CITY OF
JOHN DAY

CITY COUNCIL MEETING AGENDA
Tuesday June 11, 2024, 6:30 pm
John Day Fire Station
316 S Canyon Blvd, John Day, OR 97845
(541)575-0028 www.cityofjohnday.com

This meeting is open to the public. This agenda includes a list of the principal subjects anticipated to be considered at the meeting. However, the agenda does not limit the ability of the Council to consider additional subjects. Meetings may be canceled without notice. Zoom Meeting participants should use the "raise your hand" feature during these times to alert the moderator that they would like to speak.

Join Zoom Meeting
City of John Day is inviting you to a scheduled Zoom meeting.
https://zoom.us/j/95867942253?pwd=dHE5c3djSEx4OFBuZndPQU5HMGN3QT09
Meeting ID: 958 6794 2253
Passcode: 776959

Call to Order: Regular Meeting 6:30 pm.
1. Call John Day City Council Meeting to Order
2. Pledge of Allegiance
3. Roll Call
4. Amend or Accept Regular Agenda

5. Public Comments *(Please Limit to 3 Minutes)*
Public Comments are an opportunity to present information or speak on an issue that is not on the agenda. Comments are limited to 3 minutes for each person. Visitors may state their comments and should not expect the council to engage in back and forth dialogue regarding the comment, council may either choose to add it to a follow up meeting or direct City Manager to follow up with the speaker.

6. Consent Agenda
All matters listed within the Consent Agenda have been distributed to every member of the City Council for reading and study, are considered routine, and will be enacted by one motion of the Council. If separate discussion is desired, that item may be removed from the Consent Agenda and placed on the Regular Agenda by request.

   a. Accounts Payable through June 6, 2024

7. Ducote Consulting Update

8. Approval of Contract with Yellow Jacket Drilling Services LLC for $51,900 to construct required monitoring wells.

9. Approval of Donovan Enterprises, Inc (staff recommended) to produce a Water and Sewer Rates and SDC Study.

10. Approval of Flagline Engineering (staff recommended) for final Design and Construction of the Wastewater Plant.

11. Approval of 3-year contract for audit services with Zwygart John & Associates PLLC

12. Approval of Amendment #1 to the professional services agreement for Gaslin Accounting CPA's, PC

13. City Manager Comments
    a. City representation in Air Quality Quarterly meetings
    b. Filing for City Council positions are open for Nov election

14. Mayor and Council Comments

15. Adjournment: Next Meeting June 25, 2024 (City and URA Budget adoption)

City of John Day
Check/Voucher Register
From 6/1/2024 Through 6/6/2024

Check Number	Effective Date	Name	Transaction Amount
750103	6/5/2024	ED STAUB & SONS PROPANE	383.68
Total 750103			383.68
750104	6/5/2024	ACS - ADVANCED CONTROL SYSTEMS	1,354.47
	6/5/2024	ACS - ADVANCED CONTROL SYSTEMS	1,354.47
Total 750104			2,708.94
750105	6/5/2024	JOHN DAY FIREFIGHTERS ASSOC	450.00
Total 750105			450.00
750106	6/5/2024	USA BLUEBOOK	238.13
Total 750106			238.13
750107	6/5/2024	WELLS FARGO FINANCIAL LEASING	200.13
Total 750107			200.13
750108	6/5/2024	BADGER METER INC.	104.09
Total 750108			104.09
750109	6/5/2024	BOX R WATER ANALYSIS	50.00
	6/5/2024	BOX R WATER ANALYSIS	50.00
Total 750109			100.00
750110	6/5/2024	CLARK'S DISPOSAL	72.57
	6/5/2024	CLARK'S DISPOSAL	36.28
	6/5/2024	CLARK'S DISPOSAL	36.28
Total 750110			145.13
750111	6/5/2024	AMAZON CAPITAL SERVICES, INC.	12.99
	6/5/2024	AMAZON CAPITAL SERVICES, INC.	8.49
	6/5/2024	AMAZON CAPITAL SERVICES, INC.	70.98
	6/5/2024	AMAZON CAPITAL SERVICES, INC.	22.99
	6/5/2024	AMAZON CAPITAL SERVICES, INC.	74.49
	6/5/2024	AMAZON CAPITAL SERVICES, INC.	40.09
Total 750111			230.03
750112	6/5/2024	ROBERT BAGETT PLS CWRE	1,760.00
Total 750112			1,760.00
750113	6/5/2024	DUCOTE CONSULTING, LLC	3,525.00
	6/5/2024	DUCOTE CONSULTING, LLC	750.00
	6/5/2024	DUCOTE CONSULTING, LLC	862.50
	6/5/2024	DUCOTE CONSULTING, LLC	2,812.50
Total 750113			7,950.00

City of John Day
Check/Voucher Register
From 6/1/2024 Through 6/6/2024

Check Number	Effective Date	Name	Transaction Amount
750114	6/5/2024	GASLIN ACCOUNTING CPAS PC	2,328.00
	6/5/2024	GASLIN ACCOUNTING CPAS PC	2,328.00
	6/5/2024	GASLIN ACCOUNTING CPAS PC	2,328.00
	6/5/2024	GASLIN ACCOUNTING CPAS PC	2,328.00
Total 750114			9,312.00
750115	6/5/2024	LANE COUNCIL OF GOVERNMENTS	633.00
Total 750115			633.00
750116	6/5/2024	IT'S SAUL GOOD HAIR SALON	17,031.00
Total 750116			17,031.00
750117	6/5/2024	TYLER SHEEDY CONSTRUCTION INC.	8,026.21
Total 750117			8,026.21
750118	6/5/2024	TETRA TECH, INC	53,018.75
	6/5/2024	TETRA TECH, INC	46,915.75
Total 750118			99,934.50
750119	6/5/2024	VISA	364.00
Total 750119			364.00
Report Total			149,570.84

6/6/2024

John Day Sewer & Oregon Pine Improvements
April - June 2024 Progress Report for City Council

Task %	Task
100%	WWTF Complete!
90%	Construct the WWTF
80%	Bid the WWTF Construction
70%	Package Plant Procurement
60%	Construction Funding Secured
50%	Final Design Engineering
40%	Environmental Clearance
30%	Preliminary Engineering
20%	Procuring Engineers and
10%	Securing Final Design Funding

John Day's Sewer Improvements Project and the Oregon Pine Companion Projects have six primary tracks that are the focus of our efforts:

1. Section 7/Environmental Compliance
2. USDA and Other Funding Applications
3. DEQ Permitting Compliance
4. Preliminary Site Preparation for Companion Projects
5. Engineering Design and Package Plant Procurement
6. Community Engagement and Outreach

This memo provides a progress summary for all six tracks over April - June 2024. Our top priorities currently are Task 1) environmental compliance and Task 2) completing the funding application(s); Task 4b) Purple Pipe; and Task 5) Services Procurements.

High Notes:

- Task 1: Environmental Assessment in the final stages of clearance with USDA and Business Oregon.
- Task 2: $2,000,000 grant recommended for award along with $2,000,000 grant from DEQ-CWSRF
- Task 4: Solar grant closing out; 7th St West grant closed out.
- Task 4b: WRD has accepted the Purple Pipe project termination; no money to payback and accepting a final reimbursement.
- Task 5: Final Design Engineering & Rate Study contract recommended for award. Well Driller final contract for approval.
- Task 6: Rate Study contract recommended for award.

Council Action – WWTP Design/Project:

1. Discuss and Adopt/Reject: Scoring Committee Recommendation for Rate Study Consultant
2. Discuss and Adopt/Reject: Scoring Committee Recommendation for Wastewater Treatment Plant Final Design & Construction Engineer

Attachments and Exhibits:

1. Winning Rate Study Proposal: Donovan Enterprises, Inc.
2. Winning WWTF Engineering Proposal: Flagline Engineering/Kennedy Jenks
3. Final WWTF Solar Feasibility Study: Tetra Tech

1. Section 7/NEPA Environmental Compliance (Task 1)

USDA initiated Formal Consultation on the Biological Assessment for the new WWTF on October 26, 2023 with National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (USFWS). Final approval received May 11, 2024. Final Environmental Assessment submitted to USDA & Business Oregon on April 25, 2024 – under review.

Additional Task Updates:

- After the Environmental Assessment is approved, USDA and Business Oregon will initiate multiple comment periods, that will total 45 to 60 days until we have formal environmental clearance. However, that clearance will allow us a way forward all the way through construction. Environmental will be done.

2. USDA, Costs, and Other Funding Applications (Task 2)

The City applied for Congressionally Directed Spending/Community Initiated Project for the wastewater treatment plant project in Q1 2024 and also DEQ-CWSRF funding in Q4 2023. This funding would be earmarked for construction.

Status:

- DEQ-CWSRF published the Intended Use Plan and City of John Day is receiving a recommendation of $2,000,000 loan and $2,000,000 grant/principle forgiveness from the committee.

3. DEQ Permitting (Task 3)

The Department of Environmental Quality (DEQ) issued a new wastewater pollution control facility (WPCF) permit effective on May 1, 2022 (Permit Number: 103281; File Number: 127619). The permit is good for ten years and expires December 31, 2032.

Status:

- Ongoing discussions between City, CwM-H20, and DEQ regarding surface and groundwater testing.

4. Preliminary Area Preparation for Companion Projects (Task 4)

a. Area Improvements – CLOSED OUT

b. Purple Pipe System – CLOSING OUT

Updates:

- WRD accepted the termination request, will not ask for funding back, and invited the City to submit a final reimbursement request.

Next steps:

- Submit final reimbursement request for May 2024 work.

c. Instream Water Rights Transfers – CLOSING OUT

Next steps:

- These transfers were all a part of the Purple Pipe/WRD funded project. No reason to pursue the transfers apart from this funding. This aspect will be abandoned for now.

d. Solar Array – CLOSING OUT

Project Focus: Feasibility study of using a $10-20m solar array with pipe and storage system located northeast of the City as a "battery." The solar array would power pumps that would convey the water up a hill to a storage tank. The tank would then release water through micro-hydropower generators through a second pipe down the hill. A secondary focus is powering the normal functions of the treatment plant.

Status: Tetra Tech completed the project, attached as Exhibit #1.

Next Step: Closing out the Project.

5. Engineering Design, Services Procurement, and Package Plant Procurement (Task 5)

City went out to procure services for a Rate Study Consultant and the Final Design Engineering Consultant for the wastewater treatment facility. Recommendations from the Scoring Committee

Next Steps:

- Rate Study Consultant
  - Scoring Committee recommends accepting the proposal from: Donovan Enterprises, Inc. for: $35,425
- Final Design Engineering RFP
  - Scoring Committee recommends accepting the proposal from: Flagline Engineering/Kennedy Jenks
- Well Driller Procurement
  - Contract ready to approve.

6. Community Engagement and Outreach (Task 6)

Status:

- Canyon City rate negotiation are on-going, Rate Study consultant will be able to assist with that negotiation.
- Monthly John Day Council updates are being given in written and verbal format by Ducote Consulting.

Renewable Energy Project Development Plan

City of John Day

22-026-001 CREP PA John Day (CG-01-084)

A description of how consultation with the following groups was incorporated into the planning:

- Members of qualifying communities served by the proposed community renewable energy project;
- Businesses located in the communities served by the proposed community renewable energy project;
- Electric utilities that have customers in the communities served by the proposed community renewable energy project; and
- Other regional stakeholders.

The City of John Day has incorporated public participation in the preparation of the Innovation Gateway Master Plan (2019), which is the community's vision for creating a livable and sustainable downtown corridor. In developing this Master Plan, the public voiced their support for creating a place for sustainable commerce and jobs with an emphasis on conservation and renewable energy. A large component of this plan is the development of a new Water Reclamation Center (WRC) where wastewater will be treated then reused for the irrigation, agricultural, and other business uses. To achieve the sustainable goals of the Master Plan, the development of a solar array to power the WRC is a critical component to the community and stakeholders.

A description of the project that includes the following information:

- An assessment of the suitability of the site

The project has two renewable energy components, a Solar Power Plant (SPP) and Pump Storage Hydropower (PSH). Located on the eastern side of the Cascade Range, the City of John Day averages 206 sunny days per year. From the Innovation Gateway Master Plan, the solar array will be ground mounted and located in an area north and adjacent to the new WRC. This land is owned by the city and is relatively flat with a southern exposure. The site is suitable for a solar array to be connected to the new WRC. See Appendix A.

The Pump Storage Hydropower component is a function of the WRC having excess treated water available for storage during the fall and winter periods of the year when irrigation demand is low. This project component would redirect 270,000 gallons per day of tertiary treated wastewater from the new WRC, first to an equalization tank, and then to the surface impoundment at an elevation of approximately 800 to 1,000 feet above the WRC. The impoundment could potentially hold 120 million gallons which could be returned to the equalization tank and be available during the summer for agricultural irrigation and livestock needs and industrial reclaimed water uses. Although this component's primary purpose is to augment reclaimed water for irrigation, the hydropower

generated from this activity does not support the justification for development based on project costs and net energy generation. As a result, this component is not suitable for development. Detailed information on the configuration of the PSH including layout, pumps and turbine, impoundment area, and costs are presented in Appendix B. See Appendix C for the site figures and Appendix D for a cost estimate.

- A detailed description of the project including type and quantity of equipment, how the system will integrate into existing site or building conditions and any additional work needed.

The project includes a solar array with dedicated power to the new WRC. In Appendix A, four options are presented for development of a solar array system. The options presented provide the city with critical information to move forward and make decisions with development based on the best outcomes considering budget and power generation.

Solar Power Plant (SPP)

Option 1: Average Annual WRC Energy Demand - During a normal year the designed SPP must generate an average annual energy equal to the annual energy consumption of the WRC. Based on the average daily energy required to operate the WRC of 900 kWh, the annual energy demand for the WRC is 328,500 kWh. It is assumed that the grid will accept all surplus energy generation during the summer and provide it back during the winter.

Option 2: Optimized SPP and Battery Energy Storage System (BESS) - A BESS is added between the SPP and grid to store part of the surplus of energy and provide it to the WRC at night and during lower energy months. It would not be economical to size a BESS to store all surplus energy during the summer for use during the winter; the BESS would need to be larger and would not be used efficiently. The optimization approach is to oversize the SPP slightly with a BESS sized to best utilization. The grid will still have to accept the surplus of energy and provide it back at a later time, but to a much lower extent than with the Option 1.

Option 3: No Export with BESS - The SPP and BESS is designed to avoid any energy export to the grid during the year. The size of the SPP is reduced to balance the energy used during higher months of generation and the BESS is sized to store the energy required for the daily operation of the WRC. During the other months when energy generation is below the required energy to operate the WRC, energy will be imported from the grid to supplement the missing energy with the most grid demand during the lower monthly energy generation.

Option 4: Maximized SPP - The SPP design will utilize the available land area north of the WRC allocated for the SPP, which is 2 acres. The SPP will generate more energy annually than is required to operate the WRC, therefore having a net export of energy to the grid.

A summary of the type and quantity of equipment is presented in Table 1 below.

Table 1: Summary of SPP

Parameter	Option 1 Yearly Average Energy Demand	Option 2 Optimized for BESS	Option 3 No Export with BESS	Option 4 \Maximum Array Size
SITE INFORMATION				
Location	City of John Day			
Coordinates	44.415840°, -118.953431° (44°24'57", -118°57'12")			
Time zone	UTC-08, America / Los_Angeles [PST]			
Election	3100 ft (941 m)			
SOLAR POWER PLANT (SPP) DESIGN				
Modules				
Module Manufacturer	Canadian Solar			
Module Model	HiKu6_CS6W-550MS			
Nominal Power Rating at STC, Wp	550			
Efficiency at STC, %	21.5			
Module Type	Monofacial			
Mounting Type	26^0 Fixed TiltPr			
Ground coverage ratio (GCR)	50.5 %			
No. of Modules per String	17	26		
No. of Strings	24	20	10	60
No. of Modules	408	520	260	1560
Module Area, m²	1060	1333	667	4000
Azimuth, Deg	0			
Table pitch, m	9			

Table 1: Summary of SPP (continued)

Parameter	Option 1 Yearly Average Energy Demand	Option 2 Optimized for BESS	Option 3 No Export with BESS	Option 4 \Maximum Array Size
Table width, m	4.54			
Module orientation / modules per table	2 x Portrait			
SPP Area, m² (Acres)	2120 (0.52)	2,640 (0.65)	1320 (0.32)	7,920 (2.00)
Inverters				
Inverter Manufacturer	SMA			
Inverter Model	CORE1 50-US	SHP 125-US-21-PEAK3		
Inverter Type	String			
No. of Inverters	4	2	1	6
Nominal Inverter Rating @450C, kVA	125			
Efficiency at Capacity, %	97.5	98.5		
Inverter output voltage, V	480			
Ratio DC/AC	1.144			
Rated installed inverter capacity (AC-capacity), kWac	200	250	125	750
Nominal installed module capacity (Peak capacity), kWp	224.4	286	143	858
Battery Energy Storage System (BESS)				
Capacity, kWh	N/A	460	500	N/A
Interconnection Voltage, V	N/A	480	480	N/A
Efficiency (one way), %	N/A	97	97	N/A
Interconnection				
Grid Connection Voltage Level, V	480			
Grid Power Limitation	Assumed None			
Power Factor	0.9			
SYSTEM OPERATION SUMMARY				
Yearly Energy Summary (kWh)				
Solar PV Energy, MWh	336.1	430.5	215.9	1,280.1

If the project is for generating renewable energy:

- Technical specifications of the selected technology.

See Appendix A for full technical specifications

- Nameplate capacity (KW) of the entire project
  Option 1: 224 KW
  Option 2: 280 KW
  Option 3: 143 KW
  Option 4: 858 KW

- Projected amount of net energy the project will generate, in KWh per year for electricity generation or Btu for other types of energy.
  Option 1: 337,016 KWh/year
  Option 2: 431,908 KWh/year
  Option 3: 216,251 KWh/year
  Option 4: 1,293,182 KWh/year

- A renewable resource assessment demonstrating adequate renewable resource availability for the proposed system operations that includes the data collected to support the assessment and any assumptions made.

Please see attachments for the basis of design technical specifications

Appendix A Technical Memorandum on Solar Photo Voltaic Option

If the project is for energy storage:

- Technical specifications of the selected technology.
- Nameplate power storage capacity in KW
- Projected amount of net energy the project will supply, in KWh per year.
- Duration the project will provide backup for selected purposes.
- Proposed operational use cases for the energy storage project.

Please see attachments for the basis of design technical specifications

Appendix A Technical Memorandum on Solar Photo Voltaic Option

A project management plan that includes:

- A detailed construction plan and project schedule.

No detailed construction plan and project schedule has been developed. This project is subject to city approval and their success in securing funding for design and construction. The first step is to select a consultant to develop plans, specifications, and a cost estimate to better determine the details of the plan and help pursue funding sources.

- A description of who would manage the planning, construction, and system start-up.

The city will need to select a consultant to help manage the planning, construction and oversee the system start-up. The system startup would be managed by the installing contractor of each specific system or by the manufacturer as required to maintain applicable warranties.

If applicable, a description of the community resilience aspects of the project.

The new WRC will treat wastewater from the residents of John Day and Canyon City. The use of a solar array to power the WRC is important to the community to help reduce operational costs and provide a component of resilience during power outages.

- A project budget that includes:

  A Class 5 cost estimate has been developed for the plan for each option and includes the following:

  1. **Siteworks**
  2. **Mounting system**
  3. **PV Array**
  4. **Inverter Side**
  5. **BoS Components**
  6. **BESS**
  7. **Interconnection**
  8. **Commissioning**
  9. **Owners, Engineering, PM**
  10. **Contingency, Price Escalation**

- The anticipated total project cost with an itemized list of costs.

  An itemized list of costs has been provided in Appendix A. The following is a summary of the different options evaluated.
  Option 1: $336,000
  Option 2: $674,000
  Option 3: 562,000
  Option 4: $858,000

Appendix A

Technical Memorandum – Solar Photo Voltaic Option

TETRA TECH

Technical Memorandum

Date:	2024-05-03
To:	Casey Meyers – Public Works Director
Cc:	Tom Wilcox, PE – Project Manager
From:	Artem Donets, Solar PV Design Remi Sasseville, PE (AB, Canada) - Project Engineer
Project:	John Day Renewable Energy **Project Number:** 200-654565-24003
Subject:	Wastewater Reclamation Center Solar Photo Voltaic Option Assessment

1. Introduction

The City of John Day (City) received a grant from the Oregon Department of Energy (ODOE) under the Community Renewable Energy Grant Program. The purpose of the grant is to develop a community planning document that outlines renewable energy and energy resilience for the City as developed in the Innovation Gateway Area Plan (2019). This grant is in support of nearly two-decades of process embarked by the City to construct a new Wastewater Reclamation Center (WRC) and community redevelopment that sets the standard for renewable, sustainable, and resilient power.

From the ODOE grant application, the planning document must: determine the extent of a Solar Power Plant (SPP) that meets the daily operation energy demand of the new WRC and determine the energy storage potential utilizing inline Pump Storage Hydro (PSH) with an impoundment of reclaimed water to an elevation of about 800'. This technical memorandum provides the energy yield assessment for four (4) proposed SPP options with conceptual design and interconnection requirements:

1. Option 1 Average Annual WRC Energy Demand - SPP to meet the average annual energy demand of the new WRC with the balance grid power exported and imported annually.
2. Option 2 Optimized SPP and BESS - Combined SPP and Battery Energy Storage System (BESS) optimized to reduce grid power exported and imported annually.
3. Option 3 No Export with BESS - Combined SPP and BESS optimized to avoid grid power export of energy.
4. Option 4 Maximized SPP - SPP to maximize the available land with net grid power exported annually.

The assessment of the PHS is provided in a separate technical memorandum.

15350 SW Sequoia Parkway, Suite 220, Portland, OR 97224
Tel 503.684.9097 Fax 503.598.0583 www.tetratech.com

2. Background

A City-owned SPP that provides energy to the new WRC is the result of years of collaboration between the City, the local energy provider, Oregon Trail Electric Cooperative [OTEC], and conversations with residents. The City and OTEC decided the SPP was the most feasible method to provide energy at no cost (or offset part of the energy) to run the WRC. The SPP will provide renewable energy to power the WRC, either in part or in totality, over the year and possibly even more, pending the final array size. The feasibility of storing wastewater to a high elevation reservoir via the PSH using the surplus of energy from SPP was also explored with the intent of balancing out the wastewater supply and demand while generating renewable energy. The excess energy not used by the SPP and/or the PSH that will be returned to the OTEC grid will reduce the energy bills of low-income residents within the City. A BESS was to be reviewed as an optional component to be added based upon feasibility results. The energy stored, using either a BESS and/or the PSH, would be used to power the treatment plant operation or other future electrical demands, such as electric fleet vehicles or public charging stations.

Over the course of the past few years, the City has experienced significant staff turnover. The new City manager, who started at the beginning of January 2024, is not aware of past involvement of staff on the project. As a result, Tetra Tech had little to no interaction with City staff to coordinate and get clear directions to complete this renewable assessment. Tetra Tech moved forward with it's understanding of the renewable energy assessment and the information in the planning document required by the ODOE grant application.

3. Design Basis and Options

3.1 DESIGN BASIS

As per the grant application, the WRC was estimated to have an average energy demand for operation of 900 kWh per day. The SPP, with a possible BESS, will be the primary energy source for the WRC daily operations with grid power to supplement the required energy. The stored water with the PHS will add capacity and resilience.

The design of the SPP uses the following design criteria:

- The location for the SPP, based on the Innovation Gateway Business Area planning documents, will be located just north of the WRC on 2 acres maximum available area.
- The WRC power demand is assumed relatively uniform at 37.5 kW over the 24-hour period to cover the WRC daily energy demand of 900 kWh.
- The SPP is grid-connected, either via the WRC or directly to the gird, and can inject energy onto the grid during the surplus of solar energy generation.
- The grid will provide power to the WRC during any deficit of energy from the SPP.
- Energy storage options will be a combination of using the grid via exported and imported power, or a BESS located between the WRC and the grid. Energy storage to the PHS is not considered in this analysis. PHS power is assumed to be via a separate interconnection operating independently from the WRC and SPP.

3.2 SOLAR ARRAY OPTIONS

Based on the project description in the grant application and the design criteria outlined above, four (4) design options were evaluated to cover the major approaches the City could move forward with:

Option 1: Average Annual WRC Energy Demand

During a normal year the designed SPP must generate an average annual energy equal to the annual energy consumption of the WRC. Based on the average daily energy required to operate the WRC of 900 kWh, the annual energy demand for the WRC is 328,500 kWh. It is assumed that the grid will accept all surplus energy generation during the summer and provide it back during the winter.

Option 2: Optimized SPP and BESS

A BESS is added between the SPP and grid to store part of the surplus of energy and provide it to the WRC at night and during lower energy months. It would not be economical to size a BESS to store all surplus energy during the summer for use during the winter; the BESS needed would need to be larger and would not be used efficiently. The optimization approach is to oversize the SPP slightly with a BESS sized to best utilisation. The grid will still have to accept the surplus of energy and provide it back at a later time, but to a much lower extent than with the Option 1.

Option 3: No Export with BESS

The SPP and BESS is designed to avoid any energy export to the grid during the year. The size of the SPP is reduced to balance the energy used during higher months of generation and the BESS is sized to store the energy required for the daily operation of the WRC. During the other months when energy generation is below the required energy to operate the WRC, energy will be imported from the grid to supplement the missing energy with the most grid demand during the lower monthly energy generation.

Option 4: Maximized SPP

The SPP design will utilize the available land area north of the WRC allocated for the SPP, which is 2 acres. The SPP will generate more energy annually than is required to operate the WRC, therefore having a net export of energy to the grid.

4. PROJECT SETTING

4.1 SOLAR ARRAY LOCATION

The SPP and WRC are located within the City limits. The geographical coordinates and elevation of the site are provided in Table 6.

It was assumed that there are no major constraints for the topographic, geological, hydrological, or seismic site conditions that need to be considered for the energy yield estimation.

From the Innovation Gateway Business Park Planning documents, the solar array will be located in an area adjacent to the new WRC, just to the north of center. The land is City-owned property and part of the overall plan for community development (Figure 1).

The designated area for the SPP is predominantly flat with a road just beside the site to provide general access to the site. The City is planning or has started the construction of the recycle water pump station on the northeast corner to the land with a 500,000 gal tank. The area used by the pump station and tank have been excluded from the area available of the SPP.

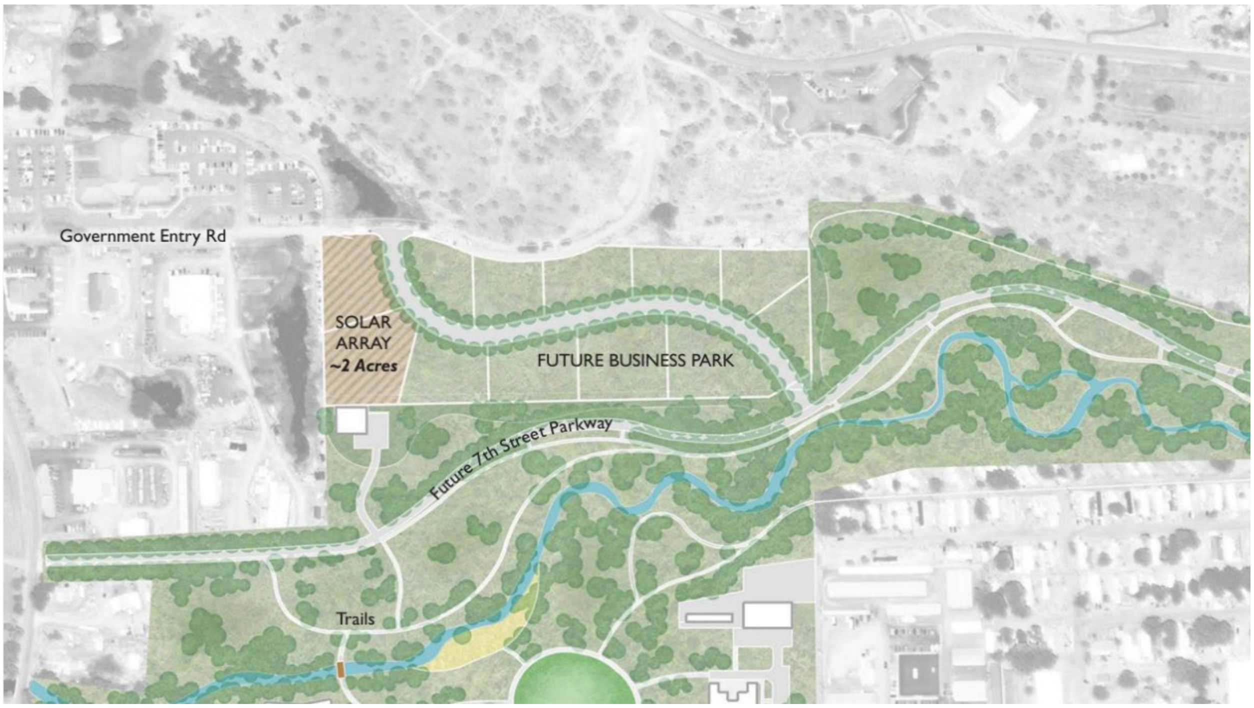

Figure 1 Location of WRC and Solar Array per the Innovation Gateway Business Park Planning

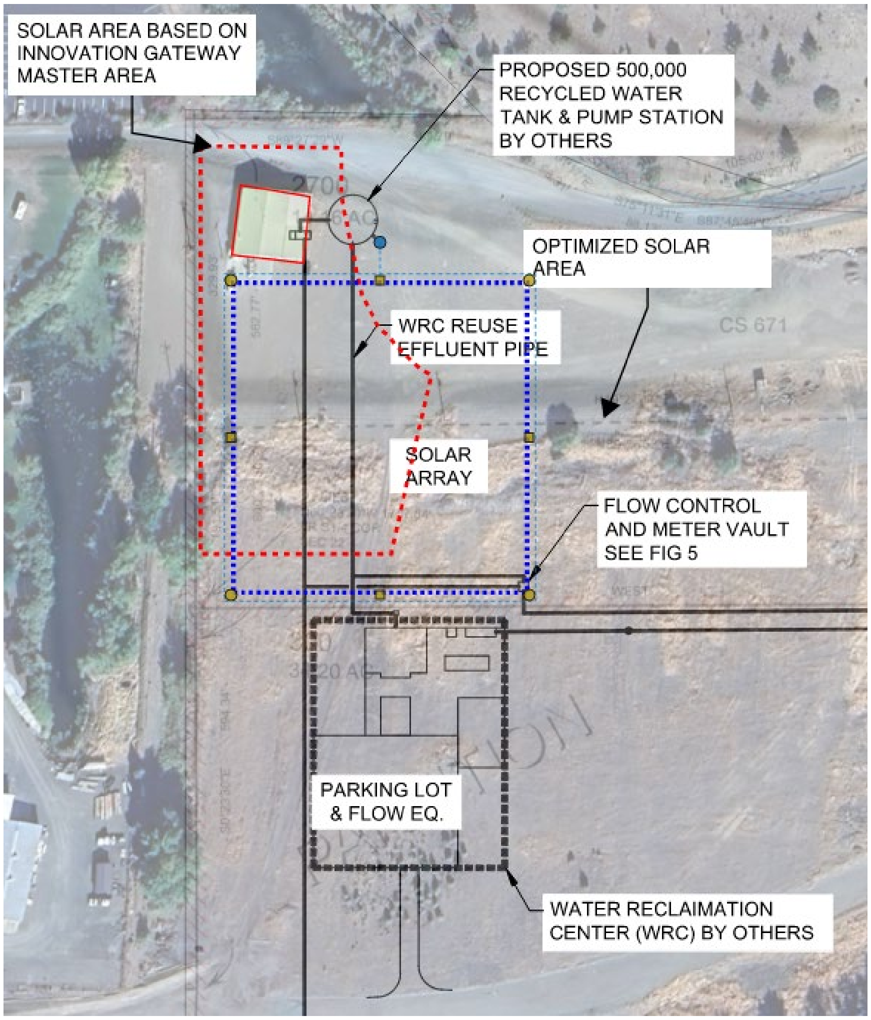

Figure 2 WRC Land and Area Available for Solar Array

Environmental and other factors to consider that could impact the solar energy production include:

- Vegetation Shading Consideration: On the western side, the presence of vegetation, including trees, could cast shadows on the solar arrays during the afternoon, reducing the efficiency and energy output of the solar system. The eastern side features a few standalone trees which could create shadows during the morning. It is crucial to assess and possibly adjust the positioning of the solar arrays to mitigate these effects and ensure proper morning and afternoon sunlight exposure and minimize energy loss.
- New Water Reclamation Center: To the south of the proposed solar array location, the construction of the new WRC is planned, along with its parking lot and buildings. The proximity and height of these new structures requires a strategic setback for the first row of the SPP to avoid shading and maximize sunlight exposure.
- New Pump Station and Tank: These structures are located directly north of the proposed SPP and are not expected to cast shadows that will affect the solar array.

