison, CCP, FAACEI	Value Management Consulting, Inc. 12308 235th Place NE Redmond, WA 98053	VA Project Manager/Facilitator	425-885-2185 (O) 206-799-7798 (M)	valuemike@aol.com
✔	✔	✔	✔		Anna M. Bremmer, CVS, LEED AP	Bremmer Consulting LLC 93 S. Jackson Street, ECM #6425 Seattle, Washington 98104-2818	VA Study Co-Facilitator	206-605-6657	abremmer@bremmerllc.com
✔	✔	✔	✔		Dick Day	R.O. Day 7209 East McDonald Road, #37 Scottsdale, AZ 85250	VA Team Member—Civil Engineering, Constructability	425-681-9880	roday@msn.com
✔	✔	✔	✔		Dale Richwine	Principal Richwine Environmental 3300 NW 185th Ave PMB# 156 Portland, OR 97229	VA Team Member—Process Engineering	503-858-5153	daler@richenv.com
✔	✔	✔	✔		Brian Elliott	Wastewater Treatment Plant Supervisor City of Sutherlin 126 East Central Ave Sutherlin, OR 97479	VA Team Member—Plant Management	541-459-5768	b.elliott@ci.sutherlin.or.us
✔	✔				Wesley Anderson	Orenco Systems®, Inc. 814 Airway Avenue Sutherlin, Oregon 97479	VA Team Observer—Local Industry	541-459-4449 Ext. 449 (O)	wanderson@orenco.com
✔	✔				Grant Denn	Orenco Systems®, Inc. 814 Airway Avenue Sutherlin, Oregon 97479	VA Team Observer— Local Industry	541-459-4449 Ext. 210 (O) 541-680-1713 (M)	gdenn@orenco.com

August 2014					Name	Organization Name Organization Address *(for all attendees)*	Role, Technical Discipline *(e.g., VA Team Member—Structural; Design Team—Civil)*	Telephone	E-Mail
19	20	21	22						
✔	✔				Jeff Nelson	Wastewater Treatment Plant City Engineer City of Sutherlin 126 East Central Ave Sutherlin, OR 97479	VA Team Member—City Management (part-time attendee due to other commitments)	541-459-2856 Ext. 234	j.nelson@ci.sutherlin.or.us
✔	✔				John Bachman	Wastewater Treatment Plant Operator City of Sutherlin 126 East Central Ave Sutherlin, OR 97479	VA Team Member—Operations (part-time attendee due to other commitments)	541-459-5768	j.bachman@ci.sutherlin.or.us
	✔	✔	✔		Vicki Luther	Community Development Director City of Sutherlin 126 East Central Ave Sutherlin, OR 97479	VA Team Member--City of Sutherlin Community Development	541-459-2856	v.luther@ci.sutherlin.or.us
✔					Jon Gasik	Water Quality Program Manager, Medford Oregon Department of Environmental Quality (DEQ) 221 Stewart Avenue Medford, OR 97501	DEQ Representative	541-776-6242 (O) 541-601-0796 (M)	jon.gasik@state.or.us
✔			✔		Steve Major	The Dyer Partnership Engineers & Planners, Inc. 1330 Teakwood Avenue Coos Bay, OR 97420	Design Engineer	541-269-0732	smajor@dyerpart.com

August 2014					Name	Organization Name Organization Address *(for all attendees)*	Role, Technical Discipline *(e.g., VA Team Member—Structural; Design Team—Civil)*	Telephone	E-Mail
19	20	21	22						
			✔		Dan Wilson	Fiscal Supervisor City of Sutherlin 126 East Central Ave Sutherlin, OR 97479	Finance	541-459-2856	d.wilson@ci.sutherlin.or.us
			✔		Jerry Gillham	City Manager City of Sutherlin 126 East Central Ave Sutherlin, OR 97479			
			✔		Randy Harris	Water Supervisor City of Sutherlin 126 East Central Ave Sutherlin, OR 97479			
			✔		Jeanne Morrison		Spouse of VA Team Facilitator	541-861-0717	
			✔		Sharon Decker		Spouse of VA Team Member		

Appendix I—Disposition of Value Study Team Proposals and Design Suggestions

Public Works Dept.
Utilities Division
126 E. Central Avenue
Sutherlin, OR 97479
(541) 459-5768
Fax (541) 459-0025

City of Sutherlin

October 6, 2014

Value Management Consulting

On October 2, 2014 city staff reviewed proposals from the value analysis. The Dyer Partnership Engineers & Planners, Inc. (Steve Major), DEQ, (Jon Gasik) was present. The following findings are listed.

GB-03
Use Existing Donuts for Sequencing Batch Reactor (SBR) with Peak-Flow Wet Weather Treatment.
Comment: Reject, existing clarifiers would need to be reconstructed to meet the minimal depth of 18'.

GB-05
Use Two New SBRs With Peak Wet Weather Flow Treatment to Reduce From Four Trains to Two.
Comment: Reject, Only allowed when using existing Treatment Facility.

GB-11
Convert Donut Clarifiers to Primary Clarifiers for Treatment Prior to the New SBRs.
Comments: Reject, missing pump station that would pump effluent from primary clarifiers to SBRs. Cost is estimated at $382,000.00. Also there would cost resulting from primary sludge and issues with odors.

RD-03
Add Submersible Pumps to Pump to the New Screening Facility Following the Pump Station.
Comments: Reject, Current vault not deep enough, would need to construct a New Wetwell.

RT-01
Accept Class C Reuse Without Using Filters.
Comments: Reject, not cost effective to go with class C recycled water. Umpqua Golf Resort and Fords Pond would require controlled Access. Which means both pieces of property would need to have a 6'cyclone fence. Ford's Pond is estimated at $522,000.00 and the golf course is estimated at $830,000.

RT-02

Accept Class B Reuse Without Using Filters.
Comments: Reject, Not cost effective to go with class B recycled water. Umpqua Golf Resort and Ford's Pond would require controlled access. Which means both pieces of property would need to have a 6'cyclone fence. Ford's Pond is estimated at $522,000.00 and the golf course is estimated at $830,000. Also Class B requires a 10 acre reliability pond estimated at $300,000.

DW-04
Use Sodium Hypochlorinate for Summer Disinfection and UV for Winter Disinfection.
Comments: Accept, will be considered in design.

M-01
Retain Geotechnical Engineer to Analyze Site Soils
Comments: Accept

M-02
Monitor Peizometric Levels on the Site during Dry Weather and Wet Weather.
Comments: Accept

M-06
Use Independent SCADA System Integrator That is a Direct and Prequalified Contractor with the City.
Comments: Will consider.

M-10
Investigate Securing a Temporary Lease Adjacent to the Plant for Staging Area.
Comments: Accept

M-08
Utilize Dispatchable Power to Make the Auxiliary Generator Part of the Electric Utility Provider Incentive Program.
Comment: Accept, will discuss with Douglas Electric.

TS-17
Compost Class A Solids with Yard Debris.
Comments: Reject, expense and lack of land for storage.

RD-01
Put Screens in Existing Channels.
Comments: Accept with Modifications, add Manual Bar Screens behind each Mechanical Screens.

Sincerely,

Brian Elliott

Brian Elliott
Wastewater Division Supervisor
b.elliott@ci.sutherlin.or.us
541-459-5768

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