To address these potential shading issues and optimize solar energy generation, it is recommended that the dedicated SPP area be adjusted towards the east and expanded horizontally with a rectangular shape within solar PV area in blue (Figure 2). Such adjustments will help maximize the energy production capacity of the SPP by reducing the impact of shading from the nearby vegetation and structures, ensuring more consistent and efficient operation throughout the day.

4.2 REGIONAL SOLAR POTENTIAL

The state of Oregon, while characterized by lower Global Horizontal Irradiation (GHI) levels compared to the southwestern United States, such as Arizona and California, still receives ample solar irradiation to facilitate the development of solar power plants. This is illustrated on by the Global Horizontal Irradiation Map from the Global Solar Atlas (https://globalsolaratlas.info/map) (Figure 3). According to the map Oregon's GHI measures approximately 1500 kWh/m^2. This data underscores the state's capacity to host effective solar power installations, particularly in regions with higher irradiation metrics, demonstrating the viability of solar energy projects across diverse geographic and climatic conditions.

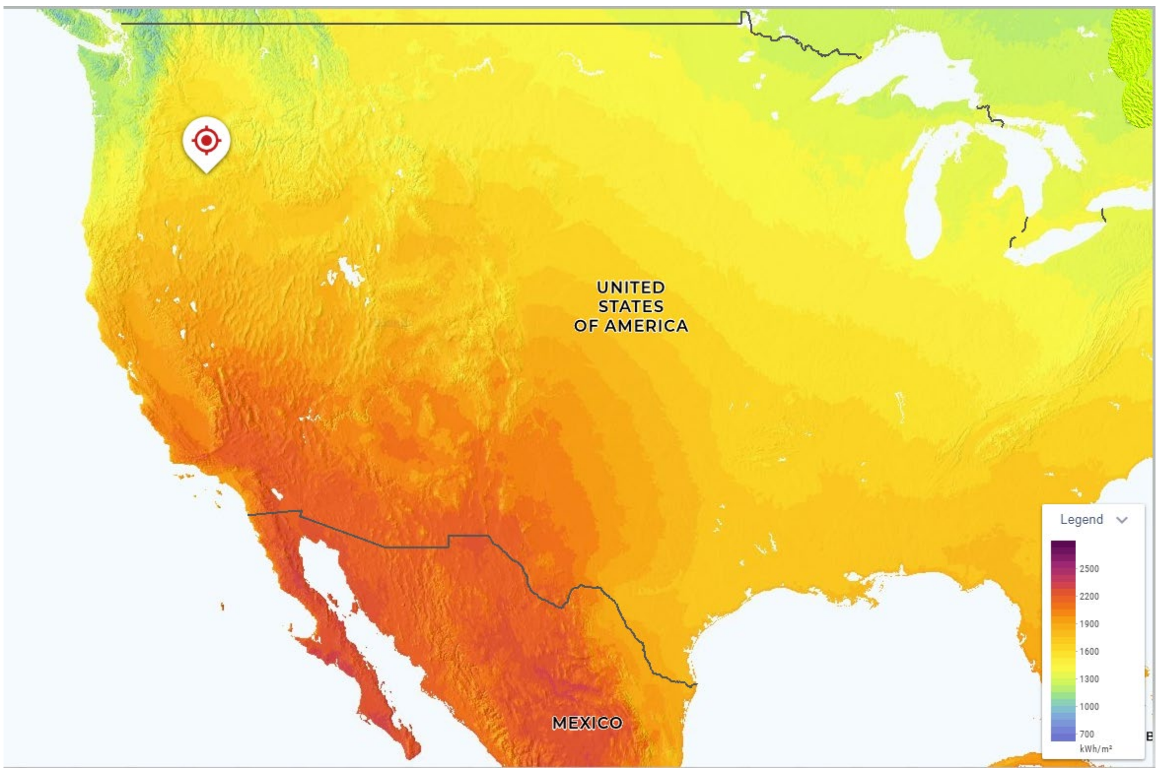

Figure 3 Global Horizontal Irradiation Map for USA

Per the Global Solar Atlas, due to its geographic location in the Pacific Northwest and its climatic conditions, which include frequent cloud cover and precipitation, solar irradiation in Oregon is more diffuse and evenly distributed throughout the year. Despite not achieving the exceptionally high GHI levels characteristic of desert regions, Oregon possesses substantial solar potential, particularly in its eastern and southern areas, such as near John Day, where irradiation levels are relatively higher. While the state of Oregon solar resource may not be as intense as other southern states, the irradiation remains sufficiently robust to support solar energy initiatives.

4.3 METEOROLOGICAL DATA

Energy yield estimation for photovoltaic (PV) power plants are highly dependant on reliable meteorological data and GHI conditions at the project site. While a few years of local data are generally used for detailed design of larger plants, more general sources of data provide good estimations at the conceptual phase and for smaller plants. Data can also be provided as a representation of multiple years, or single low to high GHI years. For conceptual analysis a Typical Meteorological Year (TMY) is generally used, from which typical energy generation variances can be estimated.

Several different solar resource data sets are proposed by PVsyst, the software used to estimate the solar PV energy generation, that have been considered to evaluate the GHI expected at the project site. For this study, the following datasets are available and have been considered:

- PVGIS TMY
- Meteonorm 8.1
- NASA-SSE

Table 1 TMY Meteodata from the PVGIS NSRDB dataset

Month	Global Horizontal Irradiation kWh/m²/mth	Diffuse Horizonal Irradiation kWh/m²/mth	Wind Speed ft/s	Temperature ^{0}F
Jan	46.6	23.1	5.25	26.24
Feb	81.4	27.8	4.59	30.2
Mar	107	52.1	5.58	31.32
Apr	139.7	72.1	6.23	38.79
May	166.8	90.8	5.58	44.82
Jun	200	73.8	4.59	59.04
Jul	247.6	50.4	4.59	73.8
Aug	205.5	52.7	4.59	67.59
Sep	147.9	45.8	4.92	60.26
Oct	78.1	38.6	5.25	42.03
Nov	54.7	20.1	5.25	30.16
Dec	28.4	15	5.91	24.15
Year	1503.7	562.3	5.25	44.11

The PVGIS TMY dataset was selected to obtain the meteodata for PVsyst energy yield simulation. Table 1 provides the monthly meteorological and irradiation data from the PVGIS TMY dataset. The GHI from the dataset aligns with the irradiation from the Global Solar Atlas. PVGIS provides TMY for geographical locations around the world with data from Satellite Application Facility on Climate Monitoring (CM-SAF), Surface Solar Radiation Data Set - Heliosat (SARAH) and National Solar Radiation Database (NSRDB). For the American region, the NSRDB TMY was used. NSRDB is a serially complete collection of hourly and half-hourly values of meteorological data and the three most common measurements of solar radiation: global horizontal, direct normal and diffuse horizontal irradiance. The

National Renewable Energy Laboratory (NREL) has provided solar resource data for the United States through the NRSDB for more than 25 years.

5. SOLAR PV SYSTEM DESIGN

5.1 MOUNTING STRUCTURE AND ARRAY LAYOUT

5.1.1 Array Mounting Structure

Larger ground based photovoltaic (PV) arrays differ from small-scale installations because the modules in the array tend to shade themselves mutually. Partial and uneven shading of modules in a large array can create problems for inverters to find and adjust the operating voltage of the array, in addition to causing energy losses. The main panel mounting structure installation types are:

- **Fixed Shed** – The simplest concept with modules as fixed sheds facing south and tilted. The modules are installed at the optimal angle to increase the direct irradiance while limiting the mutual shading effect. While this option is easier to install, less subject to damage and requires less maintenance, it doesn't offer the option of changing angles easily during the year.

- **Tilt Axis Tracking** – The modules are mounted on sheds facing south with adjustable tilt and tracking for best energy generation. Tilt axis tracking systems provide good energy production for the array. However, even with back tracking to avoid shading, the shading losses from mutual shading can be high, mainly in winter, with the electric behaviour of the array likely difficult to predict.

- **Horizontal Axis Tracking** – The modules are mounted on a horizontal axis tracking system and can tilt from side to side to track the sun, generally from east to west during the day. The energy production with North-South horizontal axis tracking systems is similar to tilt-axis tracking systems but with significant advantages. When back tracking to avoid shading, a horizontal axis system doesn't generate mutual shading of modules which eliminates any string effect from shading and all modules always perform equally. This ensures more voltage stability across the array which improves the capacity of inverters to maintain maximum efficiency.

- **Double Axis tracker** – The modules are mounted on a dual axis system that orients the panels directly towards the sun during the day. These require very large spaces between modules in order to avoid any shading effect and does not provide good use of the land. They are better for smaller installations where trackers can be spaced apart. The complexity of the tracking mechanical systems requires more maintenance than for the other systems.

A fixed shed installation has been selected for the SPP energy simulation for the project. Due to the intermediate level of solar irradiation in the John Day region, the implementation of any tracking system is unlikely to yield a significant increase in energy output. Furthermore, tracking systems necessitate specific installation conditions, regular maintenance and additional costs.

Mounting structures are classified as 1P, 2P, 3P, etc. to indicate the vertical number of panels in portrait configurations on the racking system, or as 1L, 2L, 3L etc. when panels are in the landscape configuration. The more common configuration of 2P (2 modules in portrait configuration) has been used for the project, which make better use of the racking system.

The optimal tilt angle to maximize the energy production of a solar array depends primarily on the latitude of the installation location, but it needs to be evaluated with the spacing between the rows. Higher tilt, i.e., more vertical, will crate more shading and required more spacing between rows, hence less panel density or lower Ground Coverage Ratio (GCR) for the same area.

The graph of the energy generation as a function of the tilt angle for the latitude of the City is shown on Figure 4. The optimal tilt for the SPP is 28 degrees from horizontal. However, a lower tilt angle of 26 degrees was chosen to enhance the GCR. Although this represents a deviation from the optimal tilt angle, the resultant decrease in energy production by each panel is negligible and compensated by an increase in the spatial efficiency of the array installation with more panels and overall better system energy yield.

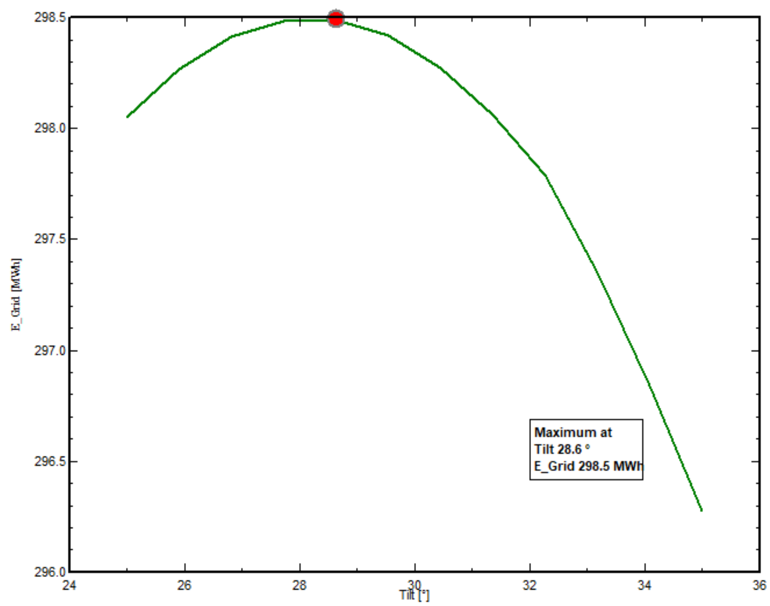

Figure 4 Optimal panel tilt angle for the project location

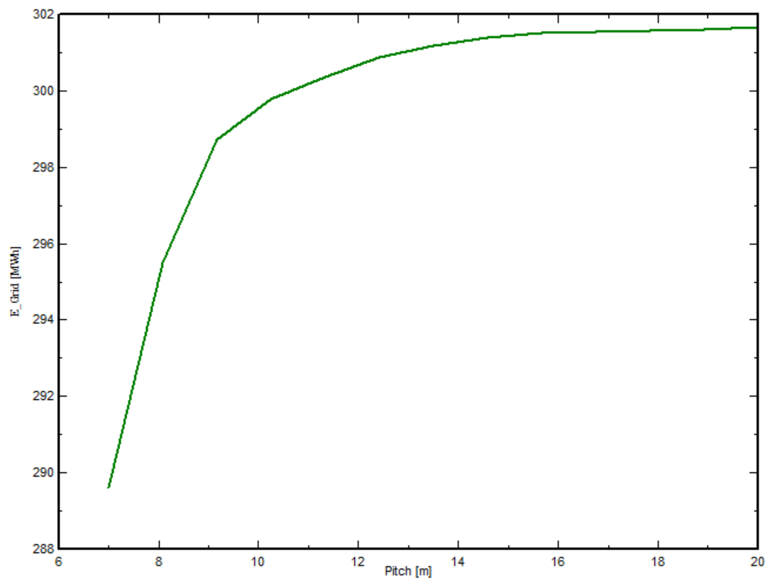

Figure 5 Optimal pitch (inter-row spacing) for 26 degree tilt

Inter-row spacing, also known as pitch, refers to the distance between rows of solar panels. This spacing has a major impact on self- shading of the panel rows, especially at lower sun angles during the winter months and on GCR. Selecting the optimal pitch considers several factors, such as the site latitude for better irradiation, the height and tilt angle of the panels on the racking system to minimize shading, and the geographic and climatic conditions of the area to favorize self-cleaning of the modules. The relation between system energy output and pitch using a 26 degree tilt for the site is presented in Figure 5. A pitch of 9 m was selected. The selected pitch is a balance between losses from the shading but a higher system energy output for the area with an increase in the GCR.

5.2 SOLAR PV MODULES

The main types of solar panels on the current market are Monofacial and Bifacial. Monofacial solar panels are the most common type of solar panel used in both residential and commercial installations. These panels are designed to capture sunlight from one side only — the front side where the solar cells are exposed. Bifacial panels are transparent which allows irradiation from the back to reach the solar PV cells and generate additional energy.

Monofacial solar panels tend to be less expensive and simpler in design compared to bifacial panels. making them a more cost-effective choice for many installations. They have a long track record of reliable performance under a variety of environmental conditions with straightforward installation well-understood by most solar technicians. In comparison to bifacial panels, they provide limited efficiency in low and diffuse light conditions, such as overcast days, since they only capture sunlight from one side.

Bifacial solar panels are capable of capturing sunlight from both their front and back sides. This allows them to produce more energy in the same footprint. They are particularly advantageous where ground reflectance (albido) is high, such as on white roofs or landscapes with reflective materials such as snow. However, bifacial panels typically cost more upfront due to more complex manufacturing processes and have a more complex installation and maintenance. The performance benefits of bifacial panels can be highly variable and dependent on specific installation conditions.

Table 2 Solar PV module parameters

Parameter	Value	Unit
Manufacturer	Canadian Solar	-
Module Name	HiKu6_CS6W-550MS LR5-72HBD-545M	-
Maximum Power (Pmax)	550 545	W
Module Efficiency (at STC)	21.5 21.3	%
Maximum Power Voltage (Vmp)	41.7 41.8	V
Maximum Power Current (Imp)	13.2 13.04	A
Open-Circuit Voltage (Voc)	49.6 49.65	V
Short-Circuit Current (Isc)	14.00 13.92	A
Maximum System Voltage	1500	V (DC)
Power Temperature Coefficient	-0.34	%/°C
Voltage Temperature Coefficient	-0.26	%/°C
Current Temperature Coefficient	0.05	%/°C

Considering the lower overall cost and simple installation, monofacial solar panels were selected for the project. The incremental energy gains offered by bifacial panels under certain conditions do not justify their higher initial cost and complexity for most standard installations. Monofacial panels provide a robust, cost-effective solution with sufficient energy output for typical solar projects, making them a more suitable choice in scenarios where budget and simplicity are prioritized.

PERC Mono-crystalline modules from Canadian Solar with a nominal power of 550Wp were used for the simulations. The main module parameters and characteristics are summarized in Table 2, with the datasheets provided in Appendix A and PVsyst PAN-files for use in the modeling software provided by the Canadian Solar manufacturer. The plant concept considers 26 modules being connected in series per string.

5.3 INVERTERS

For residential and small to medium-sized commercial solar installations, smaller string inverters are used compared to larger central inverters. String inverters can have one "string" of solar panels, with the possibility of having multiple strings linked to a single string inverter, depending on its capacity. The string inverter modular nature allows for phased system expansions, adapting seamlessly to growing energy needs or budget availability.

String inverters are generally less expensive per watt compared to central inverters, making them a more affordable option for smaller installations. They are also easier to install and configure due to their smaller size, which can significantly reduce both the initial installation costs and complexity. Expanding a solar system is also more manageable with string inverters, allowing for incremental additions as budget or space permits. Furthermore, with less strings per inverter, they are less affected by shading, thus maintaining higher overall system efficiency. Large installations may require multiple string inverters, potentially complicating the electrical design and installation process. While string inverters offer excellent string-level monitoring, diagnosing issues at the individual panel level can be more challenging without additional monitoring technology.

Central inverters are suited for large commercial and utility-scale solar installations and are designed to manage high power outputs from multiple solar panel strings with fewer inverters. The upfront cost of central inverters is high. Central inverters are too large for this project.

SMA string inverters were considered for this assessment. Multiple smaller inverters were selected for the Option 1, while one to multiple larger inverters were selected for the other options. Relevant technical parameters and output characteristics from the manufacturer are provided in Table 6 with the datasheets provided in Appendix A.

5.4 SOLAR PV INTERCONNECTION

OTEC provided a Letter of Support indicating that the site is suitable for the project. The City has started discussions with OTEC with the goal of returning/exchanging energy to/from the grid to reduce energy bills for low-income residents. Per the work session with the OTEC, it is most advantageous to utilize a behind-the-meter configuration for the proposed system via a net metering agreement.

Depending on the options and energy generated by the SPP, it is assumed that the supply of energy over the year will be credited to the community while the deficiency to operate the WRC will be charged. The cost of energy was not evaluated as part of the study. The selection of the best option will need to be evaluated against the technical limitations and commercial implications with OTEC.

The Point of Interconnection (POI) for this study is assumed to be through the WRC at 480V/3ph. Interconnection for the smaller SPP capacities, or the option to use BESS to reduce or eliminate grid requirements, could be done behind-the-meter through the WRC electrical service entrance. However, it is unlikely the electrical service entrance of the WRC would allow for the larger SPP capacities, and a dedicated interconnection at higher voltage might be required. No specific reactive power requirements beyond the inverter capabilities are considered. The energy yield estimation is based on a power factor of 1.

Per the information generally available, OTEC operates at either at 12.5 kV or at 34.5 kV in the area. To support new loads and provide additional capacity for any future load growth in the area, in 2021 OTEC was planning to convert some of the 12.5 kV systems to a 34.5 kV volt system which has capacity for growth. Per the project map from OTEC (Figure 6), the conversion would have included the local distribution facilities along Patterson Bridge Road and east along the river, which appears to be in the project area. The conversion, if it was completed, would likely offer higher interconnection capability that could be explored with OTEC.

Figure 6 OTEC line conversion project near the project site

6. ENERGY SIMULATION MODEL

6.1 SIMULATION MODEL

The SPP optimization was completed by estimating energy production and project costs for different system configurations for each option to determine the required inverter capacity and solar PV array size, i.e., number of modules, required to meet the objective of each scenarios.

The key factors influencing the energy production and its distribution during the year include:

- The variation in solar radiation over the year.
- The angle of incidence and the ratio of direct irradiation vs diffuse on the panels.
- The horizon and near shading on the array, including the shading effect on serial strings of modules.
- The ratio between the array DC power and the power of the inverters.

The software PVsyst developed by the GROUPE ENERGIE (CUEPE) of the University of Geneva was used. This software is an advanced tool for simulating and analysing complex PV systems that are either stand alone or connected to a grid. The software takes into consideration all the key factors and offers the flexibility to use built-in or actual meteorological data and component characteristics, and considers the effect of the most important variables on the energy production at every hour over an entire year of meteorological data:

- The global direct irradiation on the modules based on the characteristics of the tracking system chosen.
- Losses of irradiation on the panel corrected for the irradiation incidence.
- Variation of the module efficiency with the level of incident irradiation.

- Variation of the module efficiency related to irradiation-to-current conversion based on the module temperature (thermal loss factor). The module temperature is calculated based on the ambient temperature and wind velocity for not insulated and free air circulation mounted modules.
- Losses for module quality variation from the manufacturer nominal specification and module characteristic mismatch.
- Far shading (horizon) that will affect the direct sun exposure of the array early and later during the day and over the year.
- The mutual near shading factor for the direct irradiation on modules and the diffuse shading factor.
- The albedo factor for the soil reflectance and its variation over the year.
- Effect of partial shading of panels, which is not linear and depends on the wiring of the array. The overall reduction in energy production from partial shading can vary from a linear shading reduction to a more stepped and drastic reduction caused by an entire series of modules becoming inactive because of partial shading.
- Electrical losses between the PV modules and the inverters.
- The inverter efficiency at constant operation and losses resulting from over DC power at the inverter.

Performance losses are calculated by PVsyst for each timestep during the energy yield simulation. The annual losses are determined by the sum of these losses and presented in the Sankey Diagram in PVsyst Reports. All the losses of the SPP during all intermediate steps of PV power generation are shown in Appendices C, D, E and F for each design Option.

The PVsyst results for hourly energy production at the inverter are used in Tetra Tech's proprietary renewable power and energy (P&E) model to evaluate and summarize the overall energy management with the consumptions, BESS system and grid power flow. The P&E model takes into account other aspects not considered by PVsyst such as the plant electrical efficiency after the inverter and to the POI, and other calculations to present and compare the results, including:

- Electrical losses from the inverter to the point of interconnection with the grid.
- Losses during the BESS recharge and discharge, assumed at 3% each way.
- Interconnection transformer efficiency. Assumed not required with interconnection at 480V.
- Transmission / cabling line losses to the POI. An interconnection voltage at the POI of 480 V at a distance of 200 m from the inverters was assumed.
- Downtime loss for maintenance, set at zero for this study.
- Capacity factor of average plant power over the plant capacity for the entire period considered.
- Extraterrestrial irradiation representing the theoretical irradiation that would be received on a horizontal ground area over an entire year if there were no atmosphere. This gives an appreciation of the quality of irradiation of the site, typically referenced as the clearness index.

- Percentage of horizontal irradiation over the area representing the ratio of the annual energy sold to the annual solar energy received on the ground over the plant site to provide an appreciation of the performance of utilization of the area to produce energy.

6.2 ENERGY GENERATION LOSS ASSUMPTIONS

6.2.1 Horizon (Far) Shading

The horizon, or far shading, identifies potential far obstructions that will cast shadows on the entire solar PV array, i.e., all modules, during the day. This shading is general from distant mountains or significant man-made structures not associated with the plant infrastructure. The horizon shading will generally affect the time at which the direct irradiation from the sun will reach the array in the morning and until when it will last in the evening, and how this will change over the year as the sun position changes. However, major obstructions closer than the horizon could also have shading that could act in similar fashion to horizon shading.

A preliminary assessment of the far shading for the site was done utilizing Google Earth. The selected site terrain is predominantly flat, with no nearby mountains or tall buildings, and devoid of substantial natural shading objects that could contribute to horizon shading losses, making the site suitable for solar PV energy generation.

To evaluate the potential impact of distant objects on the solar installation efficiency, horizon data points were generated from the Photovoltaic Geographical Information System (PVGIS), which is a public source software available online, and then imported into PVsyst to create a horizon used by the software. The southern horizon from the SPP in relation to the position of the sun during the year is provided in Figure 7. The clear horizon lines above the horizon in gray are conducive to optimal solar panel performance. There are minimal risks of far shading at the site a the selected SPP which will ensure good irradiation and an efficient configuration to maximize capture of the solar energy.

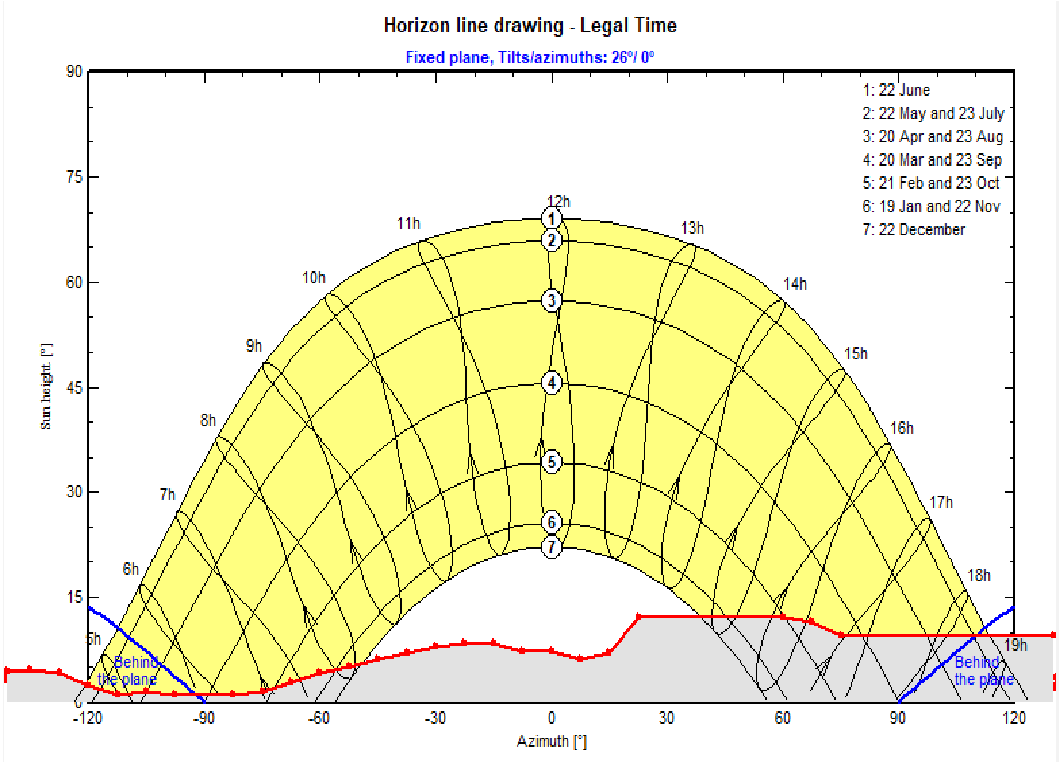

Figure 7 Southern horizon for the SPP from PVGIS with position of the sun over the year.

6.2.2 Near Shading

Near shading of the array can be from several sources, including self-shading of the solar panel rows, small nearby structures, or trees. A simplified three-dimensional model was generated to evaluate the potential impacts of the WRC and nearby trees on the SSP array. The specific layout and shading model for the Solar Power Plant (SPP) Option 4 at mid-day in the winter is illustrated in Figure 8.

The tool in PVsyst software assesses near shading impacts by analysing the shading scene over the entire year to calculate near shading losses for each timestep based on the position of the sun relative to the obstructions. The shading calculations is used by PVSyst when estimating the solar generation at different times of the day and year.

Additionally, the effect of shading from the mounting structures on the backside of the panels was incorporated into the analysis using a constant derate factor. This approach quantifies the reduction in output due to these specific shading effects, allowing for a more precise adjustment in performance expectations.

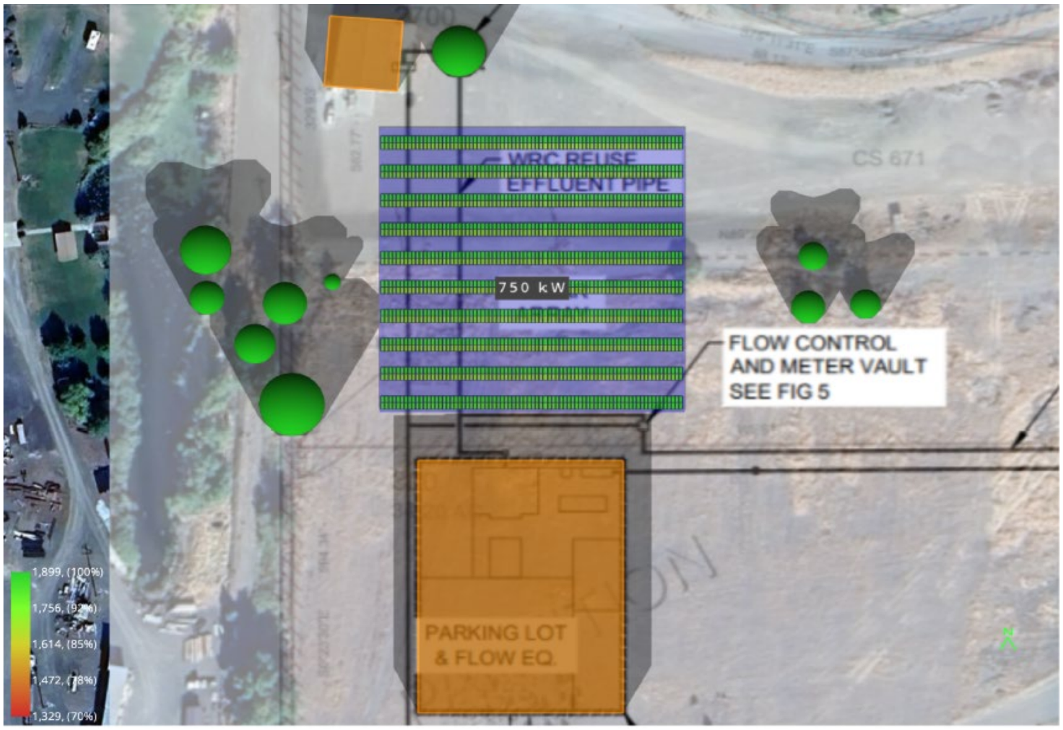

Figure 8 SPP Layout and shading model for Option 4 during winter at mid-day.

6.2.3 Equipment and System Losses

In addition to the irradiation losses, PVsyst considers losses in the systems and equipment including field losses, such as soiling on the modules, module, electrical, and system performance losses. These are detailed in Table 3. Table 3 provides a systematic breakdown of each category of loss, enabling a clearer understanding of the factors contributing to the overall efficiency of the solar power system. These losses are critical in realistic performance projections and help in optimizing system design and maintenance for enhanced functionality.

Table 3 PVSyst simulation loss/gain parameter and assumptions

Description	Loss / Gain	Assumption
Array Soiling Losses (Average annual energy lost from soiling on the module)	2.00%	Rainfall and cleaning of modules during operation.
Incidence Angle Modifier, b_o (Irradiance reflection on the module / PV cell surface)	0.05	Assumption based on based on IAM Measurement by TUV Certified Laboratory
Module Losses		
Thermal Loss Factor, U_c (Cooling of the modules by radiating heat outwards)	32.1 W/m²k	Default recommended value for fixed tilt Based on the Canadian Solar PVsyst User Guideline.
Wind Loss Factor, U_v (Cooling of modules by wind blowing over them)	1.4 W/m²k/m/s	Default for fixed tilt systems based on the Canadian Solar PVsyst User Guideline.

Description	Loss / Gain	Assumption
Light Induced Degradation (Degradation due to modules exposed to light for the first time after being installed)	-1.1%	Based on literature/experience data and Canadian Solar PVsyst User Guideline.
Annual Module Degradation (Annual degradation of the modules from date of installation to COD)	-0.00%	Module degradation is not considered during simulation.
Module quality (Loss due to efficiency deviations from manufacturers' specifications)	0.40%	Based on module manufacturer datasheet.
Module Mismatch (Loss due to variation of module Maximum Power Point and inverter MPPT performance)	1.15%	Based on the Canadian Solar PVsyst User Guideline.
<u>Electrical System Losses</u>		
Maximum DC Wiring Ohmic Loss (Overall losses in all DC cables of the plant)	1%	Based on the cable sizing.
Maximum AC Wiring Ohmic Loss (Overall losses in all AC cables after the inverter POC)	1.91%	Based on the cable sizing.
Transformer Losses (Losses in the step-up transformer to POI)	N/A	Transformer not required with interconnection at 480V.
Auxiliary losses (Loss due to own consumption of equipment)	0.00%	Not modelled in PV Syst.
<u>Overall System Performance</u>		
Plant Degradation (Losses due to equipment degradation e.g., solar module degradation)	0.00%	Plant degradation is not considered in the PVsyst simulation for this case.
Unavailability (Unavailability of the plant or of the utility grid)	0.00%	Accounted for in the P&E Model instead of in PVsyst.

7. ENERGY GENERATION AND GRID POWER FLOW

7.1 SPP AND BESS OPTIMAL CONFIGUATION

While the SPP capacities for Option 1 and Option 4 are primarily defined by either the load demand or the available land area, the SPP and BESS optimal capacities for Option 2 and Option 3 are interdependent and needs to be looked at in combination. Multiple simulations were conducted using PVsyst over a range of nominal power of the SPP (125 kW to 1000 kW) and BESS (100 kWh to 1000 kWh) capacities to determine the optimal configurations. The results of the solar fraction of energy to meet the WRC daily energy requirement of 900 kWh for the various simulations are presented in Table 4 and Figure 9.

To achieve a reasonably high solar fraction coefficient, thereby reducing reliance on the grid electricity, a BESS capacity of about 500 kWh is required regardless of the SPP power. Any additional increase in BESS capacity beyond this threshold does not produce significant enhancements and results in diminishing returns on the investment on the BESS. Consequently, a BESS capacity of 460 kWh was selected for Option 2 as the most rational value based on these findings. A BESS capacity of 500 kWh was selected for Option 3, to avoid any export to the grid.

Table 4 Solar fraction of WRC energy as a function of SPP and BESS SPP capacities

SPP Power, kWac	BESS Capacity, kWh										
	0	100	200	300	400	500	600	700	800	900	1000
125	0.34	0.42	0.48	0.54	0.58	0.60	0.61	0.61	0.61	0.61	0.61
250	0.39	0.49	0.57	0.66	0.73	0.79	0.82	0.83	0.84	0.85	0.85
375	0.41	0.51	0.61	0.70	0.79	0.85	0.88	0.90	0.90	0.91	0.92
500	0.43	0.53	0.63	0.72	0.82	0.88	0.91	0.92	0.93	0.94	0.94
625	0.43	0.54	0.64	0.74	0.83	0.90	0.93	0.94	0.95	0.96	0.96
750	0.44	0.54	0.65	0.75	0.85	0.92	0.95	0.96	0.96	0.97	0.97
875	0.45	0.55	0.65	0.76	0.86	0.93	0.96	0.97	0.97	0.98	0.98
1000	0.45	0.55	0.66	0.76	0.86	0.93	0.97	0.98	0.98	0.98	0.99

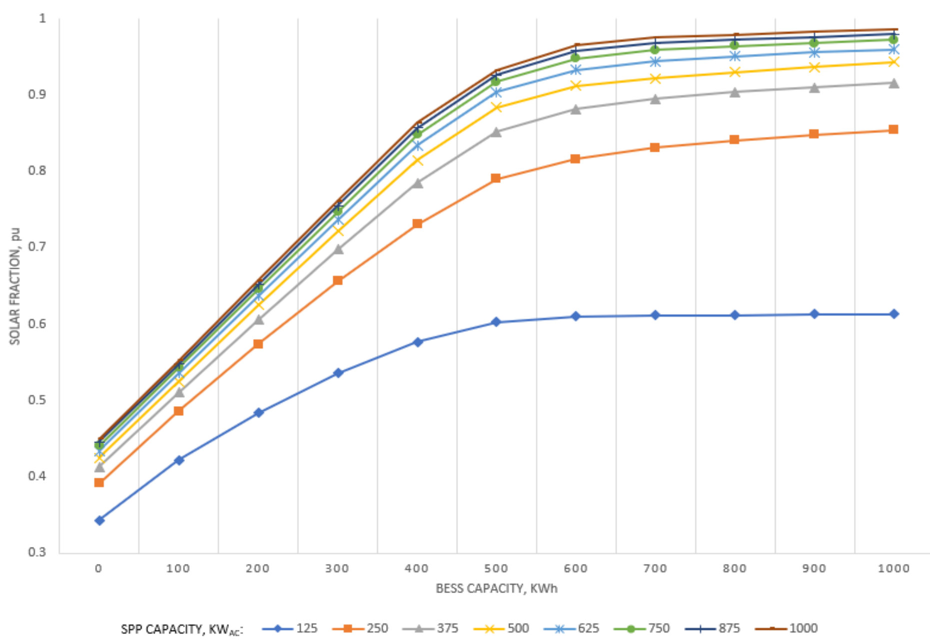

Figure 9 Solar Fraction versus BESS Capacity

The most significant gain in solar fraction is observed when SPP power reaches 375 kW. Beyond this range, further increases in SPP power do not result in substantial improvements in solar fraction. Based on this analysis, a system power of 250 kW, just below the 375 kW capacity, was selected for Option 2 as it provides a reasonable solution that meets the average annual demand requirements of the WRC. A capacity of 125 kW was used for option 3 to avoid export to the grid.

7.2 POWER AND ENERGY RESULTS

Appendices C through F contain P&E results along with the PVsyst simulation reports for each scenario (option). The energy flow summaries and power figures, as presented in this technical memorandum, offer a monthly breakdown of system operations. These figures encompass monthly averages for energy exported or imported to/from the grid, WRC energy consumption, energy produced by the SPP, system surplus/deficit, and the average energy charged to or discharged from the BESS. In the figures or tables, positive flows represent energy inputs into the system, whether from the SPP, grid, or BESS discharge. Negative flows represent energy demand from the system due to energy export to the grid, WRC consumption, or BESS charging.

7.3 OPTION 1 – AVERAGE ANNUAL WRC ENERGY DEMAND

A SPP capacity of 200 MWac produces approximately 333.8 MWh of energy annually, which corresponds to the WRC annual energy requirement of 328.5 MWh. However, although the net grid energy flow is almost zero over the year, there is an exchange of energy to and from the grid of about 200 MWh over the year.

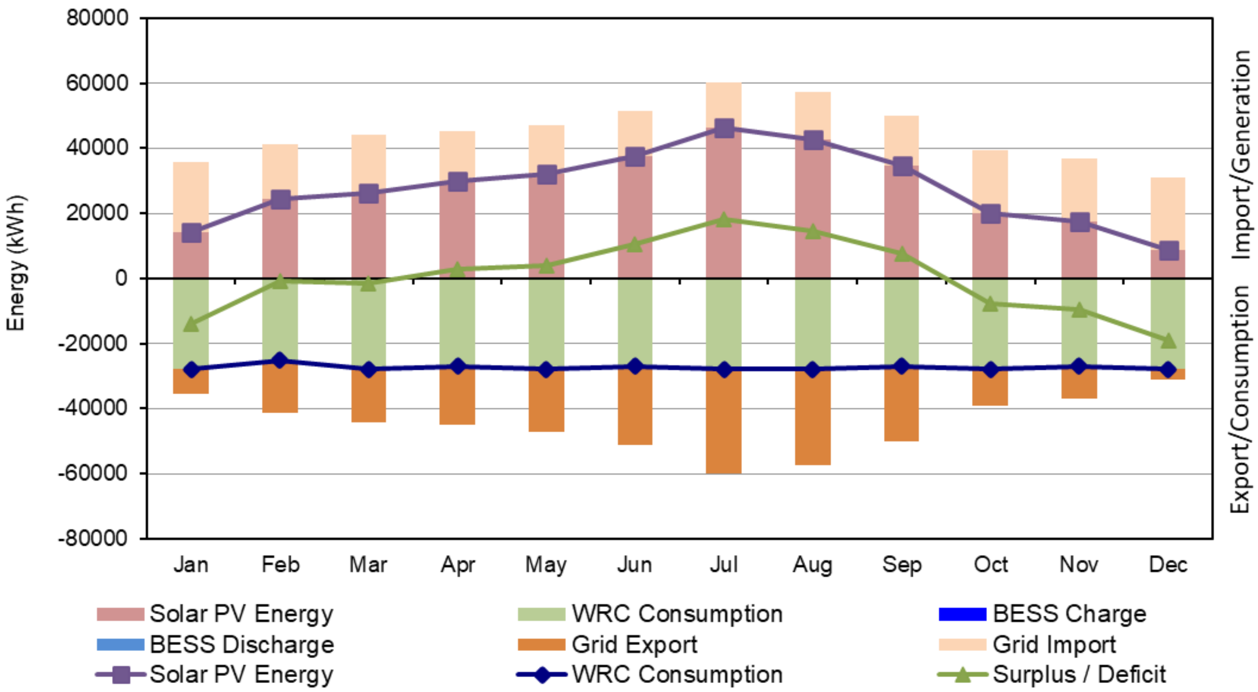

Figure 10 Average monthly energy profile for Option 1

As shown on Figure 10, on a daily basis, the energy surplus during daylight hours is exported to the grid and imported at night. More energy is exported during the summer months while more energy is imported during the winter months to achieve an annual net export / import over the year. Option 1 is contingent on OTEC allowing for the surplus solar energy to be utilized during periods of low solar irradiance, such as during night-time or winter months.

Option 1 presents a straightforward, cost-effective solution that can meet the WRC's average annual energy requirements. The interconnection will need to be able to accept up to 200 kW when the Solar PV system is generating at maximum capacity and when the WRC is not consuming any energy, i.e., being shutdown for maintenance or other reasons. This is preferred over having the additional BESS if OTEC will permit use the grid to manage the excess of energy from the SSP at an advantageous cost.

7.4 OPTION 2 – OPTIMIZED SPP AND BESS

By incorporating a BESS of 500 kWh and increasing the SPP to 250 kWac, the energy exported to the grid and then imported can be reduced while still providing sufficient energy to compensate for the entire WRC annual energy demand, in addition to the net energy exported to the grid. Figure 11 shows the very minimal energy imported from the grid during the summer by using the BESS to sufficiently store the daily energy to operate the WRC at night. The energy generation in the lower solar irradiance in the winter months is not sufficient and energy needs to be imported from the grid. To address this shortfall and ensure at least the base load of the WRC is met during December, the nominal capacity of the solar system would need to be increased to 625 kWac.

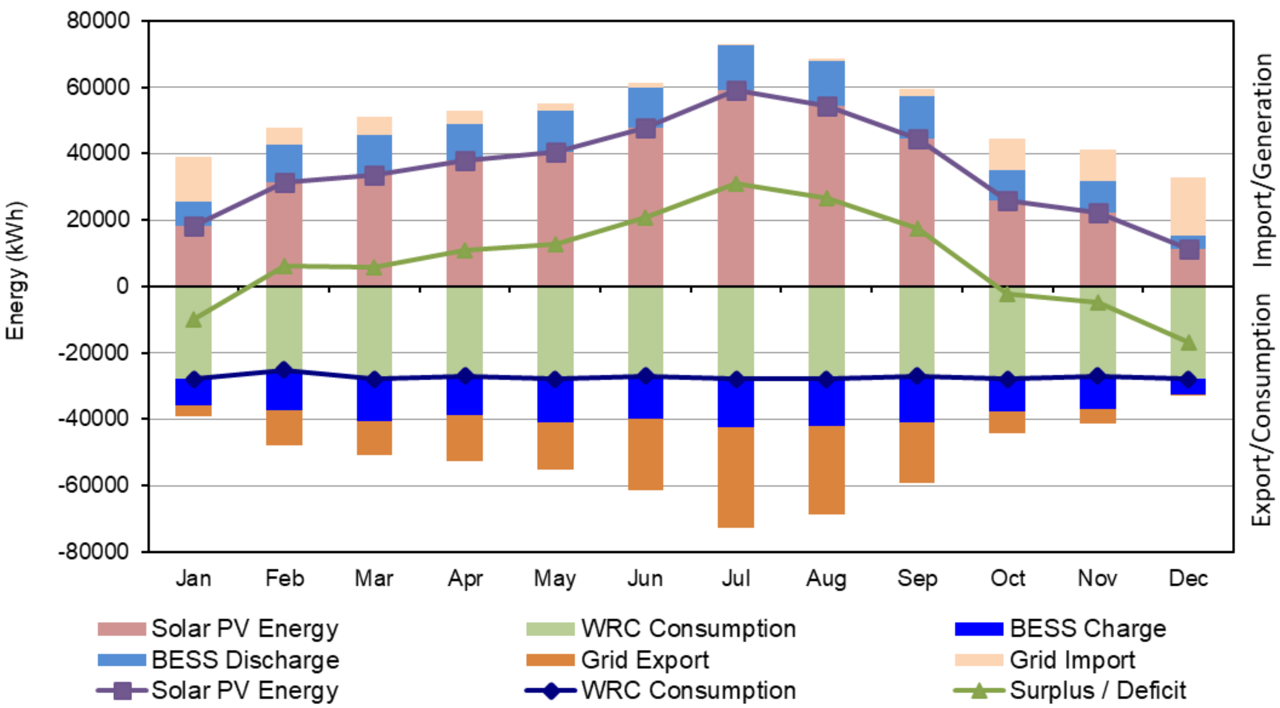

Figure 11 Average monthly energy profile for Option 2

Due to the reduced daylight hours in winter, solar penetration during these months is inherently limited. Adding a BESS with a capacity of 900 kWh to the 625 kWac solar system could significantly mitigate grid dependency. However, even with this configuration, there would still be a residual grid energy import due to consecutive days with negligible solar insolation. Achieving complete independence from grid energy would require several MWh of BESS capacity to store energy for sequential low-insolation days and would result in a substantial surplus of energy during summer months and underutilized storage capacity. This approach is deemed financially impractical.

In the present configuration, the solar system demonstrates a significant grid independence improvement by reducing the import of energy from the grid by about 130 MWh per year. Export of energy to the grid is also reduced but still remains high, at about 160 MWh, compared to the 210 MWh for Option 1.

The BESS usage compared to one full discharge per day over the year is 77%, which indicates a good usage of the system. Losses due the BESS efficiency of 97% in one direction (6% losses for charging and discharging) represents about 2% of the SPP energy.

The interconnection will need to be able to accept up to 250 kW when the Solar PV system is generating at maximum capacity with the BESS fully charged, and if the WRC is not consuming any energy. Option 2 optimized for the BESS would be preferable if OTEC restricts or does not offer significant economic advantage to use the grid to manage the excess of energy from the SPP.

7.5 OPTION 3 – NO EXPORT WITH BESS

The SSP capacity for Option 3 was reduced to 125 kWac to avoid any export of energy to the grid. The capacity of the BESS was increased slightly, to 500 kWh BESS, such that energy generated in the high irradiation month of June could all be stored during the day to power the WRC at night. The WRC for this month basically only operates on solar energy with nearly no exchange with the grid. Figure 12 shows that the BESS can store the energy from the solar PV system to avoid exporting energy the grid; only some residual energy is exported during the summer months.

Due to the lower SPP capacity, energy from the grid is required outside of July or when there is lower irradiance. The energy imported, of about 125 MWh, is lower than for Option 1 at 205 MWh, but is not compensated by energy export.

The BESS usage compared at 49% is lower than for the option 2, and still remains good. A lower usage should prolong the life expectancy of the system. Losses due to the BESS efficiency are also in the order of 2% of the SPP energy.

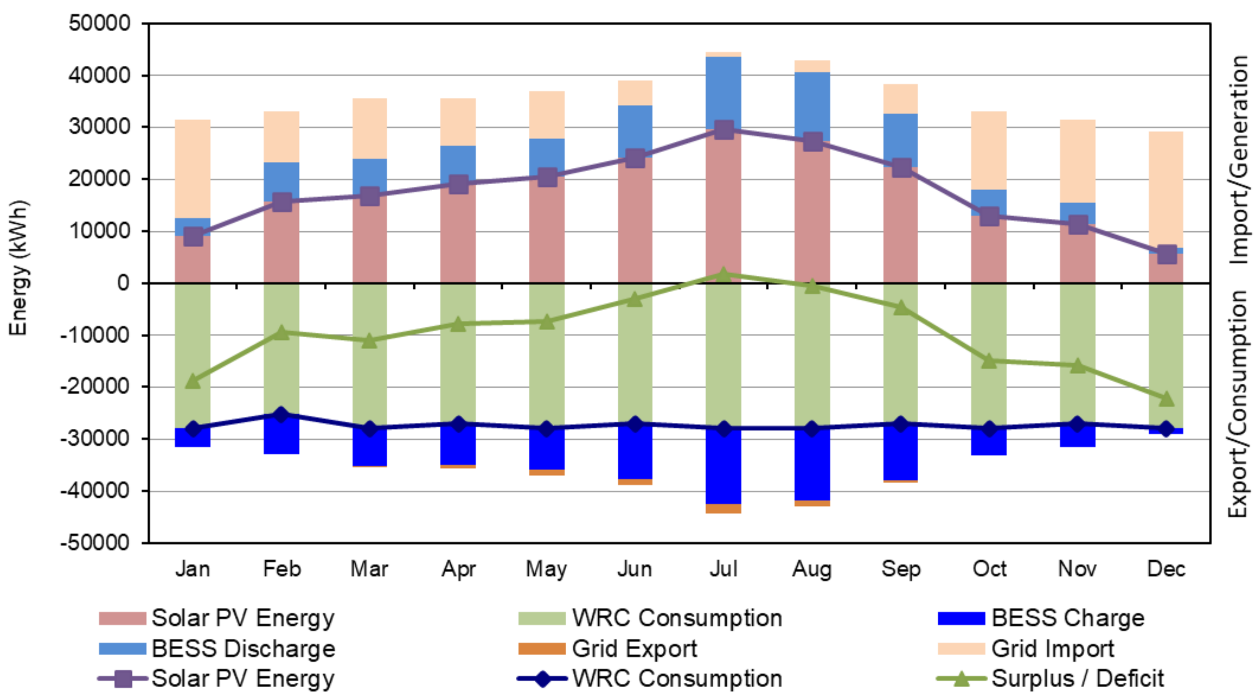

Figure 12 Average monthly energy profile for Option 3

The main advantage of this option is that the interconnection to the grid only need to be sized to provide the required power to the WRC, since the SPP will not export any power to the grid. This option would be preferable if OTEC does not permit or limits the interconnection capacity.

7.6 OPTION 4 – MAXIMIZED SPP

Option 4 is designed to maximize the utilization of available land by installing solar panels across the entire area. This configuration allows for a solar system with a capacity of 750 kWac over the 2 acres of land, which is triple the capacity of Option 1, just to supply the annual energy of the WRC. As shown on Figure 13, this option significantly increases the energy exported o the grid compared to Option 1, where 3/4 of the SSP energy generation is a net export not used to power the WRC. The increased SPP capacity also increases the amount of energy supplied to the WRC during the day, lowering slightly the requirement to import energy from the grid at night.

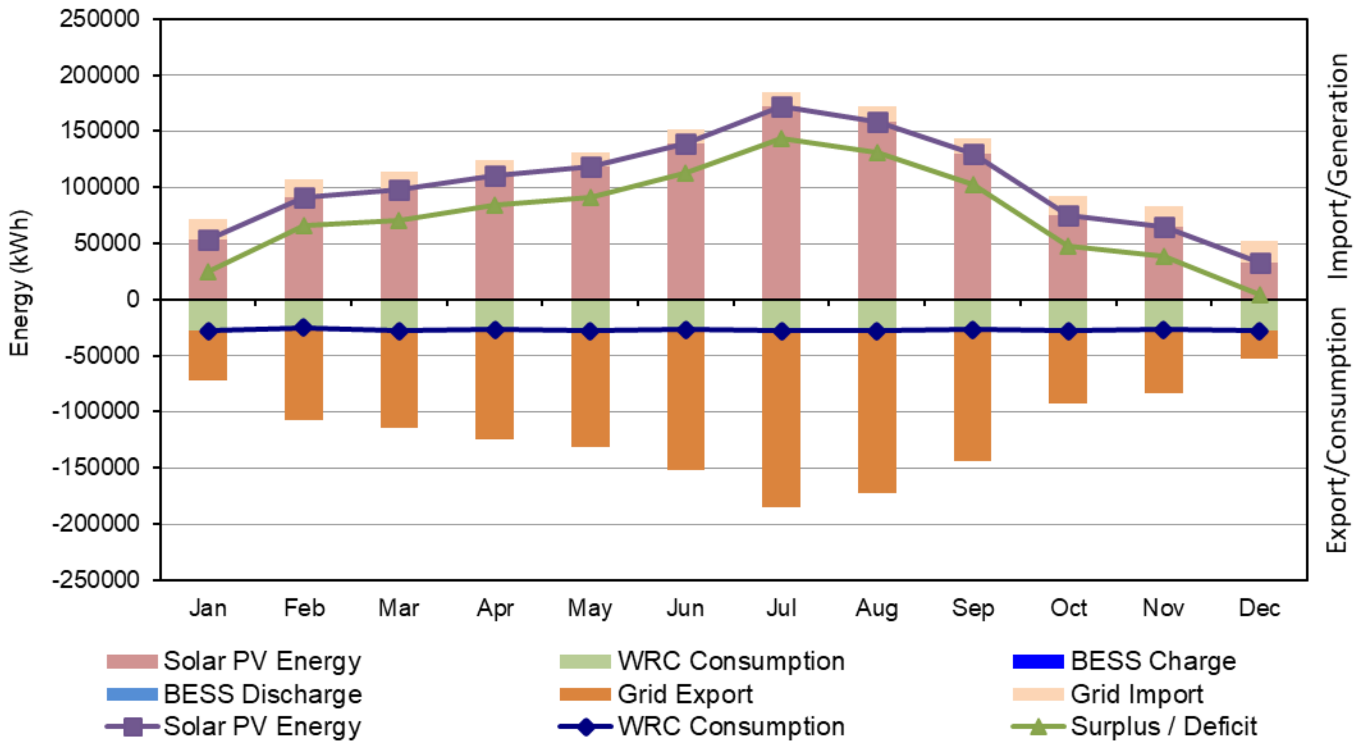

Figure 13 Average annual daily energy profile for Option 3

This approach effectively leverages the available space to enhance solar energy production and support greater energy self-sufficiency. The interconnection will need to be able to accept up to 750 kW, which is significantly higher than the other options. For Option 4, a separate interconnection to the grid from the WRC would likely be required or preferable. This option would be considered only if OTEC pays for the energy exported to the grid from SPP or provides significant economic advantage by offsetting the cost of the energy supplied elsewhere in the City to other customers.

8. ENERGY YIELD VARIATION

The energy yield results provided are based on the Typical Meteorological Year (TMY) and provide a P50 probability confidence level. This means that the predicted energy yield has a probability of 50% to either exceed or be lower than the estimated energy. By applying uncertainty factors, the results can be estimated at different confidence levels, such as P10, P25, P75 and P90. These values were determined with the following equation:

$$E(Px)_n = E_{n=0} \cdot (1 - \sigma_{total} \cdot CDF^{-1}(x)) \quad (3)$$

Where:

- n is the year
- E(Px)n is the energy generated for the year n, with Px (%) probability of exceeding this value
- $\sigma total$ is the total uncertainty
- $CDF^{-1}(x)$ is the inverse cumulative normal distribution for a probability of Px (%)

The probability distribution variance of the PV power generation is mainly dependant on uncertainties regarding solar resource data, conversion of irradiance to tilted plane, PV module parameters and modelling of module performance, inverter parameters and performance, as well as soiling losses. Assuming that the uncertainties are independent of each other, the total uncertainty total is determined by using simplified Gaussian error propagation (JCGM, 2008):

$$\sigma_{total} = \sqrt{\sigma_{SRD}{}^2 + \sigma_{POA}{}^2 + \sigma_{MPR}{}^2 + \sigma_{MP}{}^2 + \sigma_{IP}{}^2 + \sigma_{SML}{}^2} \quad (1)$$

Table 5 summarizes the values for the uncertainties used to predict the energy yield variations. Figure 14 shows an example of the estimated energy yield variations for Option 1 based on the P50 energy calculated. Energy yield probability for all options are provided in Table 6.

Table 5 Underlying uncertainties

Uncertainty source	Symbol	Value (%)	Description
Global Horizontal Irradiance	SRD	± 5 %	Uncertainty of global irradiation values for site specific applications due to the interpolation of data given from different reference weather stations, as well as methodical uncertainty with regards to measured values, averaging, etc.
Horizontal to Inclined Calculation	σPOA	± 0.8 %	Uncertainty associated with the calculation model for the different components of inclined surface irradiation. Perez model.
Module efficiency for deviation from STC conditions	σMPR	1 %	The efficiency of one PV module varies if the real conditions differ from STC. The real behaviour is modelled but contains uncertainties. Deviations in Angle of Incidence, spectral mismatch, irradiance level and temperature can be combined to the module performance ratio uncertainty.

Uncertainty source	Symbol	Value (%)	Description
PV module parameters	σMP	± 1.6 %	Certification facilities have some uncertainties in their measurement systems for the determination of module efficiency. A survey conducted for the IEA PVPS Task 13 among 9 Laboratories shows a range of uncertainty within ±1.6 % for market leading certifier and up to ±5.2 % for others (Reise et al., 2018). Considering the module manufacturer being Tier 1, an uncertainty of 1.6 % is estimated for PV module parameters and modelling.
Inverter parameters	σIP	± 0.5 %	Euro Efficiency for inverters is used for most Inverters to determine the relation between input and output power. Accuracy depends on manufacturers information and on the location.
Soiling losses	σSML	± 1 %	A study by Fraunhofer ISE in 2016 determined the uncertainty of annual soiling losses in the range of 0.5-2 % for modules with a tilt larger than 15° whereas 0.5% were estimated for SPPs set up in Germany and 2% for plants located in more arid environments (Müller et al., 2014). For the project location in USA a soiling loss uncertainty of ±1 % is estimated.
Total Single- Year Uncertainty	$\boldsymbol{\sigma_{total}}$	± 5.51 %	The total single-year uncertainty is considered for calculating the plant performance for different confidence levels (for a single year).

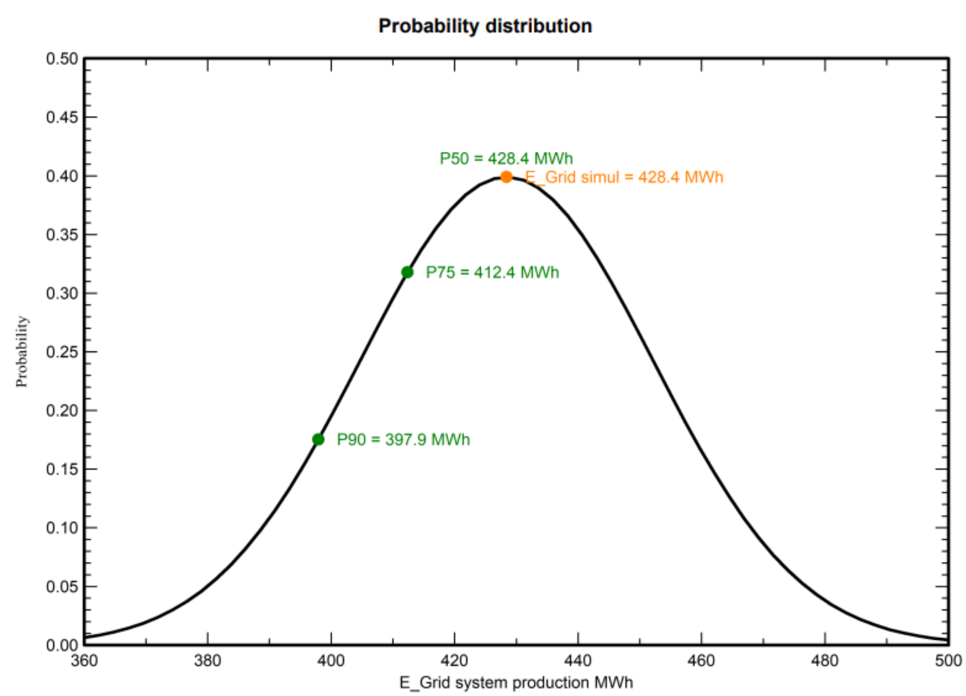

Figure 14 Option 1: Probability distribution for the annual energy yield for P(75) and P(90). P(10) and P(25) are not shown and would on the other side of the distribution.

9. COST ESTIMATE

The cost estimation used is mostly intended for relative comparison between the options. Cost estimates are considered at an AACE Class 5 level for screening and feasibility with an expected accuracy range of up to -50% to +100%. The capital cost estimates used in this study are not detailed estimates and should not be used for investment decision-making. All dollar figures quoted are in American (USD) dollars.

The cost estimate for each option is built into the P&E model and uses a combination of parametric-based prices and quantity-based take-off pricing which adjust with the system characteristics allowing to quickly compare various SPP and BESS configurations. The model takes all key aspects of the system into consideration, including major cost items such as the supply of the inverters, modules, and module supports, as well as other costs for site preparation, installation of equipment and cabling, and interconnection. Soft costs items, such as engineering and construction management, owner's costs, contingency, and escalation are estimated as percentages of the direct costs.

When comparing the four options from a cost perspective, several factors come into play, including the size and capacity of the SPP, the inclusion and size of BESS, grid export/import dynamics, and interconnection requirements. The overview of how these elements affect the costs associated with each option is provided below:

Option 1: This option is the most cost-effective with a total capital cost of $336,000 and includes a 200 kWac SPP without a BESS. The cost per SPP capacity is $1,500 per kWac, with a cost per energy generated of $1.01 per Wh. This makes it an attractive choice for those looking to meet energy demands without investing in BESS.

Option 2: This option has a capital cost of $674,000 and includes a 250 kWac SPP and a 460 kWh BESS. The BESS component significantly increases the total cost, representing 28% of the total budget. This option provides a reduced reliance on the grid and a higher solar fraction, justifying the additional cost. The cost per SPP capacity is $2,360 per kWac, while the cost per energy generated is $1.58 per Wh.

Option 3: This option has a capital cost of $562,000 and includes a smaller SPP (125 kWac) and a larger 500 kWh BESS, emphasizing minimized grid export. Although this setup has a lower solar capacity, the higher BESS capacity contributes to grid independence. The cost per SPP capacity is significantly higher at $3,940 per kWac, with a cost per energy generated of $2.62 per Wh. This is due to the increased cost of BESS, which represents 37% of the total capital cost.

Option 4: This option has the highest capital cost at $858,000, and includes a 750 kWac SPP. It doesn't include a BESS, focusing on maximizing energy production and exporting to the grid. Despite the high total cost, it has a low cost per SPP capacity ($1,000 per kWac) and cost per energy generated ($0.69 per Wh). This makes it a cost-effective choice in terms of energy generation if there are favorable conditions for energy export.

Each option has unique cost considerations, from capital investment to operational costs and grid interaction. Option 1 is the most cost-effective, with minimal reliance on BESS. Option 2 balances higher initial costs with reduced grid dependency. Option 3 aims to limit grid interaction, leading to potentially lower costs in specific contexts. Option 4, while the most expensive, could provide substantial returns if energy export incentives are in place. The choice of the best option depends on budget, energy goals, and grid policies.

A financial analysis of these options should be completed once the feasible option(s) has/have been determined. Additional refinement of the cost estimates shall also be completed at that time and as further project details and specific cost data become available. Other costs, such operation, taxes, maintenance and other operating expenses (OPEX), would also need to be considered. Finally, the agreement with OTEC will have an impact on the financial analysis depending on either the price for exporting or importing energy, or the option to offset energy consumption costs for other users in the City.

10. OPTION SUMMARY TABLES

Table 6 summarises the design parameters, energy generation and management, and costs for all options.

Table 6 Option Summary

Parameter	Option 1 Yearly Average Energy Demand	Option 2 Optimized for BESS	Option 3 No Export with BESS	Option 4 \Maximum Array Size
SITE INFORMATION				
Location	City of John Day			
Coordinates	44.415840°, -118.953431° (44°24'57", -118°57'12")			
Time zone	UTC-08, America / Los_Angeles [PST]			
Election	3100 ft (941 m)			
SOLAR POWER PLANT (SPP) DESIGN				
Modules				
Module Manufacturer	Canadian Solar			
Module Model	HiKu6_CS6W-550MS			
Nominal Power Rating at STC, Wp	550			
Efficiency at STC, %	21.5			
Module Type	Monofacial			
Mounting Type	26^0 Fixed TiltPr			
Ground coverage ratio (GCR)	50.5 %			
No. of Modules per String	17	26		
No. of Strings	24	20	10	60
No. of Modules	408	520	260	1560
Module Area, m²	1060	1333	667	4000
Azimuth, Deg	0			
Table pitch, m	9			

Parameter	Option 1 Yearly Average Energy Demand	Option 2 Optimized for BESS	Option 3 No Export with BESS	Option 4 \Maximum Array Size
Table width, m	4.54			
Module orientation / modules per table	2 x Portrait			
SPP Area, m² (Acres)	2120 (0.52)	2,640 (0.65)	1320 (0.32)	7,920 (2.00)
Inverters				
Inverter Manufacturer	SMA			
Inverter Model	CORE1 50-US	SHP 125-US-21-PEAK3		
Inverter Type	String			
No. of Inverters	4	2	1	6
Nominal Inverter Rating @450C, kVA	125			
Efficiency at Capacity, %	97.5	98.5		
Inverter output voltage, V	480			
Ratio DC/AC	1.144			
Rated installed inverter capacity (AC-capacity), kWac	200	250	125	750
Nominal installed module capacity (Peak capacity), kWp	224.4	286	143	858
Battery Energy Storage System (BESS)				
Capacity, kWh	N/A	460	500	N/A
Interconnection Voltage, V	N/A	480	480	N/A
Efficiency (one way), %	N/A	97	97	N/A
Interconnection				
Grid Connection Voltage Level, V	480			
Grid Power Limitation	Assumed None			
Power Factor	0.9			
SYSTEM OPERATION SUMMARY				
Yearly Energy Summary (kWh)				
Solar PV Energy, MWh	336.1	430.5	215.9	1,280.1

Parameter	Option 1 Yearly Average Energy Demand	Option 2 Optimized for BESS	Option 3 No Export with BESS	Option 4 \Maximum Array Size
WRC Consumption, MWh	328.5			
WRC Consumption from Solar Generation, %	100	100	66	100
BESS Usage, % of one full daily Charge	N/A	77	50	N/A
Net Grid Energy Export / Import, MWh	212.7/ 205.1	164.6/70.6	7.1/125.3	1,135.4/183.8
Solar Fraction of Generation Exported to Grid, %	63	38	3	89
System Losses (P50)				
Array Electrical Losses, %	0.3	0.3	0.4	0.4
Inverter Losses, %	3.1	2.2	2.2	2.2
BESS Losses, MWh (% of Generation)	N/A	7.9 (2%)	5.5 (2%)	N/A
Interconnection Losses, %	1.0	1.3	0.6	1.0
ENERGY				
Solar Energy Specific Yield (P50), kWh/kWp (% of Total)				
Total	1501.9 (100%)	1510.2 (100%)	1512.2 (100%)	1507.2 (100%)
Jan	63.5 (4%)	64.0 (4%)	64.4 (4%)	63.6 (4%)
Feb	110.3 (7%)	111.0 (7%)	111.3 (7%)	110.7 (7%)
Mar	118.6 (8%)	119.1 (8%)	119.2 (8%)	119.0 (8%)
Apr	133.9 (9%)	134.3 (9%)	134.4 (9%)	134.1 (9%)
May	143.5 (10%)	143.8 (10%)	144.0 (10%)	143.7 (10%)
Jun	168.4 (11%)	169.2 (11%)	169.3 (11%)	169.1 (11%)
Jul	208.2 (14%)	209.3 (14%)	209.4 (14%)	209.2 (14%)
Aug	191.9 (13%)	193.2 (13%)	193.3 (13%)	193.0 (13%)
Sep	156.3 (10%)	157.1 (10%)	157.1 (10%)	156.9 (10%)
Oct	90.0 (6%)	90.8 (6%)	90.9 (6%)	90.6 (6%)
Nov	78.4 (5%)	79.0 (5%)	79.4 (5%)	78.5 (5%)
Dec	38.9 (3%)	39.3 (3%)	39.6 (3%)	38.9 (3%)

Parameter	Option 1 Yearly Average Energy Demand	Option 2 Optimized for BESS	Option 3 No Export with BESS	Option 4 \Maximum Array Size
Solar Energy Generated (P50), MWh (% of Total)				
Total	333.7 (100%)	426.6 (100%)	214.9 (100%)	1280.1 (100%)
Jan	14.1 (4%)	18.1 (4%)	9.2 (4%)	54.1 (4%)
Feb	24.5 (7%)	31.4 (7%)	15.8 (7%)	94.0 (7%)
Mar	26.4 (8%)	33.7 (8%)	16.9 (8%)	101.1 (8%)
Apr	29.8 (9%)	37.9 (9%)	19.1 (9%)	113.9 (9%)
May	31.9 (10%)	40.6 (10%)	20.5 (10%)	122.1 (10%)
Jun	37.4 (11%)	47.8 (11%)	24.1 (11%)	143.5 (11%)
Jul	46.2 (14%)	59.0 (14%)	29.7 (14%)	177.4 (14%)
Aug	42.6 (13%)	54.5 (13%)	27.4 (13%)	163.7 (13%)
Sep	34.7 (10%)	44.3 (10%)	22.3 (10%)	133.2 (10%)
Oct	20.0 (6%)	25.7 (6%)	12.9 (6%)	77.1 (6%)
Nov	17.4 (5%)	22.4 (5%)	11.3 (5%)	66.8 (5%)
Dec	8.7 (3%)	11.2 (3%)	5.6 (3%)	33.2 (3%)
Yearly Energy Generated Variance, MWh (% of P50)				
P10	355.4 (107%)	450.8 (106%)	226.9 (106%)	1349.5 (105%)
P25	346.7 (104%)	439.7 (103%)	221.3 (103%)	1316.4 (103%)
P50	333.7 (100%)	426.6 (100%)	214.9 (100%)	1280.1 (100%)
P75	327.4 (98%)	415.2 (97%)	209.0 (97%)	1243.1 (97%)
P90	318.6 (95%)	404.2 (95%)	203.5 (95%)	1210.0 (95%)
Yearly Grid Energy Exported / Imported (P50), MWh (% of Total)				
Total	210393 / 205146	160921/70821	6662/125810	1100536/183797
Jan	7721 / 21486	3287/13521	0/18947	44268/19245
Feb	16081 / 16761	10467/5078	0/9839	81824/15572
Mar	16185 / 17721	10431/5369	224/11607	86427/15872

Parameter	Option 1 Yearly Average Energy Demand	Option 2 Optimized for BESS	Option 3 No Export with BESS	Option 4 \Maximum Array Size
Apr	18131 / 15376	13968/3799	643/9142	97425/13558
May	19171 / 15165	14417/2427	1123/9028	103653/12698
Jun	24268 / 13858	21378/1344	1197/4762	124426/11952
Jul	32164 / 13863	30307/24	1979/957	156750/12799
Aug	29381 / 14679	26527/741	1007/2281	144167/13320
Sep	23033 / 15321	18484/1934	490/5714	116545/14169
Oct	11348 / 19221	6807/9505	0/15246	64393/17004
Nov	9833 / 19392	4516/9734	0/15965	56017/17748
Dec	3076 / 22303	332/17345	0/22324	24642/19860
CAPITAL COSTS				
Project Costs, $1000				
Total Capital Cost	336 (100%)	674 (100%)	562 (100%)	858 (100%)
Siteworks	12 (4%)	12 (2%)	10 (2%)	20 (2%)
Mounting System	13 (4%)	18 (3%)	7 (1%)	52 (6%)
PV Array	73 (22%)	98 (15%)	51 (9%)	284 (33%)
Inverter Side	64 (19%)	46 (7%)	33 (6%)	98 (11%)
BoS Components	31 (9%)	31 (5%)	19 (3%)	55 (6%)
BESS	0 (0%)	191 (28%)	207 (37%)	0 (0%)
Interconnection	6 (2%)	6 (1%)	6 (1%)	6 (1%)
Commissioning	8 (2%)	14 (2%)	13 (2%)	13 (2%)
Owners, Eng, PM,	60 (18%)	119 (18%)	100 (18%)	153 (18%)
Contingency, Price Escalation	69 (21%)	139 (21%)	116 (21%)	177 (21%)
Cost per SPP Capacity, $/ kWac	1,500	2,360	3,940	1,000
Cost per Energy Generated, $/ Wh	1.01	1.58	2.62	0.69

11. CONCLUSION

Option 1 presents a straightforward, cost-effective solution that is capable of meeting the WRC’s average annual energy requirements. This option would be preferred over having the additional BESS if OTEC will permit using the grid to manage the excess of energy from the SSP at an advantageous cost.

Option 2 demonstrates a significant grid independence improvement from Option 1 by reducing the import of energy from the grid. Export of energy to the grid is also reduced but still remains high compared to Option 1. The BESS usage as 77% indicates a good usage of the system. This option optimized for the BESS would be preferable if OTEC restricts or does not offer significant economic advantage to use the grid to manage the excess of energy from the SPP.

Option 3’s main advantage is that the interconnection to the grid only needs to be sized to provide the required power to the WRC, since the SPP will not export any power to the grid. This option would be preferable if OTEC does not permit or limits the interconnection capacity.

Option 4 would leverage the available space to enhance solar energy production and support greater energy self-sufficiency. This option would be considered only if OTEC pays for the energy exported or provides a significant economic advantage by offsetting the cost of the energy supply elsewhere in the City to other customers.

For Option 1, 2, and 4, the interconnection will need to be able to accept between 200 kW and 750 kW. The interconnection power for Option 4 is significantly higher than for other Options and a separate interconnection to the grid from the WRC would likely be required or preferable.

The cost estimation used for this study is mostly intended for relative comparison between the options. Cost estimates are considered at an AACE Class 5 level for screening and feasibility with an expected accuracy range of up to -50% to +100%.

Option 1: The total capital cost is $336,000. This is the most basic and cost-effective setup, with a 200 kWac SPP and no BESS.

Option 2: The total capital cost is $674,000, which is a 100% increase compared to Option 1. The higher cost is primarily due to the addition of a 460 kWh BESS, which represents 28% of the total cost. This option also has a larger 250 kWac SPP, contributing to its higher expense.

Option 3: The total capital cost is $562,000, representing a 67% increase compared to Option 1. The higher cost is due to the inclusion of a larger 500 kWh BESS, accounting for 37% of the total cost. This option has a smaller 125 kWac SPP, but the larger BESS contributes significantly to the overall cost.

Option 4: The total capital cost is $858,000, marking a 155% increase compared to Option 1. The higher cost is due to the larger SPP capacity of 750 kWac, which triples the capacity of Option 1. Although this option does not have a BESS, the cost is driven by the extensive solar panel deployment and associated infrastructure.

A financial analysis of these options should be completed once the feasible option(s) has/have been determined. Additional refinement of the cost estimates shall also be completed at that time including considering other costs such as operation, taxes, maintenance and other operating expenses (OPEX). The agreement with OTEC, which will have an impact on the financial analysis, needs also to be considered in the final decision.

12. References

Anderson Perry & Associate, inc., Wastewater Facilities Plan Update for City of John Day, Oregon, Job No. 592-25, (2019)

City of John Day, Innovation Gateway Area Plan, (2019)

City of John Day, Innovation Gateway Area Plan: Technical Appendix., (2019)

Oregon Water Resources Department, Water Conservation, Reuse, and Storage Feasibility Study Grant Application, City of John Day, Oregon – Feasibility Study for Wastewater Reuse, (2016)

Oregon Trail Electric Cooperative, City of John Day's Wastewater Treatment Pumped Hydro letter, (2022)

Canadian Solar, Technical Bulletin No 1 (35-PVsyst-2018Q2-30-001 A0), PVsyst User Guideline, (2018)

TUV, Technical Report No.: 35-PVsyst-2018Q2-30-001 A0 (for CS6W-550MS PV Module), (2012)

A. Power and Energy Simulation Results & Data Sheets

APPENDIX A - Module Datasheet - CanSolar HiKu6 CS6W-550MS.pdf

APPENDIX B.1 - Inverter Datasheet - Sunny Tripower CORE1 50-US.pdf

APPENDIX B.2 - Inverter Datasheet - Sunny Highpower PEAK3-165-US.pdf

APPENDIX C - Power Energy and PVsyst Simulation Report - Yearly Average Energy Demand Scenario - IFR1.pdf

APPENDIX D - Power Energy and PVsyst Simulation Report - Optimized for BESS Scenario.pdf

APPENDIX E - Power Energy and PVsyst Simulation Report - No Export with BESS Scenario.pdf

APPENDIX F - Power Energy and PVsyst Simulation Report - Maximum Array Size Scenario.pdf

APPENDIX A - MODULE DATASHEET - CANSOLAR HIKU6 CS6W-550MS.PDF

NEW

CanadianSolar

HiKu6 Mono PERC

530 W ~ 550 W

CS6W-530|535|540|545|550MS

MORE POWER

550 W — Module power up to 550 W
Module efficiency up to 21.5 %

Up to 4.5 % lower LCOE
Up to 5.6 % lower system cost

Comprehensive LID / LeTID mitigation technology, up to 50% lower degradation

Compatible with mainstream trackers, cost effective product for utility power plant

Better shading tolerance

MORE RELIABLE

Minimizes micro-crack impacts

Heavy snow load up to 5400 Pa, wind load up to 2400 Pa*

12 Years — **Enhanced Product Warranty on Materials and Workmanship***

25 Years — **Linear Power Performance Warranty***

1st year power degradation no more than 2%
Subsequent annual power degradation no more than 0.55%

*According to the applicable Canadian Solar Limited Warranty Statement.

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001:2015 / Quality management system
ISO 14001:2015 / Standards for environmental management system
ISO 45001: 2018 / International standards for occupational health & safety

PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730 / CE / INMETRO / MCS / UKCA
CEC listed (US California)
UL 61730 / IEC 61701 / IEC 62716 / IEC 60068-2-68
UNI 9177 Reaction to Fire: Class 1 / Take-e-way

* The specific certificates applicable to different module types and markets will vary, and therefore not all of the certifications listed herein will simultaneously apply to the products you order or use. Please contact your local Canadian Solar sales representative to confirm the specific certificates available for your Product and applicable in the regions in which the products will be used.

CSI Solar Co., Ltd. is committed to providing high quality solar products, solar system solutions and services to customers around the world. Canadian Solar was recognized as the No. 1 module supplier for quality and performance/price ratio in the IHS Module Customer Insight Survey, and is a leading PV project developer and manufacturer of solar modules, with over 55 GW deployed around the world since 2001.

* For detailed information, please refer to the Installation Manual.

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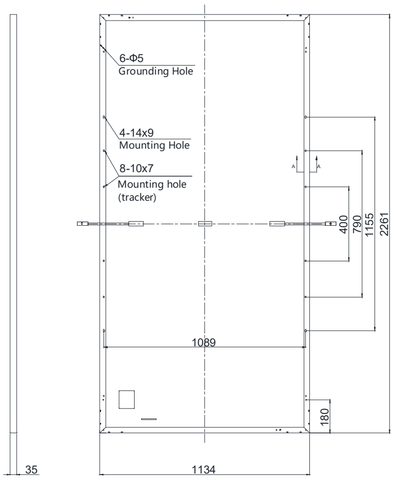
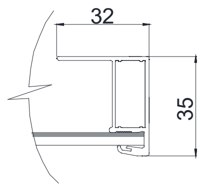
ENGINEERING DRAWING (mm)

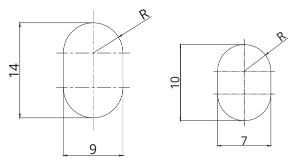
Rear View



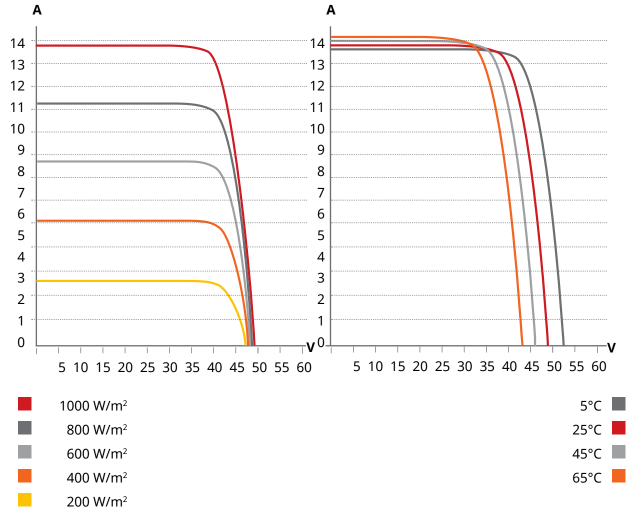
Frame Cross Section A-A



Mounting Hole



CS6W-530MS / I-V CURVES



ELECTRICAL DATA | STC*

CS6W	530MS	535MS	540MS	545MS	550MS
Nominal Max. Power (Pmax)	530 W	535 W	540 W	545 W	550 W
Opt. Operating Voltage (Vmp)	40.9 V	41.1 V	41.3 V	41.5 V	41.7 V
Opt. Operating Current (Imp)	12.96 A	13.02 A	13.08 A	13.14 A	13.20 A
Open Circuit Voltage (Voc)	48.8 V	49.0 V	49.2 V	49.4 V	49.6 V
Short Circuit Current (Isc)	13.80 A	13.85 A	13.90 A	13.95 A	14.00 A
Module Efficiency	20.7%	20.9%	21.1%	21.3%	21.5%
Operating Temperature	-40°C ~ +85°C				
Max. System Voltage	1500V (IEC/UL) or 1000V (IEC/UL)				
Module Fire Performance	TYPE 1 (UL 61730 1500V) or TYPE 2 (UL 61730 1000V) or CLASS C (IEC 61730)				
Max. Series Fuse Rating	25 A				
Application Classification	Class A				
Power Tolerance	0 ~ + 10 W				

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL DATA | NMOT*

CS6W	530MS	535MS	540MS	545MS	550MS
Nominal Max. Power (Pmax)	397 W	401 W	405 W	409 W	412 W
Opt. Operating Voltage (Vmp)	38.3 V	38.5 V	38.7 V	38.9 V	39.1 V
Opt. Operating Current (Imp)	10.38 A	10.42 A	10.47 A	10.52 A	10.55 A
Open Circuit Voltage (Voc)	46.1 V	46.3 V	46.5 V	46.7 V	46.9 V
Short Circuit Current (Isc)	11.13 A	11.17 A	11.21 A	11.25 A	11.29 A

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

MECHANICAL DATA

Specification	Data
Cell Type	Mono-crystalline
Cell Arrangement	144 [2 x (12 x 6)]
Dimensions	2261 × 1134 × 35 mm (89.0 × 44.6 × 1.38 in)
Weight	27.8 kg (61.3 lbs)
Front Cover	3.2 mm tempered glass
Frame	Anodized aluminium alloy
J-Box	IP68, 3 bypass diodes
Cable	4 mm² (IEC), 12 AWG (UL)
Cable Length (Including Connector)	410 mm (16.1 in) (+) / 290 mm (11.4 in) (-) (supply additional jumper cable: 2 lines / Pallet) or customized length*
Connector	T4 series or MC4-EVO2
Per Pallet	30 pieces
Per Container (40' HQ)	600 pieces

* For detailed information, please contact your local Canadian Solar sales and technical representatives.

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.34 % / °C
Temperature Coefficient (Voc)	-0.26 % / °C
Temperature Coefficient (Isc)	0.05 % / °C
Nominal Module Operating Temperature	41 ± 3°C

PARTNER SECTION

* The specifications and key features contained in this datasheet may deviate slightly from our actual products due to the on-going innovation and product enhancement. CSI Solar Co., Ltd. reserves the right to make necessary adjustment to the information described herein at any time without further notice.
Please be kindly advised that PV modules should be handled and installed by qualified people who have professional skills and please carefully read the safety and installation instructions before using our PV modules.

CSI Solar Co., Ltd.
199 Lushan Road, SND, Suzhou, Jiangsu, China, 215129, www.csisolar.com, support@csisolar.com

APPENDIX B.1 - INVERTER DATASHEET - SUNNY TRIPOWER CORE1 50-US.PDF

/ STP 33-US-41 / STP 50-US-41 / STP 62-US-41

Sunny Tripower CORE1-US

33 / 50 / 62

It stands on its own

/ **New! Complies with IEEE 1547-2018 and UL 1741 SB standards**

SMA Smart Connected

SMA ShadeFix STRING LEVEL OPTIMIZATION

c UL us

Fully integrated
- No additional racking required for rooftop installation
- Integrated DC and AC disconnects and overvoltage protection
- 12 direct string inputs for reduced labor and material costs
- Up to 60% faster commercial PV system installation

Increased power, flexibility
- Six MPP trackers for flexible stringing and maximum power production
- ShadeFix, SMA's proprietary shade management solution, optimizes at the string level
- Intelligent string monitoring to pinpoint array performance issues

Enhanced safety, reliability
- Integrated SunSpec PLC signal for module-level rapid shutdown
- DC AFCI arc-fault protection certified to Standard UL 1699B Ed. 1

Smart monitoring, control, service
- I-V curve diagnostic function to visualize and document PV string electrical characteristics
- Increased ROI with SMA ennexOS cross sector energy management platform
- SMA Smart Connected proactive O&M solution reduces time spent diagnosing and servicing in the field

The Sunny Tripower CORE1 is the world's first free-standing PV inverter for commercial rooftops, carports, ground mount and repowering legacy solar projects.

From distribution to construction to operation, the Sunny Tripower CORE1 enables logistical, material, labor and service cost reductions, and is the most versatile, cost-effective commercial solution available. Integrated SunSpec PLC for rapid shutdown and enhanced DC AFCI arc-fault protection ensure compliance to the latest safety codes and standards. With Sunny Tripower CORE1 and SMA's ennexOS cross sector energy management platform, system integrators can deliver comprehensive commercial energy solutions for increased ROI.

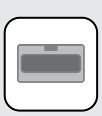
SunSpec Modbus for 1547 CERTIFIED

Rapid Shutdown CERTIFIED

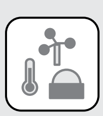
UL 3741 LISTED PV Hazard Control

Technical data	Sunny Tripower CORE1 33-US	Sunny Tripower CORE1 50-US	Sunny Tripower CORE1 62-US
Input (DC)			
Maximum array power	50000 Wp STC	75000 Wp STC	93750 Wp STC
Maximum system voltage		1000 V	
Rated MPP voltage range	330 V ... 800 V	500 V ... 800 V	550 V ... 800 V
MPPT operating voltage range		150 V ... 1000 V	
Minimum DC voltage / start voltage		150 V / 188 V	
MPP trackers / strings per MPP input		6 / 2	
Maximum usable operating input current / per MPP tracker		120 A / 20 A	
Maximum short circuit current per MPPT / per string input		32 A / 30 A	
Output (AC)			
AC nominal power	33300 W	50000 W	62500 W
Maximum apparent power	33300 VA	53000 VA	66000 VA
Output phases / line connections		3 / 3-(N)-PE	
Nominal AC voltage		480 V / 277 V WYE	
AC voltage range		244 V ... 305 V	
Maximum output current	40 A	64 A	80 A
Rated grid frequency		60 Hz	
Grid frequency / range		50 Hz, 60 Hz / -6 Hz ... +6Hz	
Power factor at rated power / adjustable displacement		1 / 0.0 leading ... 0.0 lagging	
Harmonics THD		<3 %	
Efficiency			
CEC efficiency	97.5%	97.5%	97.5%
Protection and safety features			
Load rated DC disconnect		●	
Load rated AC disconnect		●	
Ground fault monitoring: Riso / Differential current		● / ●	
DC AFCI arc-fault protection		●	
SunSpec PLC signal for rapid shutdown		●	
DC reverse polarity protection		●	
AC short circuit protection		●	
DC surge protection: Type 2 / Type 1+2		○ / ○	
AC surge protection: Type 2 / Type 1+2		○ / ○	
Protection class / overvoltage category (as per UL 840)		I / IV	
General data			
Device dimensions (W / H / D)		621 mm / 733 mm / 569 mm (24.4 in x 28.8 in x 22.4 in)	
Device weight		84 kg (185 lbs)	
Operating temperature range		-25 °C ... +60 °C (-13 °F ... +140 °F)	
Storage temperature range		-40 °C ... +70 °C (-40 °F ... +158 °F)	
Audible noise emissions (full power @ 1m and 25 °C)		65 dB(A)	
Topology		Transformerless	
Cooling concept		OptiCool (forced convection, variable speed fans)	
Enclosure protection rating		Type 4X, 3SX (as per UL 50E)	
Corrosivity classification according to IEC 61701		C3*	
Maximum permissible relative humidity (non-condensing)		100 %	
Additional information			
Mounting		Free-standing with included mounting feet	
DC connection		Amphenol UTX PV or H4Plus connectors	
AC connection		Screw terminals - 4 AWG to 4/0 AWG CU/AL	
LED indicators (Status / Fault / Communication)		●	
Network interfaces: Ethernet / WLAN / RS485		● (2 ports) / ▲ / ○	
Data protocols: SMA Modbus / SunSpec IEEE 1547 Modbus / Webconnect		● / ● / ●	
ShadeFix technology for string level optimization		●	
Intelligent string performance monitoring		●	
I-V curve diagnostic function		●	
Integrated Plant Control / Q on Demand 24/7		● / ●	
SMA Smart Connected (proactive monitoring and service support)		●	
Certifications			
Certifications and approvals		UL 1741, UL 1699B Ed. 1, UL 1998, CSA 22.2 107-1, PV Rapid Shutdown System Equipment, UL 3741	
FCC compliance		FCC Part 15 Class A	
Grid interconnection standards		IEEE 1547-2018, UL 1741 SA/SB - CA Rule 21, HECO SRD V2.0	
Advanced grid support capabilities		L/HFRT, L/HVRT, Volt-VAr, Volt-Watt, Frequency-Watt, Ramp Rate Control, Fixed Power Factor	
Warranty			
Standard		10 years	
Optional extensions		15 / 20 years	
○ Optional features ● Standard features – Not available	▲ Subject to availability	Data at nominal conditions - status: 08/2023	* ≥ 2 km from the coast
Type designation	STP 33-US-41	STP 50-US-41	STP 62-US-41

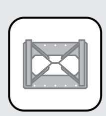
Accessories



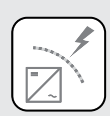
SMA Data Manager M
EDMM-US-10



SMA Sensor Module
MD.SEN-US-40



Universal Mounting System
UMS_KIT-10



AC Surge Protection Module Kit
AC_SPD_KIT1-10, AC_SPD_KIT2_T1T2
DC Surge Protection Module Kit
DC_SPD_KIT4-10, DC_SPD_KIT5_T1T2

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www.SMA-America.com

SMA America, LLC

APPENDIX B.2 - INVERTER DATASHEET - SUNNY HIGHPOWER PEAK3-165-US.PDF

SHP 125-US-21 / SHP 150-US-21 / SHP 165-US-21 / SHP 172-US-21

Sunny Highpower PEAK3-US

125 / 150 / 165 / 172

A superior distributed generation solution for large-scale power plants

25 YEAR DESIGN LIFE

SMA Smart Connected

c UL us

Cost effective

- Modular architecture reduces BOS and maximizes system uptime
- Compact design and high power density maximize transportation and logistical efficiency

Maximum flexibility

- Scalable 1,500 VDC building block with best-in-class performance
- Flexible architecture creates scalability while maximizing land usage

Simple install, commissioning

- Ergonomic handling and simple connections enable quick installation
- Centralized commissioning and control with SMA Data Manager

Highly innovative

- SMA Smart Connected reduces O&M costs and simplifies field-service
- Powered by award winning ennexOS cross sector energy management platform

The Sunny Highpower PEAK3 1,500 VDC inverter offers high power density in a modular architecture that achieves a cost-optimized solution for large-scale PV integrators.

With fast, simple installation and commissioning, the PEAK3 is accelerating the path to energization. SMA has also brought its field-proven Smart Connected technology to the PEAK3, which simplifies O&M and contributes to lower lifetime service costs. The PEAK3 power plant solution is powered by the ennexOS cross sector energy management platform, 2018 winner of the Intersolar smarter E AWARD.

Technical Data	Sunny Highpower PEAK3 125-US	Sunny Highpower PEAK3 150-US	Sunny Highpower PEAK3 165-US	Sunny Highpower PEAK3 172-US
Input (DC)				
Maximum array power [1)]	250 kWp	300 kWp	330 kWp	344 kWp
Maximum system voltage	1500 Vdc			
Rated MPP voltage range	705 V ... 1450 V	880 V ... 1450 V	924 V ... 1450 V	968 V ... 1450 V
MPPT operating voltage range	684 V ... 1500 V	855 V ... 1500 V	898 V ... 1500 V	941 V ... 1500 V
MPP trackers	1			
Maximum operating input current	180 A			
Maximum input short-circuit current	325 A			
Output (AC)				
Nominal AC power	125 kW	150 kW	165 kW	172 kW
Maximum apparent power	125 kVA	150 kVA	165 kVA	172 kVA
Output phases / line connections	3 / 3-PE			
Nominal AC voltage	480 V	600 V	630 V	660 V
Compatible transformer winding configuration	Wye-grounded			
Maximum output current	151 A			
Rated grid frequency	60 Hz			
Grid frequency / range	50 Hz, 60 Hz / -6 Hz ... +6 Hz			
Power factor at rated power / adjustable displacement	1 / 0.8 leading ... 0.8 lagging			
Harmonics (THD)	<3%			
Efficiency				
CEC efficiency	98.5 %	99.0 %	99.0 %	99.0 %
Protection and safety features				
Ground fault monitoring: Riso / Differential current	● / ●			
DC reverse polarity protection	●			
AC short circuit protection	●			
Monitored surge protection (Type 2): DC / AC	● / ●			
Protection class / overvoltage category (as per UL 840)	I / IV			
General data				
Device dimensions (W / H / D)	770 / 830 / 462 mm (30.3 / 32.7 / 18.2 in)			
Device weight	99 kg (218 lbs)			
Operating temperature range	-25°C ... +60°C (-13°F ... +140°F)			
Storage temperature range	-40°C ... +70°C (-40°F ... +158°F)			
Audible noise emission (full power @ 1m and 25°C)	< 69 dB(A)			
Internal consumption at night	< 5 W			
Topology	Transformerless			
Cooling concept	OptiCool (forced convection, variable speed fans)			
Enclosure protection rating	Type 4X			
Maximum permissible relative humidity (non-condensing)	100%			
Additional information				
Mounting	Rack mount			
DC connection	Terminal lug (up to 600 kcmil CU/AL)			
AC connection	Screw terminal (up to 300 kcmil CU/AL)			
LED indicators (Status/Fault/Communication)	●			
SMA Speedwire (Ethernet network interface)	● (2 x RJ45 ports)			
Data protocols: SMA Modbus / SunSpec Modbus	● / ●			
Integrated Plant Control / Q on Demand 24/7	● / ●			
Off-grid capable / SMA Hybrid Controller compatible	– / ●			
Monitoring				
SMA Sunny Portal (monitoring portal)	No cost for the lifetime of the system			
SMA Smart Connected (monitoring and remote O&M service)	No cost on inverters under warranty			
Supported protocols for outbound data	SMA external API, Modbus, FTP			
Certifications				
Certifications and approvals (pending)	UL 62109, UL 1998, CAN/CSA-C22.2 No.62109			
Manufacturer's Declaration of Design Life	25 years			
FCC compliance	FCC Part 15, Class A			
Grid interconnection standards	IEEE 1547:2018, UL 1741-SA - CA Rule 21, HECO Rule 14H, UL1741SB			
Advanced grid support capabilities	L/HFRT, L/HVRT, Volt-VAr, Volt-Watt, Frequency-Watt, Ramp Rate Control, Fixed Power Factor			
Warranty				
Standard	5 years			
Optional extensions (total warranty coverage cannot exceed 25 years)	+5 / +10 / +15 / +20 years			
1) Higher DC array power permitted via site inverter load modeling in SMA Sunny Design				
Type designation	SHP 125-US-21	SHP 150-US-21	SHP 165-US-21	SHP 172-US-21
● Standard features ○ Optional features – Not available				

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SMA America, LLC

APPENDIX C - POWER ENERGY AND PVSYST SIMULATION REPORT - YEARLY AVERAGE ENERGY DEMAND SCENARIO - IFR1.PDF

John Day Solar Plant

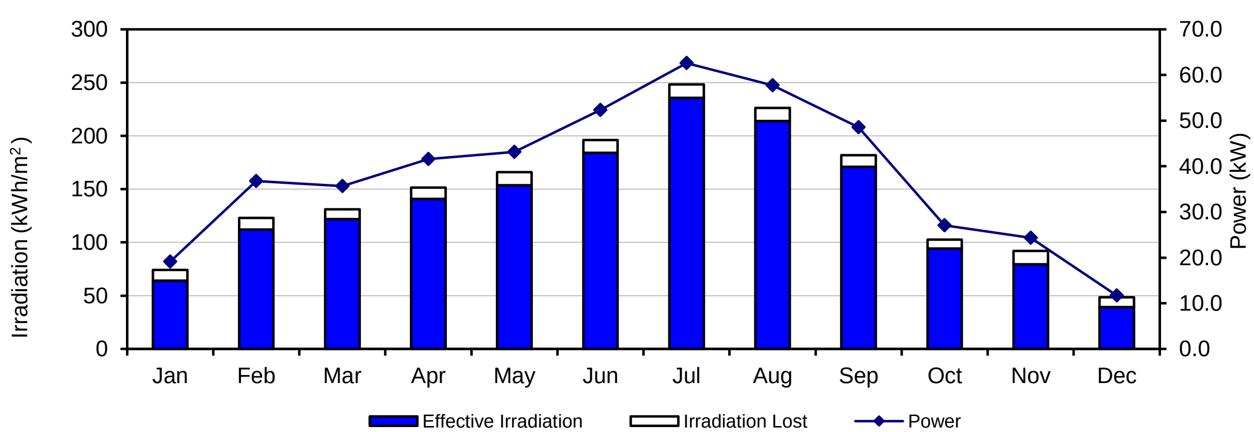
Yearly Average Energy Demand Fixed Tilt, 224.4 kWdc Capacity, 12 Units x 34 Modules, 4 Inverters

Solar Power and Energy Simulation Summary

Plant Capacity at STC:	224.4 kW_{dc}	200.0 kW_{ac}	Plant Characteristics			
Average Annual Energy Sold:	336,123 kWh			Qty	kW/Unit	kW
Capacity Factor:	17.1%	19.2%	Module Per String:	17	0.55	9.35
% of Horiz. Irradiation On Area:	10.56%		Strings Per Inverter:	6		56
			Inverters:	4	50	200
Project Latitude:	44.41 Deg		Total Number of Modules:	408	0.55	224
Extraterrestrial Irradiation:	2,696 $kWh/m^2/Yr$		Modules Per Support/Tracker Unit:	34	0.55	18.7
Yearly Horiz. Irradiation:	1,504 $kWh/m^2/Yr$		Supports/Trackers Units:	12	18.7	224
Average Clearness Index:	0.56		Total Plant Area:	0.212 ha		
			Total Module Area:	0.105 ha		
Simulation:	V01		Area Coverage:	50%		
Simulation Power Ratio:	1		Array Electrical Losses:	0.3%		
Tracking System:	Fixed Tilt		Inverter Losses:	3.0%		
Unit Tilt:	26 degrees		Interconnection Losses:	0.3%		
Unit Spacing:	9 m		Downtime Losses:	0.0%		
Shading Simulation:	None		Transmission Voltage:	0.48 kV		

	Horizontal Irradiation (kWh/m^2)	Incident Irradiation (kWh/m^2)	Ave. Amb. Temp. (˚C)	Shading Losses (%)	Effective Irradiation (kWh/m^2)	Module Power (kW_{dc})	Electrical Losses (%)	Plant Power (kW_{ac})	Capacity Factor (%)	Energy Sold (kWh)
Max	248	248	38.7	19%	236	249.21	5%	198.48	28%	46,577
Avg	125	145	6.7	9%	134	83.47	4%	38.37	17%	28,010
Min	28	49	-18.8	5%	39	0.26	3%	-0.02	5%	8,706
Jan	47	74	-1.6	13%	64	19.78	3.4%	19.11	9%	14,218
Feb	81	123	0.8	9%	112	38.02	3.3%	36.75	16%	24,695
Mar	107	131	1.8	7%	122	37.11	3.9%	35.68	16%	26,543
Apr	140	152	5.8	7%	141	43.51	4.3%	41.62	19%	29,966
May	167	166	8.8	7%	154	45.33	4.7%	43.18	19%	32,126
Jun	200	196	17.0	6%	184	54.63	4.2%	52.34	23%	37,688
Jul	248	248	25.6	5%	236	65.32	4.2%	62.60	28%	46,577
Aug	206	226	22.5	5%	214	59.99	3.8%	57.72	26%	42,941
Sep	148	182	18.5	6%	171	50.56	3.9%	48.57	22%	34,972
Oct	78	103	8.2	8%	94	28.03	3.4%	27.08	12%	20,148
Nov	55	92	0.9	14%	80	25.19	3.3%	24.37	11%	17,543
Dec	28	49	-2.8	19%	39	12.13	3.6%	11.70	5%	8,706

* Irradiation data for Typical Meteorological Years (TMY) with data from the National Solar Radiation Database (NSRDB)



John Day Solar Plant

Yearly Average Energy Demand Fixed Tilt, 224.4 kWdc Capacity, 12 Units x 34 Modules, 4 Inverters

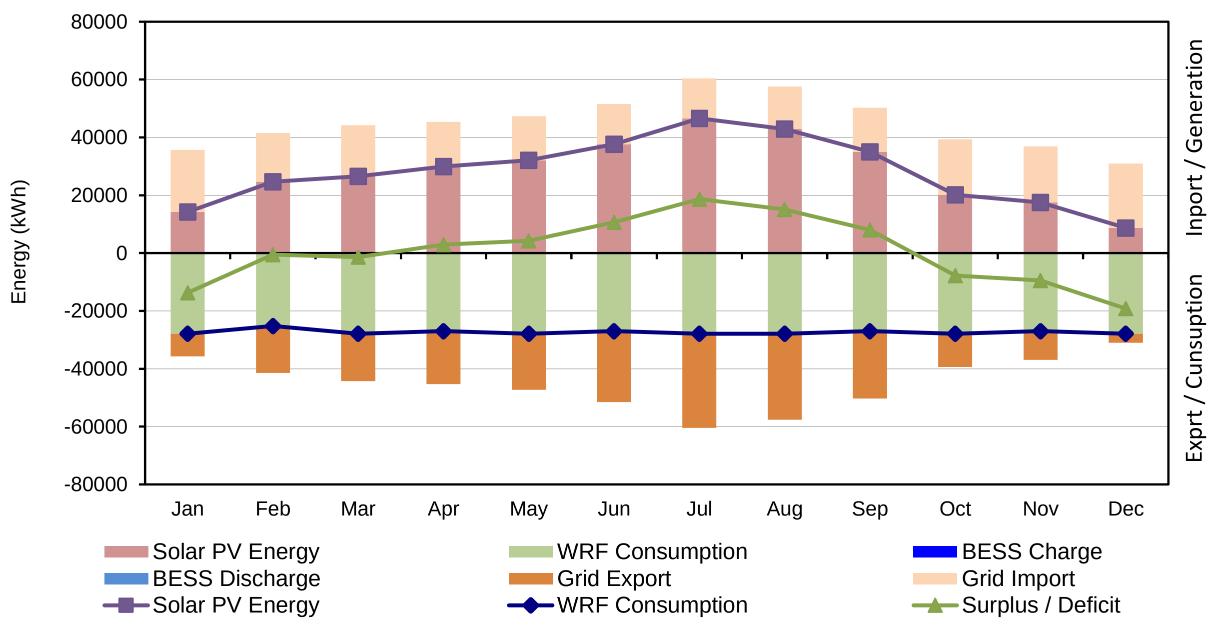
Power and Energy Scenarios

WRF Consuption	37.5	kWh
BESS Capacity	0	kWh
BESS Power	0	KWh
BESS C Rating	N/A	
BESS Efficiency	97%	(One direction)

Yearly Energy Summary (kWh)

Solar PV Energy	336,123	100%
WRF Consumption	-328,500	98%
BESS Total	0	0%
Grid Total	-7,623	2%
BESS Usage	N/A	

Month	Solar PV Energy (kWh)	WRF Consumption (kWh)	Surplus / Deficit (kWh)	BESS Charge (kWh)	BESS Discharge (kWh)	BESS Loss (kWh)	Grid Export (kWh)	Grid Import (kWh)
Jan	14,218	-27,900	-13,682	0	0	0	-7,801	21,484
Feb	24,695	-25,200	-505	0	0	0	-16,255	16,760
Mar	26,543	-27,900	-1,357	0	0	0	-16,363	17,720
Apr	29,966	-27,000	2,966	0	0	0	-18,339	15,373
May	32,126	-27,900	4,226	0	0	0	-19,389	15,162
Jun	37,688	-27,000	10,688	0	0	0	-24,544	13,856
Jul	46,577	-27,900	18,677	0	0	0	-32,537	13,860
Aug	42,941	-27,900	15,041	0	0	0	-29,717	14,676
Sep	34,972	-27,000	7,972	0	0	0	-23,291	15,319
Oct	20,148	-27,900	-7,752	0	0	0	-11,467	19,219
Nov	17,543	-27,000	-9,457	0	0	0	-9,934	19,390
Dec	8,706	-27,900	-19,194	0	0	0	-3,106	22,300
Total	336,123	-328,500	7,623	0	0	0	-212,742	205,119
Mth Min.	8,706	-27,900	-19,194	0	0	0	-32,537	13,856
Yearly Ave.	28,010	-27,375	635	0	0	0	-17,728	17,093
Mth Max.	46,577	-25,200	18,677	0	0	0	-3,106	22,300

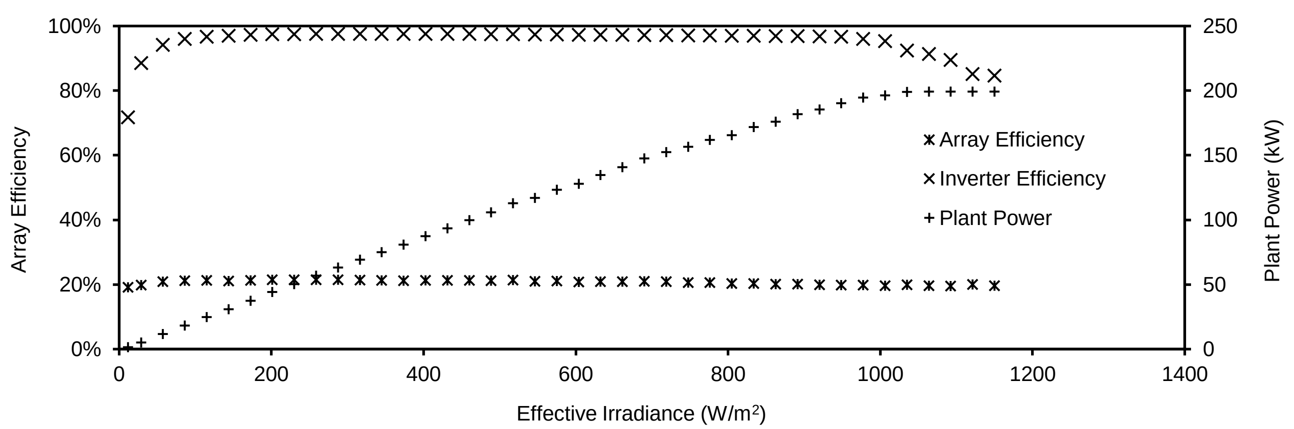


John Day Solar Plant

Yearly Average Energy Demand Fixed Tilt, 224.4 kWdc Capacity, 12 Units x 34 Modules, 4 Inverters

Performance Characteristics At Average Temperature

Percent Capacity	Effective Irradiation (W/m^2)	Module Efficiency (%)	Array Power (kW_{dc})	Electrical Loss (dc) (%)	Power to Inverter (kW_{dc})	Voltage To Inverter (V_{dc})	Current To Inverter (kA_{dc})	Inverter Efficiency (%)	Power to Substation (kW)	Sub/Line Loss (%)	Point of Sale (kW)
100%	1150	19.6%	236.7	0.6%	235.3	710	289.6	84.7%	199.3	0.4%	198.5
97.5%	1121	20.0%	235.5	0.6%	234.0	711	289.3	85.1%	199.3	0.4%	198.5
95.0%	1093	19.5%	223.9	0.6%	222.6	693	297.4	89.5%	199.3	0.4%	198.5
92.5%	1064	19.7%	219.3	0.6%	218.0	686	300.4	91.4%	199.3	0.4%	198.5
90.0%	1035	20.0%	216.6	0.5%	215.4	689	299.0	92.4%	199.1	0.4%	198.3
87.5%	1006	19.6%	207.1	0.5%	206.0	660	308.3	95.4%	196.4	0.4%	195.7
85.0%	978	19.9%	203.9	0.5%	202.8	656	307.2	96.1%	194.9	0.4%	194.1
82.5%	949	19.9%	197.9	0.5%	196.9	657	299.5	96.7%	190.5	0.4%	189.7
80.0%	920	20.0%	192.4	0.5%	191.5	654	292.7	96.9%	185.5	0.4%	184.8
77.5%	891	20.2%	188.5	0.5%	187.6	661	283.7	96.9%	181.8	0.4%	181.1
75.0%	863	20.2%	182.4	0.5%	181.5	662	274.3	96.9%	176.0	0.4%	175.4
72.5%	834	20.4%	178.0	0.4%	177.2	669	265.1	97.0%	171.9	0.3%	171.3
70.0%	805	20.3%	171.4	0.4%	170.7	669	255.3	97.0%	165.7	0.3%	165.1
67.5%	776	20.6%	167.6	0.4%	166.9	675	247.4	97.1%	162.0	0.3%	161.5
65.0%	748	20.7%	162.0	0.4%	161.3	681	237.1	97.1%	156.7	0.3%	156.2
62.5%	719	20.9%	157.6	0.4%	157.0	686	228.8	97.2%	152.6	0.3%	152.1
60.0%	690	21.1%	152.4	0.3%	151.9	695	218.6	97.2%	147.7	0.3%	147.3
57.5%	661	21.0%	145.3	0.3%	144.8	688	210.4	97.3%	140.9	0.3%	140.5
55.0%	633	21.0%	139.0	0.3%	138.5	691	200.6	97.3%	134.8	0.3%	134.5
52.5%	604	20.8%	131.9	0.3%	131.5	686	191.7	97.3%	128.0	0.3%	127.7
50.0%	575	21.1%	127.1	0.3%	126.7	695	182.4	97.4%	123.4	0.3%	123.1
47.5%	546	21.1%	120.6	0.3%	120.3	696	172.7	97.4%	117.2	0.2%	116.9
45.0%	518	21.4%	116.2	0.3%	115.9	708	163.8	97.5%	113.0	0.2%	112.8
42.5%	489	21.2%	108.8	0.2%	108.5	700	155.0	97.5%	105.9	0.2%	105.6
40.0%	460	21.3%	102.6	0.2%	102.4	702	145.8	97.6%	99.9	0.2%	99.7
37.5%	431	21.3%	96.2	0.2%	96.0	702	136.8	97.6%	93.7	0.2%	93.5
35.0%	402	21.3%	89.8	0.2%	89.6	703	127.5	97.6%	87.5	0.2%	87.4
32.5%	374	21.2%	83.0	0.2%	82.9	700	118.4	97.6%	80.9	0.2%	80.8
30.0%	345	21.3%	77.1	0.2%	76.9	707	108.9	97.6%	75.1	0.2%	75.0
27.5%	316	21.5%	71.1	0.2%	71.0	712	99.8	97.7%	69.4	0.1%	69.3
25.0%	287	21.5%	64.8	0.1%	64.7	714	90.7	97.6%	63.2	0.1%	63.1
22.5%	259	21.6%	58.5	0.1%	58.4	714	81.7	97.6%	57.0	0.1%	56.9
20.0%	230	21.5%	51.8	0.1%	51.7	711	72.8	97.6%	50.5	0.1%	50.4
17.5%	201	21.5%	45.5	0.1%	45.4	713	63.7	97.5%	44.3	0.1%	44.2
15.0%	172	21.3%	38.5	0.1%	38.5	704	54.7	97.3%	37.5	0.1%	37.4
12.5%	144	21.1%	31.8	0.1%	31.8	700	45.4	97.1%	30.9	0.1%	30.8
10.0%	115	21.3%	25.6	0.1%	25.6	709	36.2	96.7%	24.8	0.1%	24.8
7.5%	86	21.2%	19.2	0.0%	19.2	711	27.0	96.0%	18.4	0.0%	18.4
5.0%	57	20.9%	12.6	0.0%	12.6	700	18.0	94.3%	11.9	0.0%	11.9
2.5%	29	19.9%	6.0	0.0%	6.0	675	8.9	88.6%	5.3	0.0%	5.3
1.0%	12	19.2%	2.3	0.0%	2.3	670	3.5	71.8%	1.7	0.0%	1.7



John Day Solar Plant

Yearly Average Energy Demand Fixed Tilt, 224.4 kWdc Capacity, 12 Units x 34 Modules, 4 Inverters

Collector and Inverter Electrical System

Photovoltaic Modules and Inverters

Photovoltaic Module Characteristics at STC			Inverter Characteristics		
Manufacturer:	Canadian Solar		Manufacturer:	SMA	
Model:	CS6W-550MS		Model:	Sunny Tripower CORE1 50-US	
Nominal Power at STC (P_{mpp}):	550	Watts	Max DC input Power:	100	kWatts
Module Efficiency:	21.5%		Max Open Circuit Input Voltage:	1000	V_{dc}
Max Power Voltage at STC (V_{mpp}):	41.7	V_{dc}	Min Start Input Voltage:	150	V_{dc}
Open Circuit Voltage (V_{oc}):	49.6	V_{dc}	Min Tracking Input Voltage:	500	V_{dc}
Max System (String) Voltage:	1500	V_{dc}	Max Tracking Input Voltage:	800	V_{dc}
Max Power Current (I_{mpp}):	13.20	A_{dc}	Max Input Current:	120	A_{dc}
Short Circuit Current (I_{sc}):	14.00	A_{dc}	Max AC Output Power:	50	kWatts
Max String Current (Fuse Rating):	25.00	A_{dc}	Nominal AC Output Voltage:	480	V_{ac}
Power Temp. Coef. (P_{max}):	-0.34%	% / °C	Max AC Output Current:	64.00	A_{rms}
Voltage Temp. Coef. (V_{oc}):	-0.26%	% / °C	Inverter Efficiency:	97.5%	
Current Temp. Coef. (I_{sc}):	0.050%	% / °C	Cost per Inverter:	$7,700	
Module Area:	2.57	m^2			
Cost per Module:	$150	CPL Estimated			

Array String Sizing

Solar Rad. Absorb. Coef. (α):	0.90	
Thermal Loss Factor (U):	32	$W / m^2 K$ (15 to 30 $W / m^2 K$ for insulated to free-standing arrays)
Min Starting Irrad. (W/m^2):	100	W/m^2
Module Per String:	17	
Strings Per Inverter:	6	

Conditions:	Ext. Cold	Min. Oper.	STC	NOCT	Max Oper.	Ext. Hot
Max Daily Panel Irrad. (W/m^2):	600	800	1000	1000	1000	1000
Air Temp.(°C):	-35	-20	-3	20	25	40
Max Oper. Panel Temp. (°C):	-22	-3	25	42	47	62
Min Start Panel Temp. (°C):	-32	-17	0	23	28	43
Max Panel Oper. Volt (V_{mpp}, V_{dc}):	46.8	44.7	41.7	39.9	39.3	37.7
Max String Oper. Volt (V_{mpp}, V_{dc}):	795	760	709	678	669	641
Max String Oper. Current (I_{mpp}, A_{dc}):	12.89	13.02	13.20	13.31	13.34	13.44
Max Inverter Oper. Current (I_{mpp}, A_{dc}):	77	78	79	80	80	81
Max Panel Oper. Power(P_{mpp}, W):	638	602	550	519	509	481
Max String Oper. Power(P_{mpp}, kW):	10.8	10.2	9.4	8.8	8.7	8.2
Max Inverter Oper. Power(P_{mpp}, kW):	65	61	56	53	52	49
Array / Inverter Power Ratio:	65%	61%	56%	53%	52%	49%
Panel Open Circuit Volt (V_{oc}, V_{dc}):	57.0	55.0	52.9	49.9	49.2	47.3
String Open Circuit Volt (V_{oc}, V_{dc}):	969	936	899	848	837	804
String Short Circuit Current (I_{sc}, A_{dc}):	13.67	13.81	14.00	14.12	14.15	14.26

Notes:

1 - Nominal Operating Cell Temperature (NOCT) are at 20°C air temperature, 1 m/s wind speed, 800 W/m2, 1.5 air mass (AM) spectrum. Exact wind speed effect is difficult to evaluate and is considered included in the thermal loss factor (U).

2 - Standard Test Conditions (STC) are 25°C cell temperature, 1000 W/m^2, 1.5 air mass (AM) spectrum, which corresponds to clear day irradiance on 37° Tilted surface with sun at 42° above horizon.

John Day Solar Plant

Yearly Average Energy Demand Fixed Tilt, 224.4 kWdc Capacity, 12 Units x 34 Modules, 4 Inverters

Electrical and Transmission Line Data and Losses

Array Electrical Losses

	Number Per Inv.	Average Length (m)	Maximum Current 1.25 I_{sc} (A)	Wire Size (kcmil)	Conductor Resistance (Ω/km)	Conductor Resistance (Ω)	Power Loss (W)	Power Loss (%)
String Wiring	6	40	13.2	10	3.390	0.136	47.3	0.51%
DC Comb. Box to Inv.	0	10	0	4	0.795	0.008	0.0	0.00%
Inv. to AC Comb. Box	0.25	50	64	4/0	0.197	0.010	121.0	0.24%
Total Array Loss								**0.75%**

* Array electrical losses are calculated here only for reference. Actual DC losses are calculated directly in PVSyst.

Transmission Line (AC Combiner Box to POC)

Input Data

Line Voltage	0.480	kV
Conductor Name	Kcmil 1750	
Wire Size	1750.0	kcmil
Resistance (per phase)	0.0190	Ω/km
Length	0.2	km
Plant Capacity	200.00	kW
Power Factor	0.90	cos ϕ

Calculations

Current per Phase	267.3	A
Resistance per Phase	0.00	Ω
Loss per Phase	0.27	kW
Total Tx Loss	0.81	kW
Total Tx Loss	**0.41%**	
Percent of Plant Capacity	**1.15%**	
Loss Factor	0.000058	

Conductor Resistance Table for DC use

Material	Gauge	Area (kcmil)	Resistance Ω/km	Ampacity 60°C (A)
Cu	12	6.53	5.090	55
Cu	10	26.3	3.390	70
Cu	8	104.5	1.950	98
Cu	6	133.0	1.240	132
Cu	4	166.1	0.795	176
Cu	2	210.4	0.565	218
Cu	1	250	0.393	276
Cu	2/0	350	0.277	347
Cu	3/0	500	0.210	416
Cu	4/0	750	0.164	488

Conductor Resistance Table for AC use

Material	Name	Size kcmil	Resistance Ω/km	Ampacity 90°C (A)
Al	Partridge	266.8	0.2136	
Al	Tulip	336.4	0.1693	
Al	Cosmos	477.0	0.1194	
Al	Orchid	636.0	0.0896	
Al	2/0	133.0	0.3250	230
Al	3/0	166.1	0.2230	261
Al	4/0	210.4	0.1970	298
Al	Kcmil 250	250.0	0.1388	324
Al	Kcmil 350	350.0	0.0990	390
Al	Kcmil 500	500.0	0.0694	473
Al	Kcmil 750	750.0	0.0463	586
Al	Kcmil 100C	1000.0	0.0347	677
Cu	Kcmil 175C	1750.0	0.0190	1017

John Day Solar Plant

Yearly Average Energy Demand Fixed Tilt, 224.4 kWdc Capacity, 12 Units x 34 Modules, 4 Inverters

Capatial Cost (AACE Class 5)

	Capital Cost	Quantity		Unit Cost	Total*	% of Total	
Siteworks	Siteworks - Mob / Demob, Etc.	1	LS	$8,000	$8,000		BOP Direct Costs (DC)
	Clearing / Site prep	0.21	ha	$15,000	$4,000		
	Access Roads - New	0	km	$64,000	$0		
	Access Roads - Upgrade	0	km	$47,000	$0	4%	
	Onsite Roads	0	km	$50,000	$0		
	Office and Laydown Area / Rehab	0	ha	$80,000	$0		
	Granular Material - supply / Haul	0	m^2				
Mounting Sys	Mount. Structure - Pile Supply	68	EA	$30	$2,000		
	Mount. Structure - Pile Install	68	EA	$30	$2,000	4%	
	Mount. Structure - Raking Supply	232	m	$30	$7,000		
	Mount. Structure - Raking Install	232	m	$10	$2,000		
PV Array	Inst. - Mob / Demob, Etc.	1	LS	$4,000	$4,000		
	PV Panel: CS6W-550MS, (CAD)	408	EA	$150	$61,000		
	PV Panel Installation	408	EA	$15	$6,000	22%	
	DC Cable	1.0	km	$2,000	$2,000		
	DC Combiner Boxes	0	EA	$3,000	$0		
Inverter Side	Inverter: Sunny Tripower CORE1 50-US (CAD)	4	EA	$7,700	$31,000		
	Inverter Installation	4	EA	$200	$1,000	19%	
	AC Cables	0.4	km	$72,300	$29,000		
	AC Combiner Boxes	1	EA	$2,900	$3,000		
BoS Com	Security (Fence)	200	m	$110	$22,000		
	Comm. and Monitoring incl. installation	1	EA	$7,300	$7,000	9%	
	Grounding	200	m	$10	$2,000		
BESS	Battery Units	0	kWh	$300	$0		
	Battery Management System (BMS)	1	EA	$0	$0	0%	
	Power Conversion System (PCS)	1	EA	$0	$0		
	BESS Housing and Cooling Systems	1	EA	$0	$0		
Interconn.	Interconnection / Metering	1	EA	$1,800	$2,000		
	Padmount Transformers	0	Xformers	$11,000	$0	2%	
	Protection (Breaker, Disconnect)	1	EA	$3,700	$4,000		
Commissioning	DC side commissioning (Polarity, Uov, Isc, IV curve, etc.)	1	EA	$2,000	$2,000		
	Inverters Commissioning	1	EA	$1,600	$2,000	2%	
	AC cables commissioning	1	EA	$2,900	$3,000		
	Comm. system commissioning	1	EA	$1,400	$1,000		
	BESS commissioning	1	EA	$0	$0		
Const.	Control / Electrical Building and Yard	0	LS	$0	$0		
	Construction Site Services	1.5%	Above BOP I	$207,000	$3,000	1%	
	End of Life	0%	Above BOP I	$210,000	$0	0%	
Owners, Eng, PM	PM and Engineering	15%	BOP DC	$210,000	$32,000	10%	Soft Costs
	Construction Mgmt	10%	BOP DC	$210,000	$21,000	6%	
	Owners Costs	2%	BOP DC	$210,000	$4,000	1%	
	Contingency on BOP	30%	BOP DC	$210,000	$63,000	19%	
	Escalation on BOP (1.5%/Yr)	3.0%	BOP DC	$210,000	$6,000	2%	
	Total Capital Cost (CC)	224.4	kWdc	$1,500	$336,000	100%	

* Extended total costs are rounded to the nearest thousand dollars.

Version 7.4.4

PVsyst - Simulation report

Grid-Connected System

Project: PVGIS

Variant: Yearly Average Energy Demand

Sheds, single array

System power: 224 kWp

John Day - United States

Author

Tetra Tech Inc (United states)

Project: PVGIS

Variant: Yearly Average Energy Demand

Tetra Tech Inc (United states)

Project summary

Geographical Site
John Day
United States

Situation

Latitude	44.41 °N
Longitude	-118.94 °W
Altitude	1032 m
Time zone	UTC-8

Project settings
Albedo 0.20

Meteo data
John Day
PVGIS TMY 5.2 - Synthetic

System summary

Grid-Connected System

Sheds, single array

PV Field Orientation
Fixed plane
Tilt/Azimuth 26 / 0 °

Near Shadings
Linear shadings : Fast (table)

User's needs
Unlimited load (grid)

System information

PV Array		Inverters	
Nb. of modules	408 units	Nb. of units	4 units
Pnom total	224 kWp	Pnom total	200 kWac
		Pnom ratio	1.122

Results summary

Produced Energy	337016 kWh/year	Specific production	1502 kWh/kWp/year	Perf. Ratio PR	86.23 %

Table of contents

General parameters

Grid-Connected System

Sheds, single array

PV Field Orientation

Orientation
Fixed plane
Tilt/Azimuth 26 / 0 °

Sheds configuration
Nb. of sheds 6 units
Single array

Sizes
Sheds spacing 9.00 m
Collector width 4.54 m
Ground Cov. Ratio (GCR) 50.5 %
Top inactive band 0.02 m
Bottom inactive band 0.02 m

Shading limit angle
Limit profile angle 22.2 °

Models used
Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Horizon
Average Height 6.4 °

Near Shadings
Linear shadings : Fast (table)

User's needs
Unlimited load (grid)

PV Array Characteristics

PV module
Manufacturer CSI Solar
Model CS6W-550MS 1500V
(Original PVsyst database)
Unit Nom. Power 550 Wp
Number of PV modules 408 units
Nominal (STC) 224 kWp
Modules 24 string x 17 In series

At operating cond. (50°C)
Pmpp 206 kWp
U mpp 639 V
I mpp 322 A

Inverter
Manufacturer SMA
Model Sunny Tripower STP50-US-41-Core1
(Original PVsyst database)
Unit Nom. Power 50.0 kWac
Number of inverters 4 units
Total power 200 kWac
Operating voltage 150-800 V
Pnom ratio (DC:AC) 1.12
Power sharing within this inverter

Total PV power
Nominal (STC) 224 kWp
Total 408 modules
Module area 1046 m²

Total inverter power
Total power 200 kWac
Number of inverters 4 units
Pnom ratio 1.12

Array losses

Array Soiling Losses
Loss Fraction 2.0 %

Thermal Loss factor
Module temperature according to irradiance
Uc (const) 32.4 W/m²K
Uv (wind) 1.4 W/m²K/m/s

DC wiring losses
Global array res. 11 mΩ
Loss Fraction 0.5 % at STC

LID - Light Induced Degradation
Loss Fraction 1.1 %

Module Quality Loss
Loss Fraction -0.5 %

Module mismatch losses
Loss Fraction 1.0 % at MPP

Strings Mismatch loss
Loss Fraction 0.2 %

IAM loss factor
Incidence effect (IAM): User defined profile

10°	20°	30°	40°	50°	60°	70°	80°	90°
0.998	0.998	0.995	0.992	0.986	0.970	0.917	0.763	0.000

AC wiring losses

Inv. output line up to injection point

Inverter voltage	480 Vac tri
Loss Fraction	0.39 % at STC

Inverter: Sunny Tripower STP50-US-41-Core1

Wire section (4 Inv.)	Alu 4 x 3 x 95 mm²
Average wires length	50 m

Horizon definition

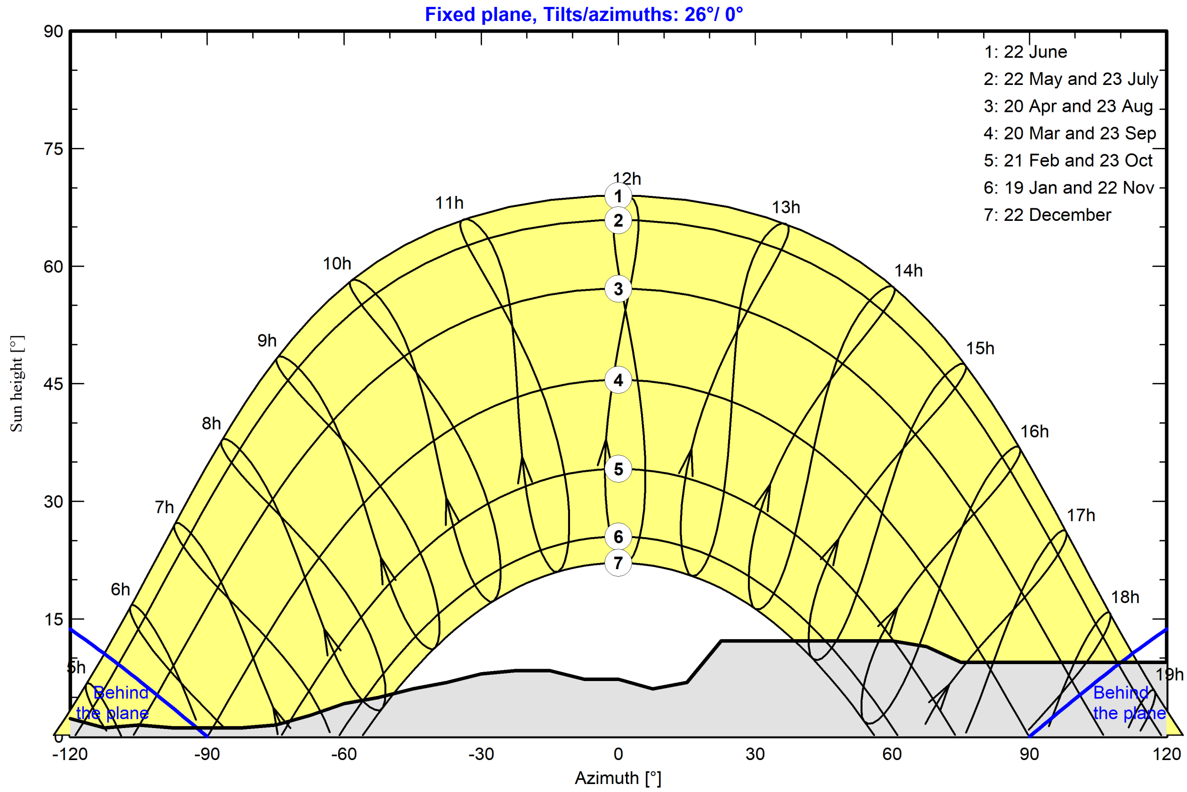
Horizon from PVGIS website API, Lat=44°24'44", Long=-118°56'9", Alt=1032m

Average Height	6.4 °	Albedo Factor	0.58
Diffuse Factor	0.95	Albedo Fraction	100 %

Horizon profile

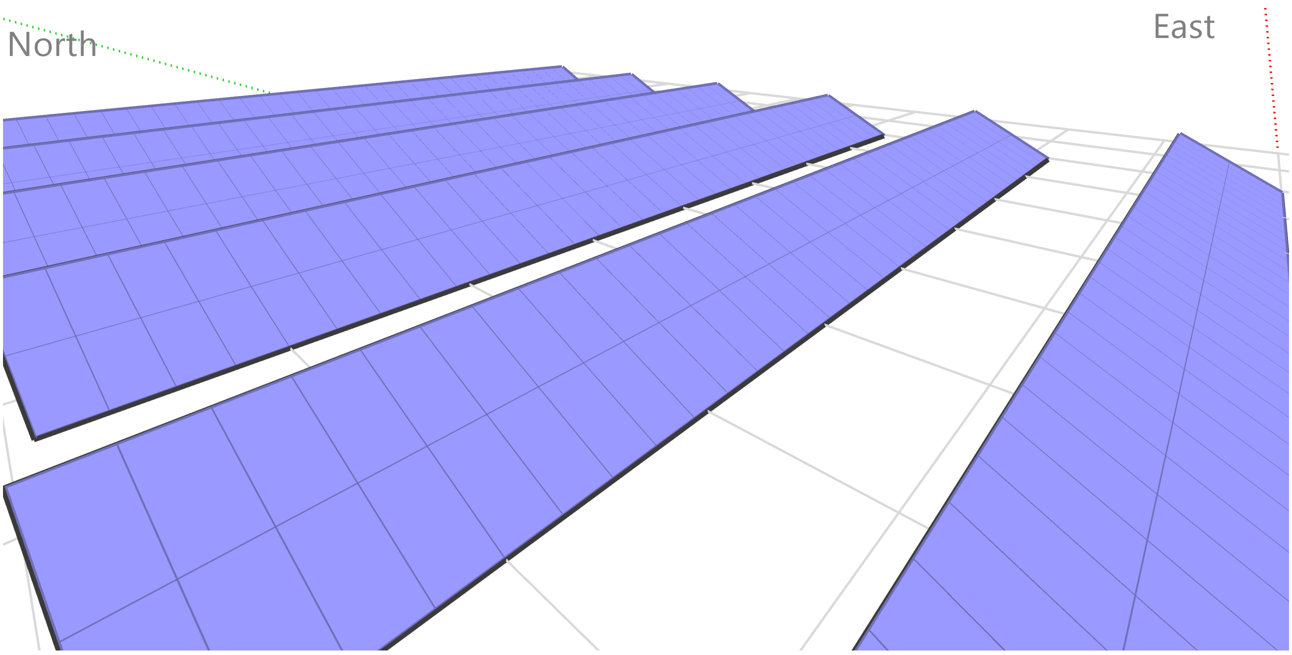
Azimuth [°]	-180	-173	-158	-150	-143	-135	-128	-120	-113	-105	-98	-83
Height [°]	3.4	3.1	3.8	3.4	4.2	4.6	4.2	2.3	1.1	1.5	1.1	1.1
Azimuth [°]	-75	-68	-60	-53	-45	-38	-30	-23	-15	-8	0	8
Height [°]	1.5	2.7	4.2	5.0	6.1	6.9	8.0	8.4	8.4	7.3	7.3	6.1
Azimuth [°]	15	23	60	68	75	143	150	158	173	180		
Height [°]	6.9	12.2	12.2	11.5	9.5	9.5	1.9	2.3	3.4	3.4		

Sun Paths (Height / Azimuth diagram)



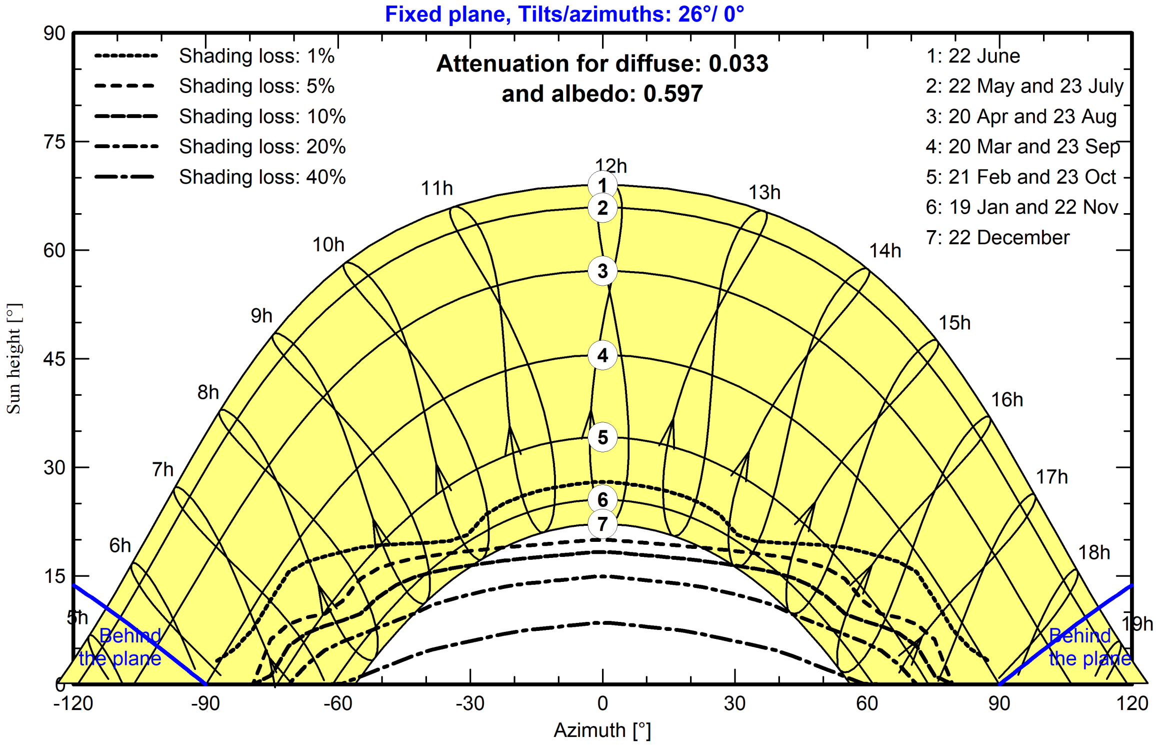
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

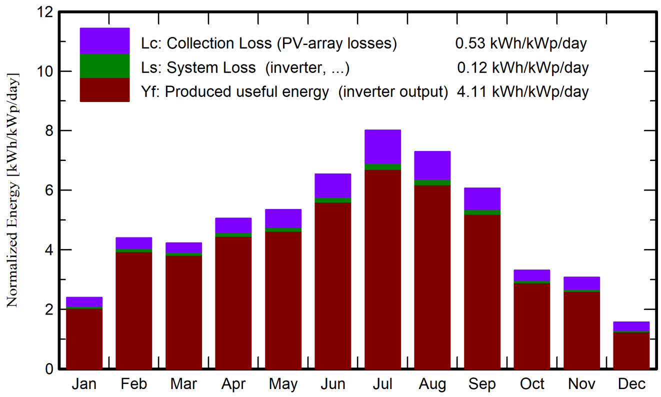


Main results

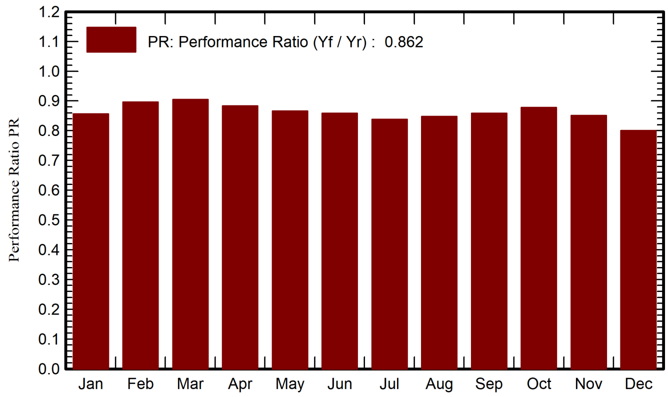
System Production

Produced Energy	337016 kWh/year	Specific production	1502 kWh/kWp/year
		Perf. Ratio PR	86.23 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	46.6	23.10	-3.20	74.1	64.2	14682	14248	0.857
February	81.4	27.80	-1.00	123.0	112.0	25469	24761	0.897
March	107.0	52.10	-0.38	131.1	122.0	27388	26610	0.905
April	139.7	72.10	3.77	151.6	140.7	30932	30045	0.883
May	166.8	90.80	7.12	165.8	153.7	33173	32209	0.866
June	200.0	73.80	15.02	196.2	184.2	38953	37792	0.858
July	247.6	50.40	23.22	248.4	235.6	48179	46719	0.838
August	205.5	52.70	19.77	226.3	213.9	44411	43068	0.848
September	147.9	45.80	15.70	182.0	171.0	36119	35069	0.859
October	78.1	38.60	5.57	102.6	94.4	20802	20193	0.877
November	54.7	20.10	-1.02	92.1	79.6	18095	17582	0.851
December	28.4	15.00	-4.36	48.6	39.3	9014	8719	0.800
Year	1503.7	562.29	6.73	1741.6	1610.7	347218	337016	0.862

Legends

GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane		
GlobEff	Effective Global, corr. for IAM and shadings		

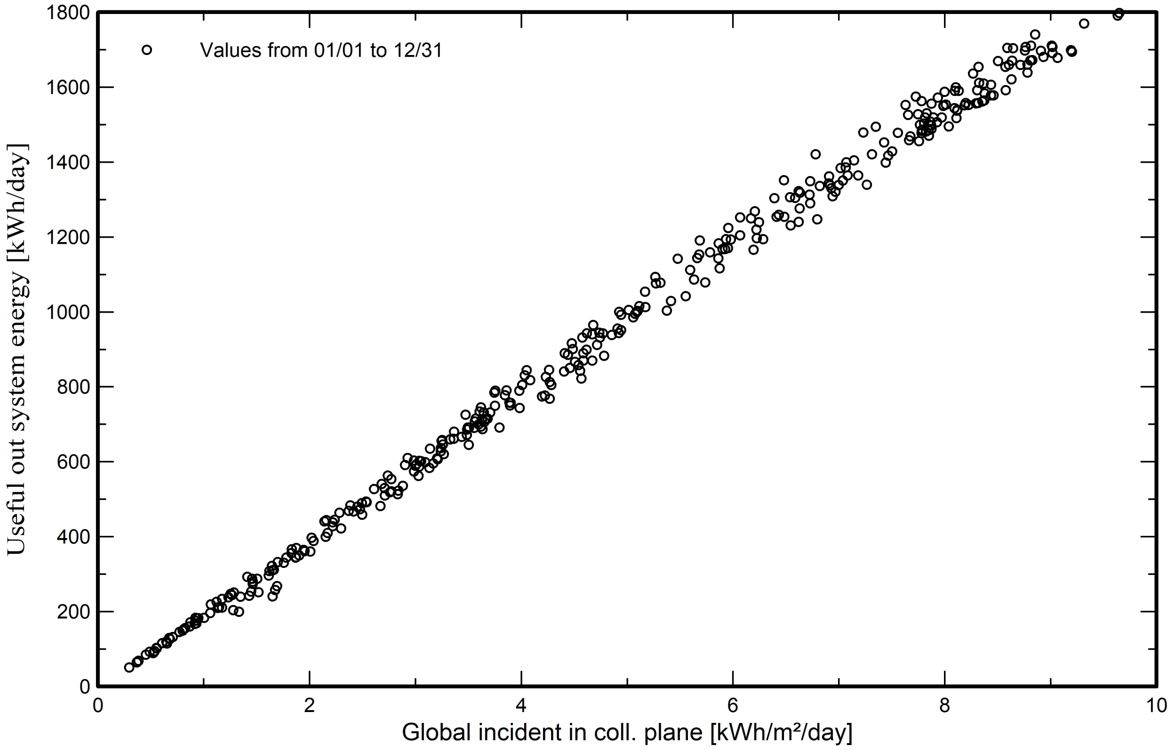
PVsyst V7.4.4
VCP, Simulation date:
05/01/24 15:05
with v7.4.4

Loss diagram

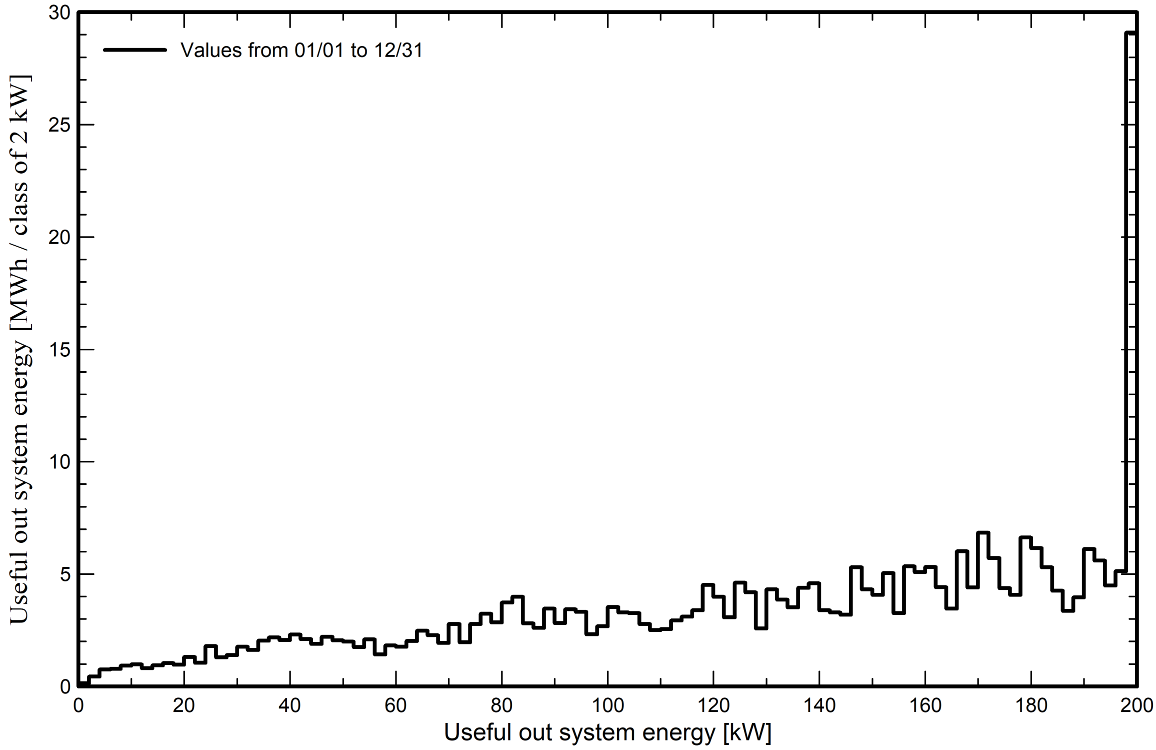
1504 kWh/m²	**Global horizontal irradiation**
+15.8%	**Global incident in coll. plane**
-2.82%	Far Shadings / Horizon
-1.10%	Near Shadings: irradiance loss
-1.81%	IAM factor on global
-2.00%	Soiling loss factor
1611 kWh/m² * 1046 m² coll.	**Effective irradiation on collectors**
efficiency at STC = 21.49%	PV conversion
362036 kWh	**Array nominal energy (at STC effic.)**
-0.63%	PV loss due to irradiance level
-0.95%	PV loss due to temperature
+0.45%	Module quality loss
-1.10%	LID - Light induced degradation
-1.15%	Mismatch loss, modules and strings
-0.33%	Ohmic wiring loss
348787 kWh	**Array virtual energy at MPP**
-2.66%	Inverter Loss during operation (efficiency)
-0.46%	Inverter Loss over nominal inv. power
0.00%	Inverter Loss due to max. input current
0.00%	Inverter Loss over nominal inv. voltage
-0.01%	Inverter Loss due to power threshold
0.00%	Inverter Loss due to voltage threshold
-0.03%	Night consumption
337811 kWh	**Available Energy at Inverter Output**
-0.24%	AC ohmic loss
337016 kWh	**Energy injected into grid**

Predef. graphs

Daily Input/Output diagram

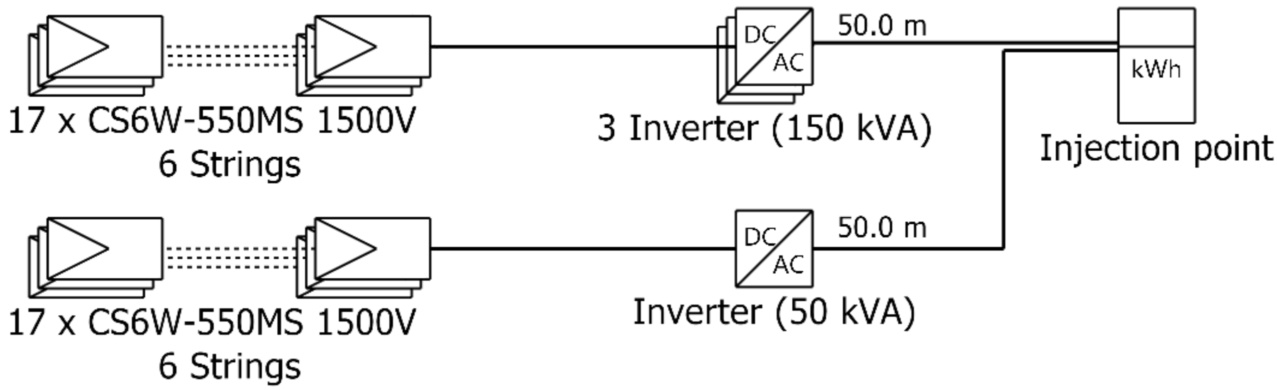


System Output Power Distribution



Single-line diagram

PVsyst V7.4.4
VCP, Simulation date:
05/01/24 15:05
with v7.4.4



PV module	CS6W-550MS 1500V
Inverter	Sunny Tripower STP50-US-41-Core1
String	17 x CS6W-550MS 1500V

PVGIS	Tetra Tech Inc (United state
VCP : Yearly Average Energy Demand	05/01/24

APPENDIX D - POWER ENERGY AND PVSYST SIMULATION REPORT - OPTIMIZED FOR BESS SCENARIO.PDF

John Day Solar Plant

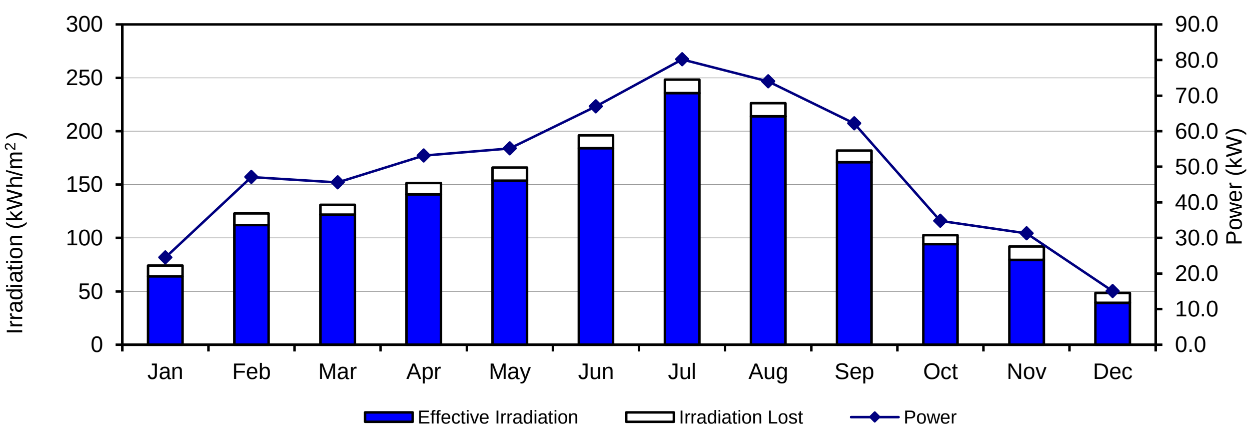
Optimized for BESS Fixed Tilt, 286 kWdc Capacity, 10 Units x 52 Modules, 2 Inverters

Solar Power and Energy Simulation Summary

Plant Capacity at STC:	286.0 kW_{dc}	250.0 kW_{ac}	Plant Characteristics				
Average Annual Energy Sold:	430,450 kWh			Qty	kW/Unit	kW
Capacity Factor:	17.2%	19.7%	Module Per String:	26	0.55	14.3
% of Horiz. Irradiation On Area:	10.82%		Strings Per Inverter:	10		143
			Inverters:	2	125	250
Project Latitude:	44.41 Deg		Total Number of Modules:	520	0.55	286
Extraterrestrial Irradiation:	2,696 $kWh/m^2/Yr$		Modules Per Support/Tracker Unit:	52	0.55	28.6
Yearly Horiz. Irradiation:	1,504 $kWh/m^2/Yr$		Supports/Trackers Units:	10	28.6	286
Average Clearness Index:	0.56		Total Plant Area:	0.265 ha		
			Total Module Area:	0.134 ha		
Simulation:	V01		Area Coverage:	51%		
Simulation Power Ratio:	1		Array Electrical Losses:	0.3%		
Tracking System:	Fixed Tilt		Inverter Losses:	2.2%		
Unit Tilt:	26 degrees		Interconnection Losses:	0.3%		
Unit Spacing:	9 m		Downtime Losses:	0.0%		
Shading Simulation:	None		Transmission Voltage:	0.48 kV		

	Horizontal Irradiation (kWh/m^2)	Incident Irradiation (kWh/m^2)	Ave. Amb. Temp. (˚C)	Shading Losses (%)	Effective Irradiation (kWh/m^2)	Module Power (kW_{dc})	Electrical Losses (%)	Plant Power (kW_{ac})	Capacity Factor (%)	Energy Sold (kWh)
Max	248	248	38.7	19%	236	317.59	5%	247.59	28%	59,639
Avg	125	145	6.7	9%	134	106.38	3%	49.14	17%	35,871
Min	28	49	-18.8	5%	39	0.35	2%	-0.01	5%	11,205
Jan	47	74	-1.6	13%	64	25.20	2.6%	24.54	9%	18,261
Feb	81	123	0.8	9%	112	48.47	2.8%	47.10	16%	31,651
Mar	107	131	1.8	7%	122	47.29	3.5%	45.64	16%	33,956
Apr	140	152	5.8	7%	141	55.44	4.1%	53.16	19%	38,276
May	167	166	8.8	7%	154	57.76	4.6%	55.11	19%	41,005
Jun	200	196	17.0	6%	184	69.62	3.8%	66.99	23%	48,234
Jul	248	248	25.6	5%	236	83.24	3.7%	80.16	28%	59,639
Aug	206	226	22.5	5%	214	76.45	3.2%	73.98	26%	55,045
Sep	148	182	18.5	6%	171	64.44	3.5%	62.17	22%	44,763
Oct	78	103	8.2	8%	94	35.73	2.6%	34.80	12%	25,892
Nov	55	92	0.9	14%	80	32.11	2.6%	31.28	11%	22,522
Dec	28	49	-2.8	19%	39	15.45	2.5%	15.06	5%	11,205

* Irradiation data for Typical Meteorological Years (TMY) with data from the National Solar Radiation Database (NSRDB)



John Day Solar Plant

Optimized for BESS Fixed Tilt, 286 kWdc Capacity, 10 Units x 52 Modules, 2 Inverters

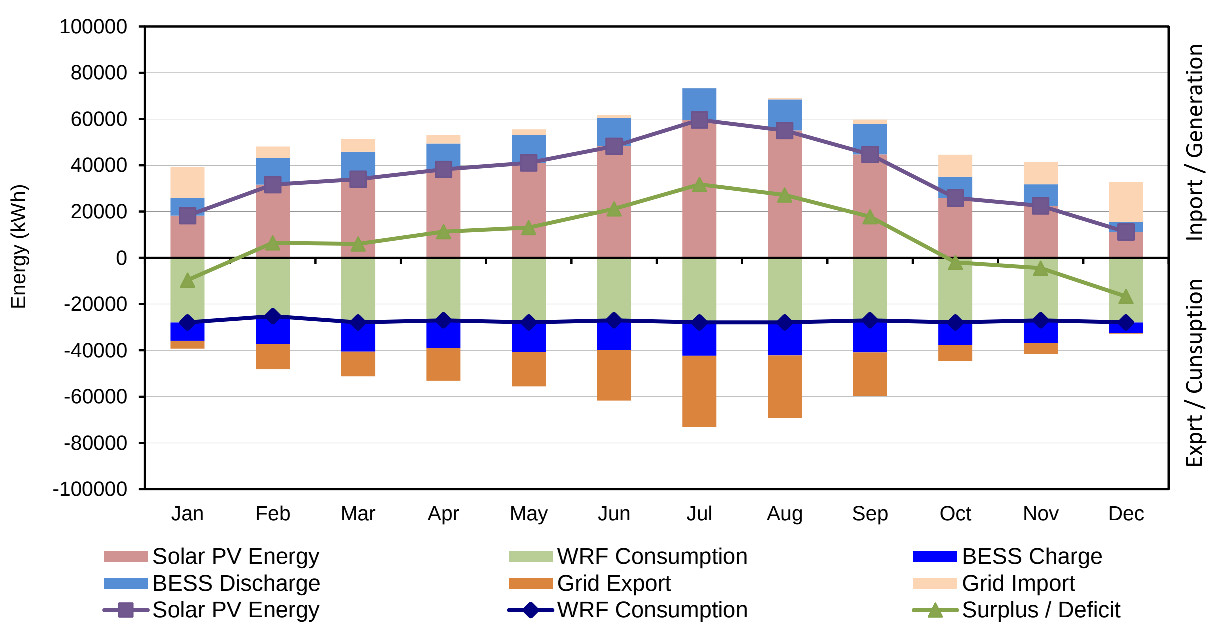
Power and Energy Scenarios

WRF Consuption	37.5	kWh
BESS Capacity	460	kWh
BESS Power	250	KWh
BESS C Rating	0.54C	
BESS Efficiency	97%	(One direction)

Yearly Energy Summary (kWh)

Solar PV Energy	430,450	100%
WRF Consumption	-328,500	76%
BESS Total	-7,980	2%
Grid Total	-93,970	22%
BESS Usage	77%	

Month	Solar PV Energy (kWh)	WRF Consumption (kWh)	Surplus / Deficit (kWh)	BESS Charge (kWh)	BESS Discharge (kWh)	BESS Loss (kWh)	Grid Export (kWh)	Grid Import (kWh)
Jan	18,261	-27,900	-9,639	-7,925	7,464	-462	-3,401	13,501
Feb	31,651	-25,200	6,451	-12,193	11,416	-708	-10,729	5,055
Mar	33,956	-27,900	6,056	-12,666	11,958	-739	-10,690	5,342
Apr	38,276	-27,000	11,276	-11,854	11,091	-688	-14,290	3,776
May	41,005	-27,900	13,105	-12,912	12,152	-752	-14,744	2,399
Jun	48,234	-27,000	21,234	-12,867	12,119	-750	-21,822	1,336
Jul	59,639	-27,900	31,739	-14,431	13,591	-841	-30,923	24
Aug	55,045	-27,900	27,145	-14,230	13,428	-830	-27,081	738
Sep	44,763	-27,000	17,763	-13,854	13,064	-808	-18,901	1,928
Oct	25,892	-27,900	-2,008	-9,666	9,174	-565	-6,984	9,484
Nov	22,522	-27,000	-4,478	-9,826	9,253	-572	-4,655	9,706
Dec	11,205	-27,900	-16,695	-4,570	4,305	-266	-352	17,312
Total	430,450	-328,500	101,950	-136,995	129,014	-7,980	-164,571	70,601
Mth Min.	11,205	-27,900	-16,695	-14,431	4,305	-841	-30,923	24
Yearly Ave.	35,871	-27,375	8,496	-11,416	10,751	-665	-13,714	5,883
Mth Max.	59,639	-25,200	31,739	-4,570	13,591	-266	-352	17,312

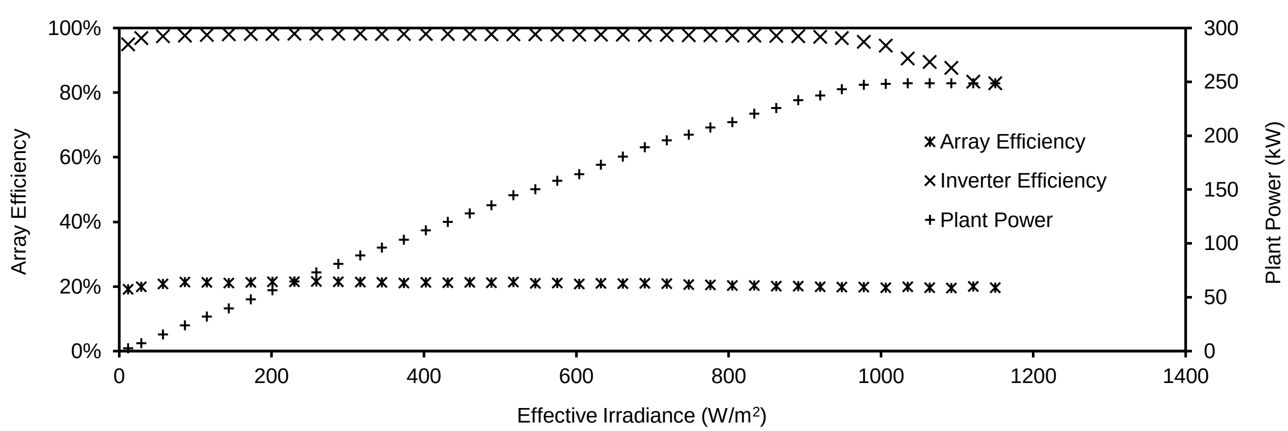


John Day Solar Plant

Optimized for BESS Fixed Tilt, 286 kWdc Capacity, 10 Units x 52 Modules, 2 Inverters

Performance Characteristics At Average Temperature

Percent Capacity	Effective Irradiation (W/m^2)	Module Efficiency (%)	Array Power (kW_{dc})	Electrical Loss (dc) (%)	Power to Inverter (kW_{dc})	Voltage To Inverter (V_{dc})	Current To Inverter (kA_{dc})	Inverter Efficiency (%)	Power to Substation (kW)	Sub/Line Loss (%)	Point of Sale (kW)
100%	1150	19.6%	301.7	0.6%	299.8	1094	233.7	83.0%	248.8	0.5%	247.6
97.5%	1121	20.0%	300.1	0.6%	298.3	1095	233.5	83.4%	248.8	0.5%	247.6
95.0%	1093	19.5%	285.4	0.6%	283.7	1071	238.9	87.7%	248.8	0.5%	247.6
92.5%	1064	19.7%	279.4	0.6%	277.9	1063	240.6	89.6%	248.8	0.5%	247.6
90.0%	1035	20.0%	276.0	0.5%	274.5	1070	239.2	90.7%	248.8	0.5%	247.6
87.5%	1006	19.6%	263.9	0.5%	262.5	1027	248.8	94.6%	248.3	0.5%	247.0
85.0%	978	19.9%	259.8	0.5%	258.5	1018	249.9	95.7%	247.4	0.5%	246.2
82.5%	949	19.9%	252.4	0.5%	251.1	1013	246.6	96.9%	243.4	0.5%	242.2
80.0%	920	19.9%	245.1	0.5%	243.9	1004	242.6	97.3%	237.5	0.5%	236.3
77.5%	891	20.2%	240.2	0.5%	239.1	1012	236.2	97.6%	233.2	0.5%	232.1
75.0%	863	20.2%	232.4	0.5%	231.4	1012	228.6	97.6%	225.9	0.5%	224.8
72.5%	834	20.4%	226.9	0.4%	225.9	1023	220.9	97.7%	220.6	0.4%	219.6
70.0%	805	20.3%	218.4	0.4%	217.5	1023	212.7	97.7%	212.6	0.4%	211.7
67.5%	776	20.6%	213.5	0.4%	212.7	1032	206.1	97.8%	207.9	0.4%	207.1
65.0%	748	20.7%	206.4	0.4%	205.6	1040	197.7	97.8%	201.1	0.4%	200.3
62.5%	719	20.9%	200.8	0.4%	200.1	1049	190.7	97.9%	195.8	0.4%	195.1
60.0%	690	21.1%	194.3	0.3%	193.6	1063	182.2	97.9%	189.6	0.4%	188.8
57.5%	661	21.0%	185.2	0.3%	184.5	1053	175.3	98.0%	180.8	0.4%	180.1
55.0%	633	21.0%	177.3	0.3%	176.8	1057	167.3	98.0%	173.2	0.4%	172.6
52.5%	604	20.9%	168.3	0.3%	167.7	1050	159.8	98.0%	164.4	0.3%	163.9
50.0%	575	21.1%	162.1	0.3%	161.6	1063	152.0	98.0%	158.4	0.3%	157.9
47.5%	546	21.1%	153.7	0.3%	153.3	1065	143.9	98.1%	150.3	0.3%	149.8
45.0%	518	21.4%	148.1	0.3%	147.7	1082	136.5	98.1%	144.8	0.3%	144.4
42.5%	489	21.2%	138.6	0.2%	138.2	1069	129.3	98.1%	135.6	0.3%	135.3
40.0%	460	21.3%	130.8	0.2%	130.5	1074	121.5	98.1%	128.1	0.3%	127.7
37.5%	431	21.3%	122.5	0.2%	122.3	1073	113.9	98.2%	120.0	0.2%	119.7
35.0%	402	21.3%	114.7	0.2%	114.5	1078	106.2	98.2%	112.4	0.2%	112.2
32.5%	374	21.2%	105.6	0.2%	105.4	1069	98.6	98.2%	103.6	0.2%	103.4
30.0%	345	21.3%	98.3	0.2%	98.1	1081	90.7	98.2%	96.4	0.2%	96.2
27.5%	316	21.5%	90.7	0.2%	90.5	1088	83.2	98.2%	88.9	0.2%	88.8
25.0%	287	21.5%	82.6	0.1%	82.4	1090	75.6	98.3%	81.0	0.2%	80.9
22.5%	259	21.6%	74.6	0.1%	74.5	1094	68.1	98.3%	73.3	0.1%	73.2
20.0%	230	21.5%	66.0	0.1%	66.0	1088	60.7	98.3%	64.8	0.1%	64.7
17.5%	201	21.5%	57.9	0.1%	57.8	1089	53.1	98.2%	56.8	0.1%	56.7
15.0%	172	21.3%	49.2	0.1%	49.2	1079	45.6	98.2%	48.3	0.1%	48.2
12.5%	144	21.1%	40.5	0.1%	40.5	1068	37.9	98.1%	39.7	0.1%	39.7
10.0%	115	21.3%	32.8	0.1%	32.8	1087	30.2	97.9%	32.1	0.1%	32.1
7.5%	86	21.4%	24.6	0.0%	24.6	1091	22.6	97.7%	24.0	0.0%	24.0
5.0%	57	20.8%	16.0	0.0%	16.0	1067	15.0	97.5%	15.6	0.0%	15.6
2.5%	29	20.0%	7.7	0.0%	7.7	1037	7.4	97.0%	7.4	0.0%	7.4
1.0%	12	19.2%	2.9	0.0%	2.9	1024	2.9	95.0%	2.8	0.0%	2.8



John Day Solar Plant
Optimized for BESS Fixed Tilt, 286 kWdc Capacity, 10 Units x 52 Modules, 2 Inverters

Collector and Inverter Electrical System

Photovoltaic Modules and Inverters

Photovoltaic Module Characteristics at STC			Inverter Characteristics		
Manufacturer:	Canadian Solar		Manufacturer:	SMA	
Model:	CS6W-550MS		Model:	PEAK3 125-US	
Nominal Power at STC (P_{mpp}):	550	Watts	Max DC input Power:	250	kWatts
Module Efficiency:	21.5%		Max Open Circuit Input Voltage:	1500	V_{dc}
Max Power Voltage at STC (V_{mpp}):	41.7	V_{dc}	Min Start Input Voltage:	684	V_{dc}
Open Circuit Voltage (V_{oc}):	49.6	V_{dc}	Min Tracking Input Voltage:	705	V_{dc}
Max System (String) Voltage:	1500	V_{dc}	Max Tracking Input Voltage:	1450	V_{dc}
Max Power Current (I_{mpp}):	13.20	A_{dc}	Max Input Current:	180	A_{dc}
Short Circuit Current (I_{sc}):	14.00	A_{dc}	Max AC Output Power:	125	kWatts
Max String Current (Fuse Rating):	25.00	A_{dc}	Nominal AC Output Voltage:	480	V_{ac}
Power Temp. Coef. (P_{max}):	-0.34%	% / °C	Max AC Output Current:	151.00	A_{rms}
Voltage Temp. Coef. (V_{oc}):	-0.26%	% / °C	Inverter Efficiency:	98.5%	
Current Temp. Coef. (I_{sc}):	0.050%	% / °C	Cost per Inverter:	$9,900	
Module Area:	2.57	m^2			
Cost per Module:	$150	CPL Estimated			

Array String Sizing

Solar Rad. Absorb. Coef. (α):	0.90		
Thermal Loss Factor (U):	32	W / m^2 K	(15 to 30 W / m^2 K for insulated to free-standing arrays)
Min Starting Irrad. (W/m^2):	100	W/m^2	
Module Per String:	26		
Strings Per Inverter:	10		

Conditions:	Ext. Cold	Min. Oper.	STC	NOCT	Max Oper.	Ext. Hot
Max Daily Panel Irrad. (W/m^2):	600	800	1000	1000	1000	1000
Air Temp.(°C):	-35	-20	-3	20	25	40
Max Oper. Panel Temp. (°C):	-22	-3	25	42	47	62
Min Start Panel Temp. (°C):	-32	-17	0	23	28	43
Max Panel Oper. Volt (V_{mpp}, V_{dc}):	46.8	44.7	41.7	39.9	39.3	37.7
Max String Oper. Volt (V_{mpp}, V_{dc}):	1216	1162	1084	1037	1023	980
Max String Oper. Current (I_{mpp}, A_{dc}):	12.89	13.02	13.20	13.31	13.34	13.44
Max Inverter Oper. Current (I_{mpp}, A_{dc}):	129	130	132	133	133	134
Max Panel Oper. Power(P_{mpp}, W):	638	602	550	519	509	481
Max String Oper. Power(P_{mpp}, kW):	16.6	15.6	14.3	13.5	13.2	12.5
Max Inverter Oper. Power(P_{mpp}, kW):	166	156	143	135	132	125
Array / Inverter Power Ratio:	66%	63%	57%	54%	53%	50%
Panel Open Circuit Volt (V_{oc}, V_{dc}):	57.0	55.0	52.9	49.9	49.2	47.3
String Open Circuit Volt (V_{oc}, V_{dc}):	1481	1431	1375	1297	1280	1230
String Short Circuit Current (I_{sc}, A_{dc}):	13.67	13.81	14.00	14.12	14.15	14.26

Notes:

1 - Nominal Operating Cell Temperature (NOCT) are at 20°C air temperature, 1 m/s wind speed, 800 W/m2, 1.5 air mass (AM) spectrum. Exact wind speed effect is difficult to evaluate and is considered included in the thermal loss factor (U).

2 - Standard Test Conditions (STC) are 25°C cell temperature, 1000 W/m^2, 1.5 air mass (AM) spectrum, which corresponds to clear day irradiance on 37° Tilted surface with sun at 42° above horizon.

John Day Solar Plant

Optimized for BESS Fixed Tilt, 286 kWdc Capacity, 10 Units x 52 Modules, 2 Inverters

Electrical and Transmission Line Data and Losses

Array Electrical Losses

	Number Per Inv.	Average Length (m)	Maximum Current 1.25 I_{sc} (A)	Wire Size (kcmil)	Conductor Resistance (Ω/km)	Conductor Resistance (Ω)	Power Loss (W)	Power Loss (%)
String Wiring	10	40	13.2	10	3.390	0.136	47.3	0.33%
DC Comb. Box to Inv.	1	10	132	4	0.795	0.008	277.0	0.19%
Inv. to AC Comb. Box	0.5	50	151	4/0	0.197	0.010	673.8	0.54%
Total Array Loss								**1.06%**

* Array electrical losses are calculated here only for reference. Actual DC losses are calculated directly in PVSyst.

Transmission Line (AC Combiner Box to POC)

Input Data

Line Voltage	0.480	kV
Conductor Name	Kcmil 1750	
Wire Size	1750.0	kcmil
Resistance (per phase)	0.0190	Ω/km
Length	0.2	km
Plant Capacity	250.00	kW
Power Factor	0.90	cos ϕ

Calculations

Current per Phase	334.1	A
Resistance per Phase	0.00	Ω
Loss per Phase	0.42	kW
Total Tx Loss	1.27	kW
Total Tx Loss	**0.51%**	
Percent of Plant Capacity	**1.57%**	
Loss Factor	0.000063	

Conductor Resistance Table for DC use

Material	Gauge	Area (kcmil)	Resistance Ω/km	Ampacity 60°C (A)
Cu	12	6.53	5.090	55
Cu	10	26.3	3.390	70
Cu	8	104.5	1.950	98
Cu	6	133.0	1.240	132
Cu	4	166.1	0.795	176
Cu	2	210.4	0.565	218
Cu	1	250	0.393	276
Cu	2/0	350	0.277	347
Cu	3/0	500	0.210	416
Cu	4/0	750	0.164	488

Conductor Resistance Table for AC use

Material	Name	Size kcmil	Resistance Ω/km	Ampacity 90°C (A)
Al	Partridge	266.8	0.2136	
Al	Tulip	336.4	0.1693	
Al	Cosmos	477.0	0.1194	
Al	Orchid	636.0	0.0896	
Al	2/0	133.0	0.3250	230
Al	3/0	166.1	0.2230	261
Al	4/0	210.4	0.1970	298
Al	Kcmil 250	250.0	0.1388	324
Al	Kcmil 350	350.0	0.0990	390
Al	Kcmil 500	500.0	0.0694	473
Al	Kcmil 750	750.0	0.0463	586
Al	Kcmil 100C	1000.0	0.0347	677
Cu	Kcmil 175C	1750.0	0.0190	1017

John Day Solar Plant

Optimized for BESS Fixed Tilt, 286 kWdc Capacity, 10 Units x 52 Modules, 2 Inverters

Capatial Cost (AACE Class 5)

	Capital Cost	Quantity		Unit Cost	Total*	% of Total	
Siteworks	Siteworks - Mob / Demob, Etc.	1	LS	$8,000	$8,000		BOP Direct Costs (DC)
	Clearing / Site prep	0.26	ha	$15,000	$4,000		
	Access Roads - New	0	km	$64,000	$0		
	Access Roads - Upgrade	0	km	$47,000	$0	2%	
	Onsite Roads	0	km	$50,000	$0		
	Office and Laydown Area / Rehab	0	ha	$80,000	$0		
	Granular Material - supply / Haul	0	m^2				
Mounting Sys	Mount. Structure - Pile Supply	86	EA	$30	$3,000		
	Mount. Structure - Pile Install	86	EA	$30	$3,000	3%	
	Mount. Structure - Raking Supply	295	m	$30	$9,000		
	Mount. Structure - Raking Install	295	m	$10	$3,000		
PV Array	Inst. - Mob / Demob, Etc.	1	LS	$4,000	$4,000		
	PV Panel: CS6W-550MS, (CAD)	520	EA	$150	$78,000		
	PV Panel Installation	520	EA	$15	$8,000	15%	
	DC Cable	0.8	km	$2,000	$2,000		
	DC Combiner Boxes	2	EA	$3,000	$6,000		
Inverter Side	Inverter: PEAK3 125-US (CAD)	2	EA	$9,900	$20,000		
	Inverter Installation	2	EA	$200	$0	7%	
	AC Cables	0.3	km	$76,200	$23,000		
	AC Combiner Boxes	1	EA	$2,900	$3,000		
BoS Com	Security (Fence)	200	m	$110	$22,000		
	Comm. and Monitoring incl. installation	1	EA	$7,300	$7,000	5%	
	Grounding	200	m	$10	$2,000		
BESS	Battery Units	460	kWh	$300	$138,000		
	Battery Management System (BMS)	1	EA	$13,800	$14,000	28%	
	Power Conversion System (PCS)	1	EA	$27,600	$28,000		
	BESS Housing and Cooling Systems	1	EA	$11,040	$11,000		
Interconn.	Interconnection / Metering	1	EA	$1,800	$2,000		
	Padmount Transformers	0	Xformers	$11,000	$0	1%	
	Protection (Breaker, Disconnect)	1	EA	$3,700	$4,000		
Commissioning	DC side commissioning (Polarity, Uov, Isc, IV curve, etc.)	1	EA	$2,000	$2,000		
	Inverters Commissioning	1	EA	$1,000	$1,000		
	AC cables commissioning	1	EA	$2,300	$2,000	2%	
	Comm. system commissioning	1	EA	$1,400	$1,000		
	BESS commissioning	1	EA	$7,640	$7,640		
Const.	Control / Electrical Building and Yard	0	LS	$0	$0		
	Construction Site Services	1.5%	Above BOP I	$415,640	$6,000	1%	
	End of Life	0%	Above BOP I	$421,640	$0	0%	
Owners, Eng, PM	PM and Engineering	15%	BOP DC	$421,640	$63,000	9%	Soft Costs
	Construction Mgmt	10%	BOP DC	$421,640	$42,000	6%	
	Owners Costs	2%	BOP DC	$421,640	$8,000	1%	
	Contingency on BOP	30%	BOP DC	$421,640	$126,000	19%	
	Escalation on BOP (1.5%/Yr)	3.0%	BOP DC	$421,640	$13,000	2%	
	Total Capital Cost (CC)	286	kWdc	$2,360	$674,000	100%	

* Extended total costs are rounded to the nearest thousand dollars.

Version 7.4.4

PVsyst - Simulation report

Grid-Connected System

Project: PVGIS

Variant: Optimized for BESS

Sheds, single array

System power: 286 kWp

John Day - United States

Author

Tetra Tech Inc (United states)

Project summary

Geographical Site
John Day
United States

Situation

Latitude	44.41 °N
Longitude	-118.94 °W
Altitude	1032 m
Time zone	UTC-8

Project settings

Albedo	0.20

Meteo data
John Day
PVGIS TMY 5.2 - Synthetic

System summary

Grid-Connected System

Sheds, single array

PV Field Orientation
Fixed plane
Tilt/Azimuth 26 / 0 °

Near Shadings
Linear shadings : Fast (table)

User's needs
Unlimited load (grid)

System information

PV Array

Nb. of modules	520 units
Pnom total	286 kWp

Inverters

Nb. of units	2 units
Pnom total	250 kWac
Pnom ratio	1.144

Results summary

Produced Energy	431908 kWh/year	Specific production	1510 kWh/kWp/year	Perf. Ratio PR	86.71 %

Table of contents

General parameters

Grid-Connected System

Sheds, single array

PV Field Orientation

Orientation
Fixed plane
Tilt/Azimuth 26 / 0 °

Sheds configuration
Nb. of sheds 13 units
Single array

Sizes
Sheds spacing 9.00 m
Collector width 4.54 m
Ground Cov. Ratio (GCR) 50.5 %
Top inactive band 0.02 m
Bottom inactive band 0.02 m

Shading limit angle
Limit profile angle 22.2 °

Models used
Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Horizon
Average Height 6.4 °

Near Shadings
Linear shadings : Fast (table)

User's needs
Unlimited load (grid)

PV Array Characteristics

PV module
Manufacturer CSI Solar
Model CS6W-550MS 1500V
(Original PVsyst database)
Unit Nom. Power 550 Wp
Number of PV modules 520 units
Nominal (STC) 286 kWp
Modules 20 string x 26 In series

At operating cond. (50°C)
Pmpp 262 kWp
U mpp 977 V
I mpp 268 A

Inverter
Manufacturer SMA
Model Sunny Highpower SHP125-US-21-PEAK3
(Original PVsyst database)
Unit Nom. Power 125 kWac
Number of inverters 2 units
Total power 250 kWac
Operating voltage 684-1500 V
Pnom ratio (DC:AC) 1.14

Total PV power
Nominal (STC) 286 kWp
Total 520 modules
Module area 1333 m²

Total inverter power
Total power 250 kWac
Number of inverters 2 units
Pnom ratio 1.14

Array losses

Array Soiling Losses
Loss Fraction 2.0 %

Thermal Loss factor
Module temperature according to irradiance
Uc (const) 32.4 W/m²K
Uv (wind) 1.4 W/m²K/m/s

DC wiring losses
Global array res. 20 mΩ
Loss Fraction 0.5 % at STC

LID - Light Induced Degradation
Loss Fraction 1.1 %

Module Quality Loss
Loss Fraction -0.5 %

Module mismatch losses
Loss Fraction 1.0 % at MPP

Strings Mismatch loss
Loss Fraction 0.2 %

IAM loss factor
Incidence effect (IAM): User defined profile

10°	20°	30°	40°	50°	60°	70°	80°	90°
0.998	0.998	0.995	0.992	0.986	0.970	0.917	0.763	0.000

AC wiring losses

Inv. output line up to injection point

Inverter voltage	480 Vac tri
Loss Fraction	0.52 % at STC

Inverter: Sunny Highpower SHP125-US-21-PEAK3

Wire section (2 Inv.)	Alu 2 x 3 x 185 mm²
Average wires length	50 m

Horizon definition

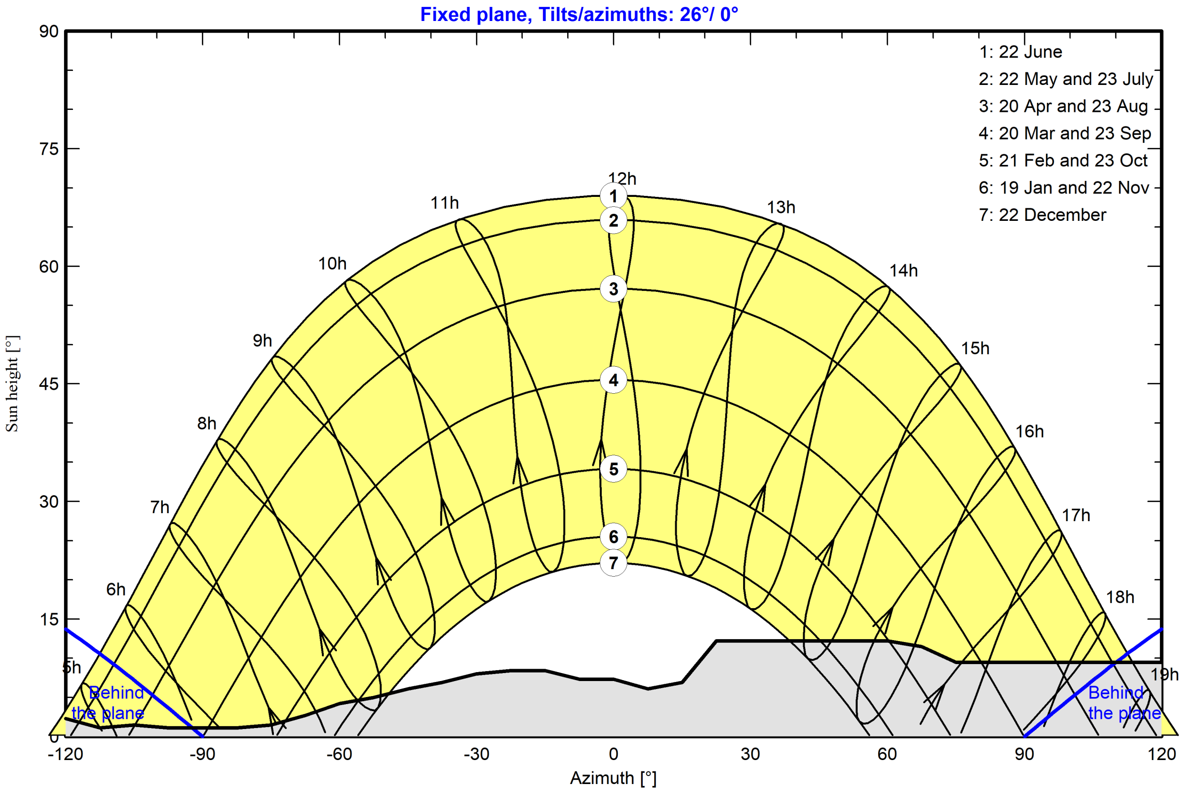
Horizon from PVGIS website API, Lat=44°24'44", Long=-118°56'9", Alt=1032m

Average Height	6.4 °	Albedo Factor	0.58
Diffuse Factor	0.95	Albedo Fraction	100 %

Horizon profile

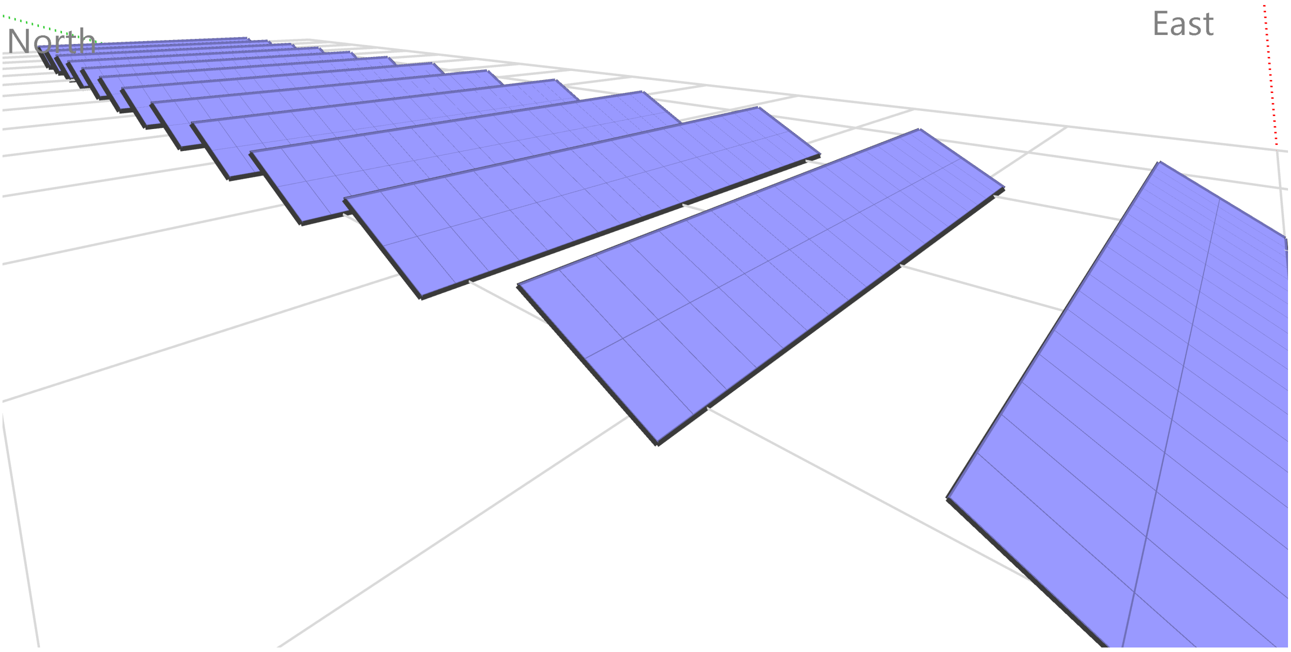
Azimuth [°]	-180	-173	-158	-150	-143	-135	-128	-120	-113	-105	-98	-83
Height [°]	3.4	3.1	3.8	3.4	4.2	4.6	4.2	2.3	1.1	1.5	1.1	1.1
Azimuth [°]	-75	-68	-60	-53	-45	-38	-30	-23	-15	-8	0	8
Height [°]	1.5	2.7	4.2	5.0	6.1	6.9	8.0	8.4	8.4	7.3	7.3	6.1
Azimuth [°]	15	23	60	68	75	143	150	158	173	180		
Height [°]	6.9	12.2	12.2	11.5	9.5	9.5	1.9	2.3	3.4	3.4		

Sun Paths (Height / Azimuth diagram)



Near shadings parameter

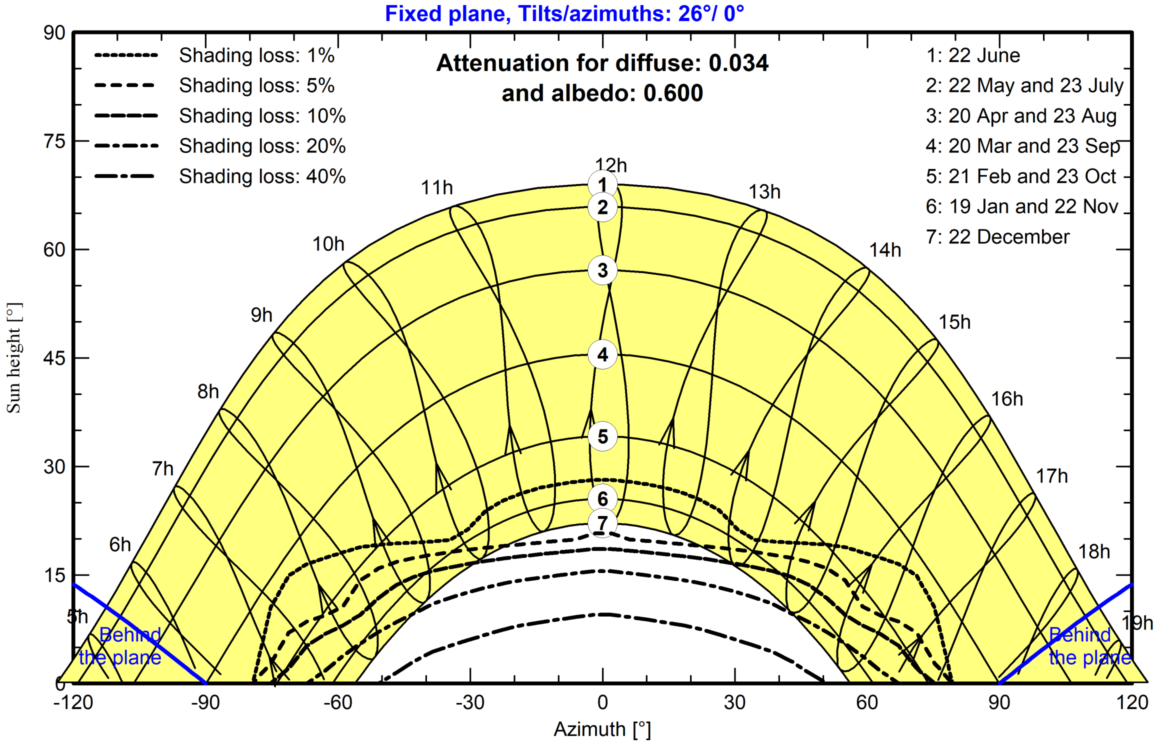
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

Fixed plane, Tilts/azimuths: 26°/ 0°

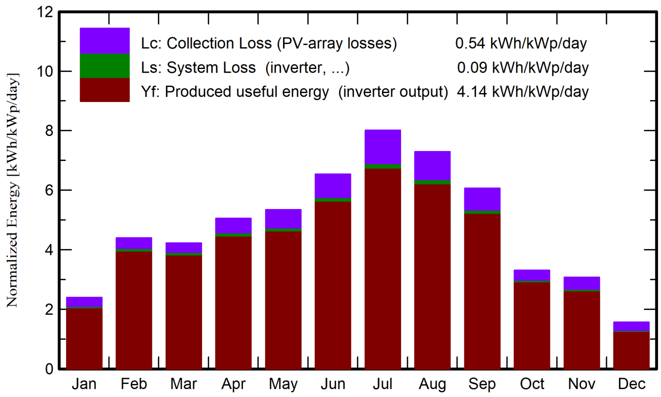


Main results

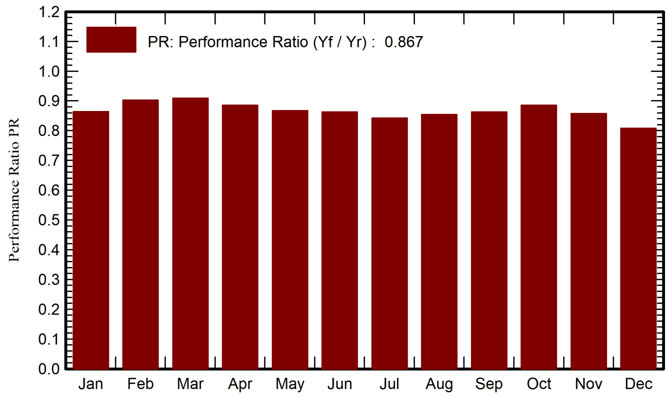
System Production

Produced Energy	431908 kWh/year	Specific production	1510 kWh/kWp/year
		Perf. Ratio PR	86.71 %

Normalized productions (per installed kWp)



Performance Ratio PR



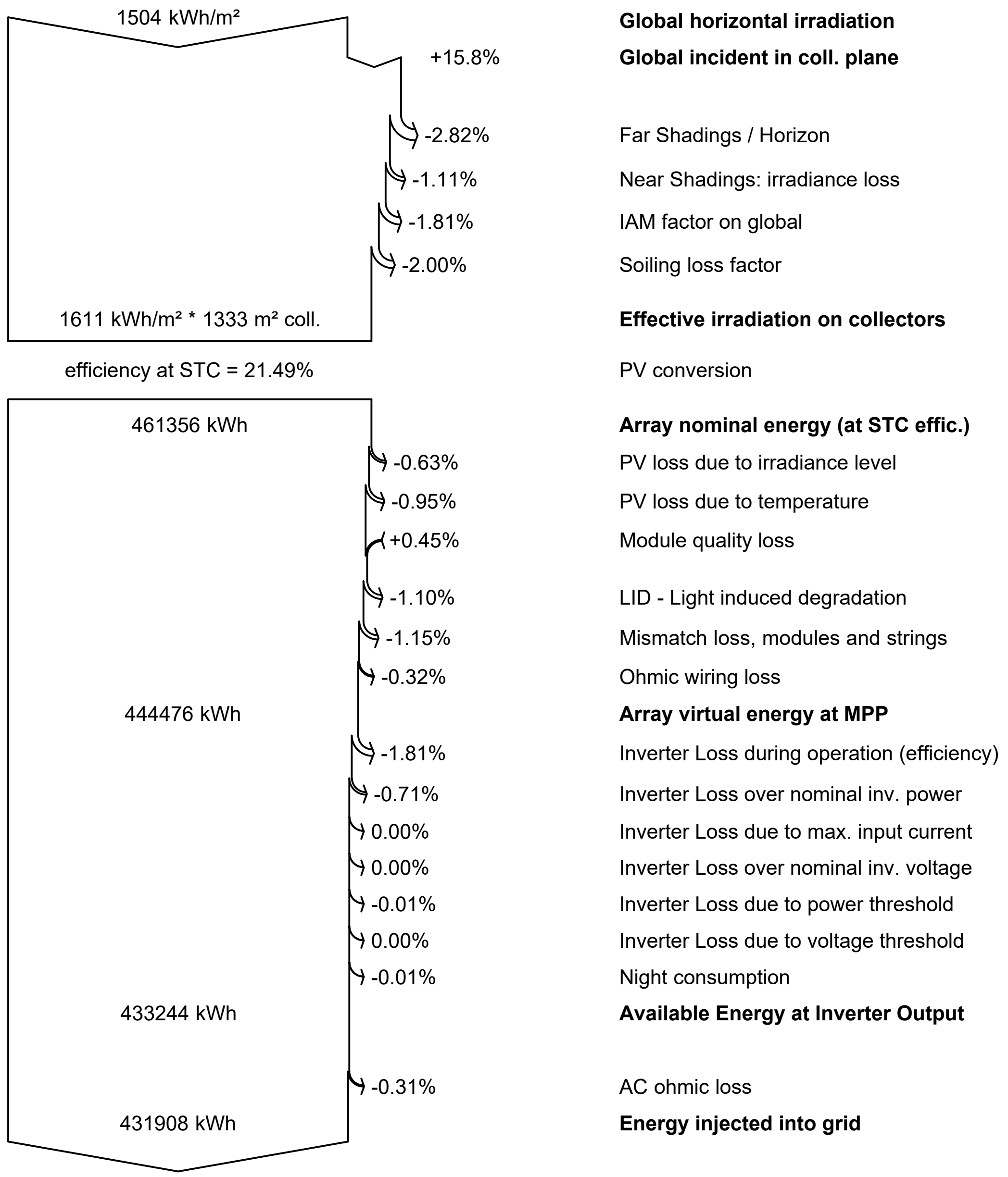
Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	46.6	23.10	-3.20	74.1	64.2	18703	18312	0.864
February	81.4	27.80	-1.00	123.0	112.1	32453	31759	0.902
March	107.0	52.10	-0.38	131.1	122.0	34810	34066	0.909
April	139.7	72.10	3.77	151.6	140.7	39257	38404	0.886
May	166.8	90.80	7.12	165.8	153.6	42043	41140	0.867
June	200.0	73.80	15.02	196.2	184.2	49476	48404	0.863
July	247.6	50.40	23.22	248.4	235.6	61204	59871	0.843
August	205.5	52.70	19.77	226.3	213.9	56482	55254	0.854
September	147.9	45.80	15.70	182.0	171.0	45898	44922	0.863
October	78.1	38.60	5.57	102.6	94.4	26512	25967	0.885
November	54.7	20.10	-1.02	92.1	79.6	23067	22586	0.858
December	28.4	15.00	-4.36	48.6	39.3	11475	11226	0.808
Year	1503.7	562.29	6.73	1741.6	1610.5	441380	431908	0.867

Legends

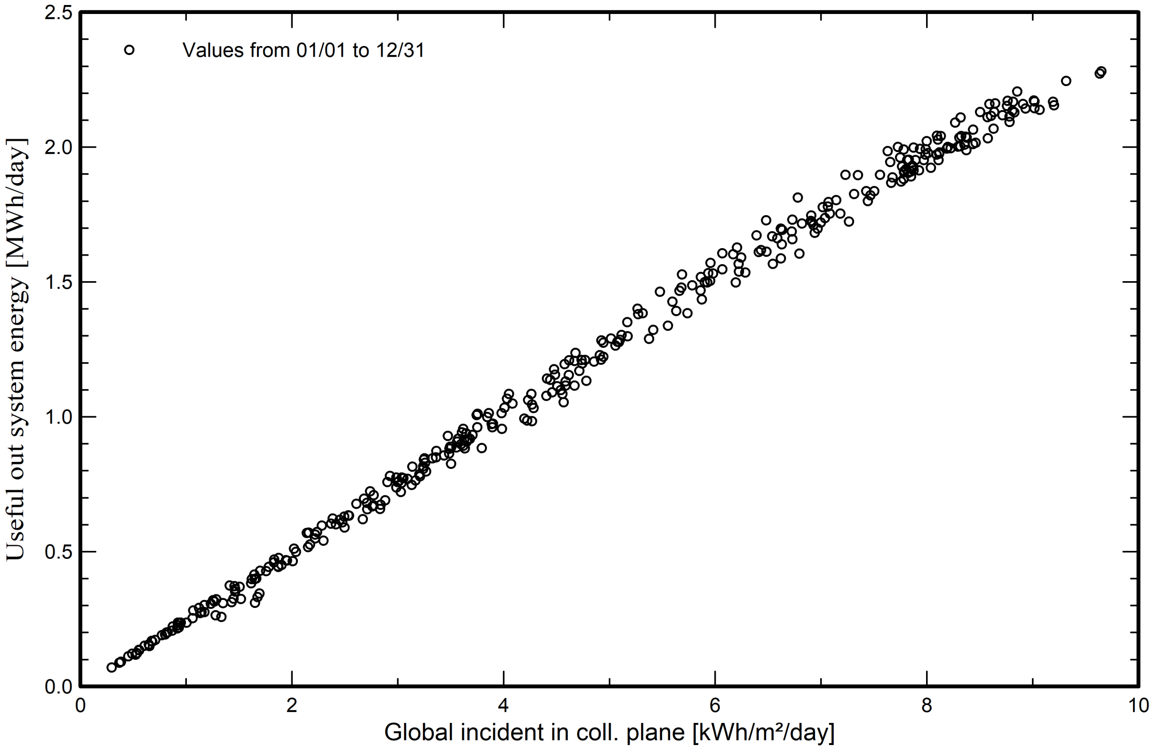
GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane		
GlobEff	Effective Global, corr. for IAM and shadings		

Loss diagram

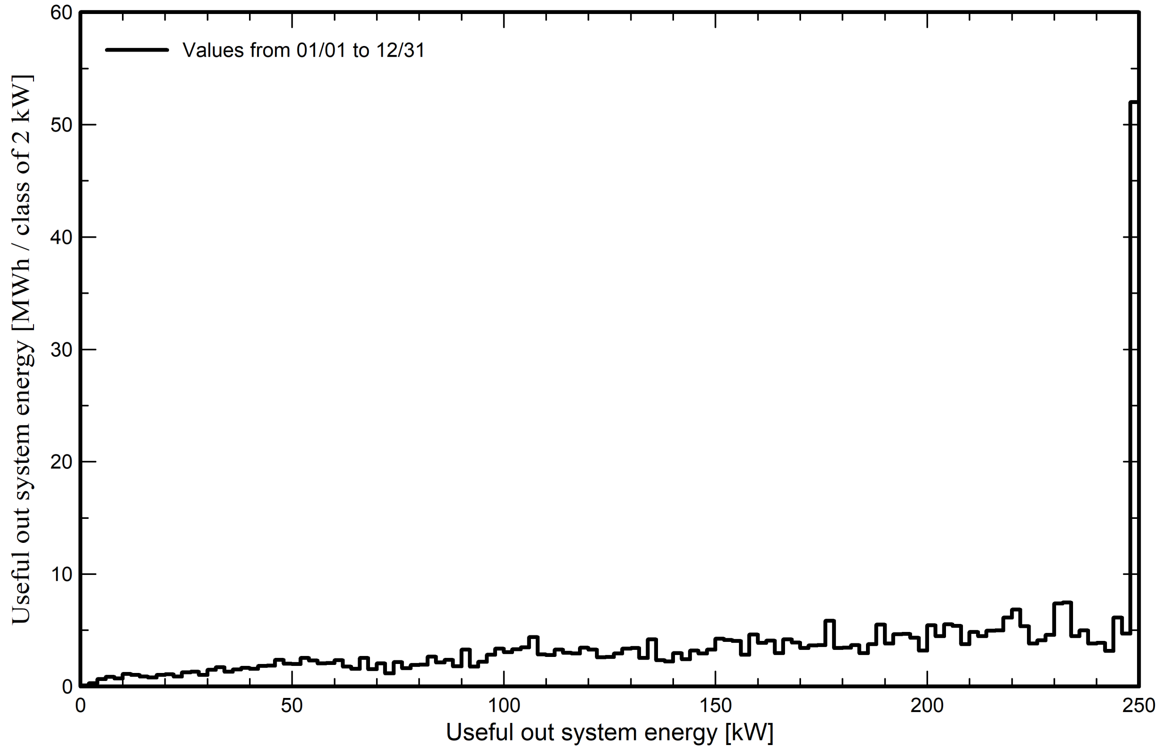


Predef. graphs

Daily Input/Output diagram

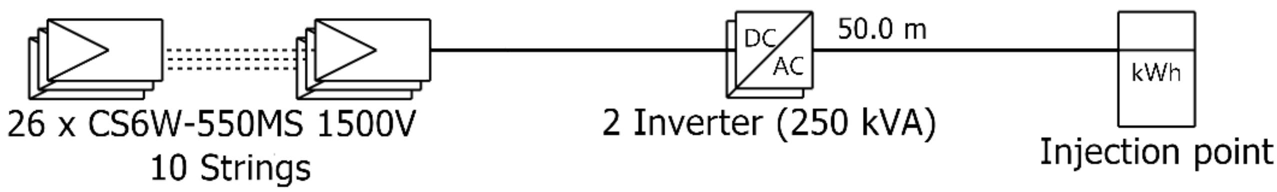


System Output Power Distribution



Single-line diagram

PVsyst V7.4.4
VCQ, Simulation date:
05/01/24 15:06
with v7.4.4



PV module	CS6W-550MS 1500V
Inverter	Sunny Highpower SHP125-US-21-PEAK3
String	26 x CS6W-550MS 1500V

PVGIS	Tetra Tech Inc (United states)
VCQ : Optimized for BESS	05/01/24

APPENDIX E - POWER ENERGY AND PVSYST SIMULATION REPORT - NO EXPORT WITH BESS SCENARIO.PDF

John Day Solar Plant

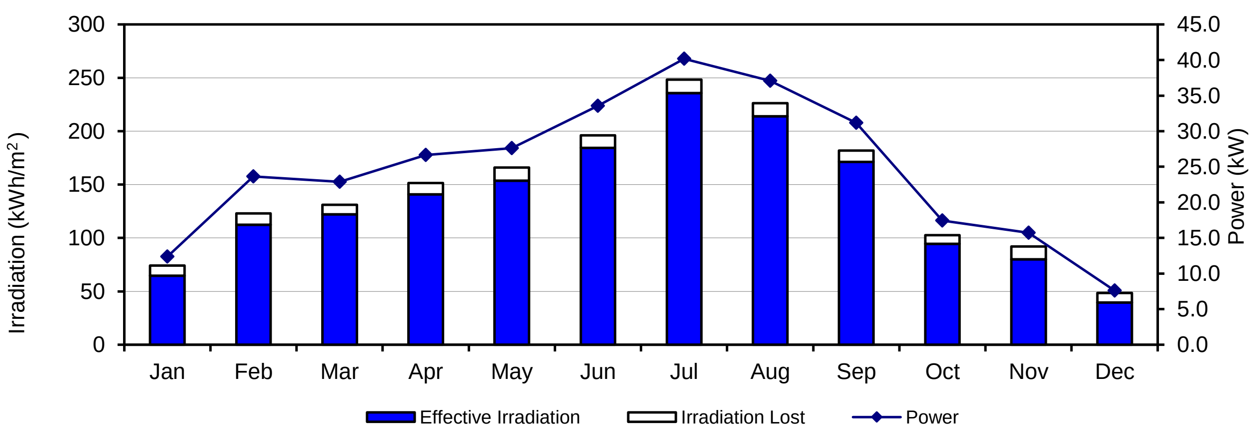
No Export with BESS Fixed Tilt, 143 kWdc Capacity, 5 Units x 52 Modules, 1 Inverters

Solar Power and Energy Simulation Summary

Plant Capacity at STC:	143.0	kW_{dc}	125.0 kW_{ac}	Plant Characteristics				
Average Annual Energy Sold:	215,886	kWh			Qty	kW/Unit	kW	
Capacity Factor:	17.2%		19.7%	Module Per String:	26	0.55	14.3	
% of Horiz. Irradiation On Area:	10.85%			Strings Per Inverter:	10		143	
				Inverters:	1	125	125	
Project Latitude:	44.41	Deg		Total Number of Modules:	260	0.55	143	
Extraterrestrial Irradiation:	2,696	$kWh/m^2/Yr$		Modules Per Support/Tracker Unit:	52	0.55	28.6	
Yearly Horiz. Irradiation:	1,504	$kWh/m^2/Yr$		Supports/Trackers Units:	5	28.6	143	
Average Clearness Index:	0.56			Total Plant Area:	0.132	ha		
				Total Module Area:	0.067	ha		
Simulation:	V01			Area Coverage:	51%			
Simulation Power Ratio:	1			Array Electrical Losses:	0.4%			
Tracking System:	Fixed Tilt			Inverter Losses:	2.2%			
Unit Tilt:	26	degrees		Interconnection Losses:	0.2%			
Unit Spacing:	9 m			Downtime Losses:	0.0%			
Shading Simulation:	None			Transmission Voltage:	0.48	kV		

	Horizontal Irradiation (kWh/m^2)	Incident Irradiation (kWh/m^2)	Ave. Amb. Temp. (˚C)	Shading Losses (%)	Effective Irradiation (kWh/m^2)	Module Power (kW_{dc})	Electrical Losses (%)	Plant Power (kW_{ac})	Capacity Factor (%)	Energy Sold (kWh)
Max	248	248	38.7	18%	236	158.89	4%	124.11	28%	29,886
Avg	125	145	6.7	9%	134	53.27	3%	24.64	17%	17,990
Min	28	49	-18.8	5%	40	0.18	2%	-0.01	5%	5,658
Jan	47	74	-1.6	13%	65	12.67	2.5%	12.36	9%	9,196
Feb	81	123	0.8	9%	112	24.29	2.7%	23.64	17%	15,885
Mar	107	131	1.8	7%	122	23.67	3.4%	22.88	16%	17,019
Apr	140	152	5.8	7%	141	27.75	4.0%	26.64	19%	19,183
May	167	166	8.8	7%	154	28.91	4.5%	27.62	19%	20,553
Jun	200	196	17.0	6%	184	34.84	3.6%	33.57	23%	24,172
Jul	248	248	25.6	5%	236	41.64	3.5%	40.17	28%	29,886
Aug	206	226	22.5	5%	214	38.25	3.1%	37.07	26%	27,583
Sep	148	182	18.5	6%	171	32.24	3.4%	31.15	22%	22,430
Oct	78	103	8.2	8%	94	17.89	2.5%	17.45	12%	12,982
Nov	55	92	0.9	13%	80	16.14	2.5%	15.75	11%	11,338
Dec	28	49	-2.8	18%	40	7.79	2.4%	7.61	5%	5,658

* Irradiation data for Typical Meteorological Years (TMY) with data from the National Solar Radiation Database (NSRDB)



John Day Solar Plant

No Export with BESS Fixed Tilt, 143 kWdc Capacity, 5 Units x 52 Modules, 1 Inverters

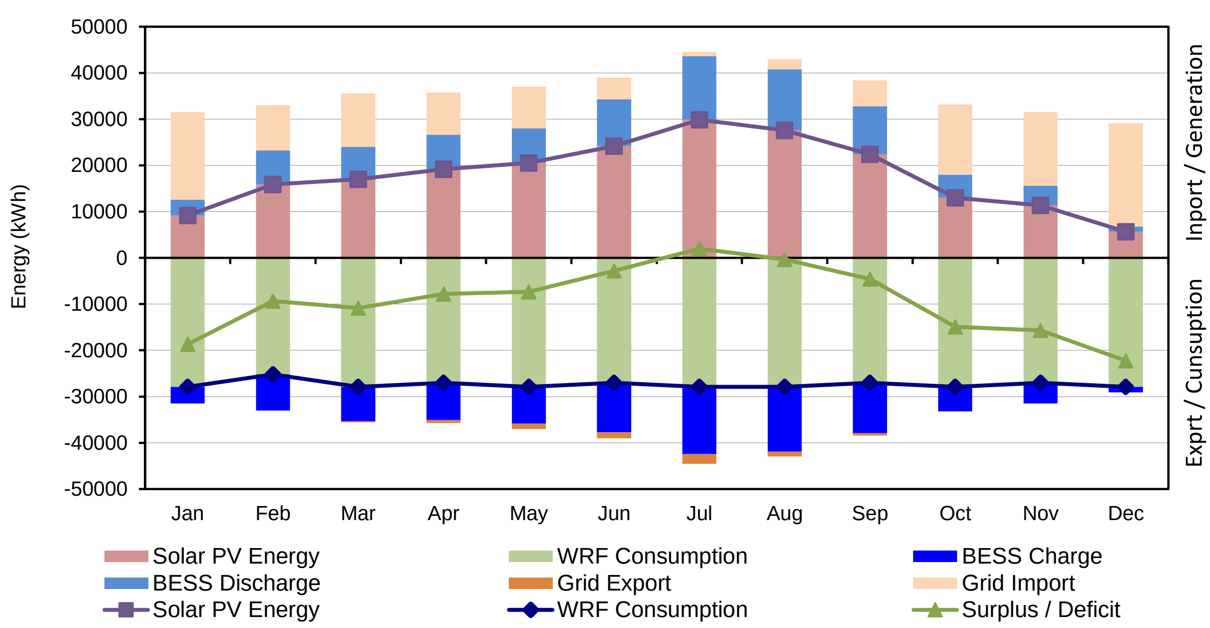
Power and Energy Scenarios

WRF Consuption	37.5	kWh
BESS Capacity	500	kWh
BESS Power	125	KWh
BESS C Rating	0.25C	
BESS Efficiency	97%	(One direction)

Yearly Energy Summary (kWh)

Solar PV Energy	215,886	100%
WRF Consumption	-328,500	152%
BESS Total	-5,589	3%
Grid Total	118,203	55%
BESS Usage	50%	

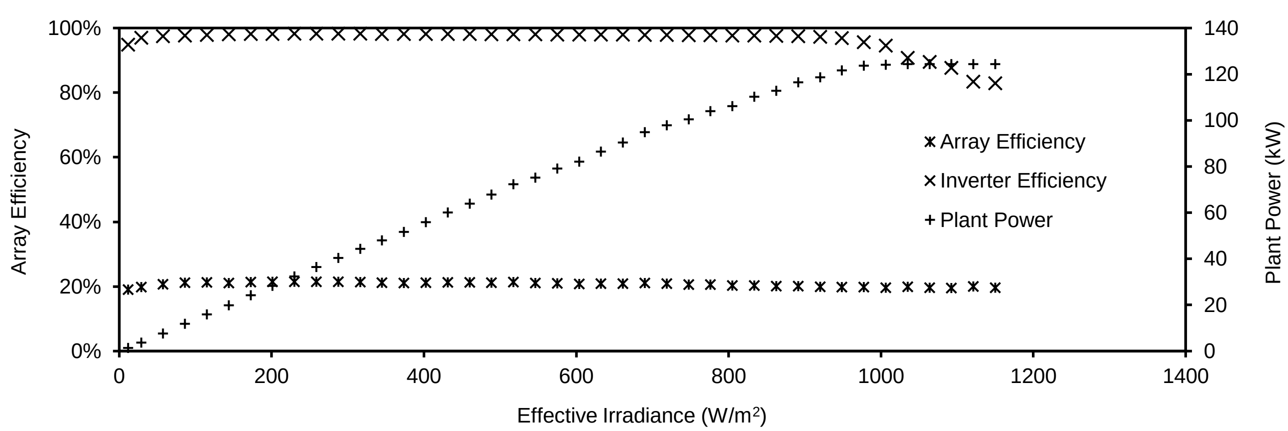
Month	Solar PV Energy (kWh)	WRF Consumption (kWh)	Surplus / Deficit (kWh)	BESS Charge (kWh)	BESS Discharge (kWh)	BESS Loss (kWh)	Grid Export (kWh)	Grid Import (kWh)
Jan	9,196	-27,900	-18,704	-3,619	3,408	-211	0	18,915
Feb	15,885	-25,200	-9,315	-7,835	7,377	-456	0	9,772
Mar	17,019	-27,900	-10,881	-7,400	6,970	-431	-251	11,562
Apr	19,183	-27,000	-7,817	-8,059	7,460	-466	-697	9,112
May	20,553	-27,900	-7,347	-7,922	7,452	-461	-1,177	8,994
Jun	24,172	-27,000	-2,828	-10,730	10,103	-625	-1,273	4,727
Jul	29,886	-27,900	1,986	-14,555	13,740	-849	-2,114	943
Aug	27,583	-27,900	-317	-13,975	13,154	-814	-1,097	2,236
Sep	22,430	-27,000	-4,570	-10,876	10,325	-636	-533	5,654
Oct	12,982	-27,900	-14,918	-5,279	5,003	-308	-4	15,198
Nov	11,338	-27,000	-15,662	-4,504	4,241	-262	0	15,925
Dec	5,658	-27,900	-22,242	-1,192	1,122	-69	0	22,311
Total	215,886	-328,500	-112,614	-95,945	90,356	-5,589	-7,146	125,349
Mth Min.	5,658	-27,900	-22,242	-14,555	1,122	-849	-2,114	943
Yearly Ave.	17,990	-27,375	-9,385	-7,995	7,530	-466	-595	10,446
Mth Max.	29,886	-25,200	1,986	-1,192	13,740	-69	0	22,311



John Day Solar Plant
No Export with BESS Fixed Tilt, 143 kWdc Capacity, 5 Units x 52 Modules, 1 Inverters

Performance Characteristics At Average Temperature

Percent Capacity	Effective Irradiation	Module Efficiency	Array Power	Electrical Loss (dc)	Power to Inverter	Voltage To Inverter	Current To Inverter	Inverter Efficiency	Power to Substation	Sub/Line Loss	Point of Sale
	(W/m^2)	(%)	(kW_{dc})	(%)	(kW_{dc})	(V_{dc})	(kA_{dc})	(%)	(kW)	(%)	(kW)
100%	1150	19.6%	150.9	0.7%	149.9	1093	116.9	83.0%	124.4	0.3%	124.1
97.5%	1121	20.0%	150.1	0.6%	149.1	1094	116.8	83.4%	124.4	0.3%	124.1
95.0%	1093	19.6%	142.7	0.6%	141.8	1070	119.5	87.7%	124.4	0.3%	124.1
92.5%	1064	19.7%	139.7	0.6%	138.9	1063	120.3	89.6%	124.4	0.3%	124.1
90.0%	1035	19.9%	137.8	0.6%	137.0	1066	120.0	90.8%	124.4	0.3%	124.1
87.5%	1006	19.6%	132.0	0.6%	131.3	1026	124.4	94.6%	124.1	0.3%	123.8
85.0%	978	19.9%	130.0	0.6%	129.3	1020	124.8	95.7%	123.7	0.3%	123.4
82.5%	949	19.9%	126.2	0.5%	125.5	1014	123.2	96.9%	121.7	0.2%	121.3
80.0%	920	19.9%	122.5	0.5%	121.9	1004	121.3	97.4%	118.6	0.2%	118.4
77.5%	891	20.2%	120.1	0.5%	119.5	1012	118.1	97.6%	116.6	0.2%	116.3
75.0%	863	20.2%	116.2	0.5%	115.7	1012	114.3	97.6%	112.9	0.2%	112.7
72.5%	834	20.4%	113.5	0.5%	113.0	1022	110.5	97.7%	110.3	0.2%	110.1
70.0%	805	20.3%	109.2	0.5%	108.7	1022	106.4	97.7%	106.3	0.2%	106.0
67.5%	776	20.6%	106.9	0.4%	106.4	1033	103.0	97.8%	104.0	0.2%	103.8
65.0%	748	20.7%	103.2	0.4%	102.8	1040	98.8	97.8%	100.6	0.2%	100.3
62.5%	719	20.9%	100.4	0.4%	100.0	1050	95.3	97.9%	97.9	0.2%	97.7
60.0%	690	21.1%	97.3	0.4%	96.9	1064	91.1	97.9%	94.9	0.2%	94.7
57.5%	661	21.0%	92.6	0.4%	92.3	1053	87.7	98.0%	90.4	0.2%	90.3
55.0%	633	21.0%	88.6	0.3%	88.3	1057	83.5	98.0%	86.5	0.2%	86.4
52.5%	604	20.8%	84.1	0.3%	83.8	1049	79.9	98.0%	82.2	0.2%	82.0
50.0%	575	21.1%	81.0	0.3%	80.7	1063	75.9	98.0%	79.1	0.2%	79.0
47.5%	546	21.1%	76.9	0.3%	76.7	1065	72.0	98.1%	75.2	0.2%	75.1
45.0%	518	21.4%	74.1	0.3%	73.9	1082	68.2	98.1%	72.4	0.1%	72.3
42.5%	489	21.3%	69.4	0.3%	69.2	1073	64.5	98.1%	67.9	0.1%	67.8
40.0%	460	21.3%	65.4	0.2%	65.2	1074	60.7	98.1%	64.0	0.1%	63.9
37.5%	431	21.3%	61.3	0.2%	61.2	1074	57.0	98.2%	60.1	0.1%	60.0
35.0%	402	21.2%	57.1	0.2%	57.0	1073	53.1	98.2%	56.0	0.1%	55.9
32.5%	374	21.1%	52.7	0.2%	52.6	1067	49.4	98.2%	51.7	0.1%	51.6
30.0%	345	21.2%	49.0	0.2%	48.9	1080	45.3	98.2%	48.0	0.1%	48.0
27.5%	316	21.4%	45.3	0.2%	45.2	1087	41.6	98.3%	44.4	0.1%	44.4
25.0%	287	21.5%	41.3	0.2%	41.2	1089	37.8	98.3%	40.5	0.1%	40.4
22.5%	259	21.5%	37.2	0.1%	37.2	1091	34.1	98.3%	36.5	0.1%	36.5
20.0%	230	21.5%	33.0	0.1%	33.0	1087	30.4	98.3%	32.4	0.1%	32.4
17.5%	201	21.5%	28.9	0.1%	28.9	1089	26.5	98.2%	28.4	0.1%	28.4
15.0%	172	21.4%	24.7	0.1%	24.7	1081	22.8	98.2%	24.2	0.0%	24.2
12.5%	144	21.1%	20.3	0.1%	20.3	1070	19.0	98.1%	19.9	0.0%	19.9
10.0%	115	21.3%	16.4	0.1%	16.3	1085	15.1	97.9%	16.0	0.0%	16.0
7.5%	86	21.2%	12.2	0.0%	12.2	1086	11.3	97.7%	12.0	0.0%	11.9
5.0%	57	20.7%	8.0	0.0%	7.9	1065	7.5	97.5%	7.8	0.0%	7.8
2.5%	29	19.9%	3.8	0.0%	3.8	1030	3.7	97.0%	3.7	0.0%	3.7
1.0%	12	19.0%	1.5	0.0%	1.5	1025	1.4	94.9%	1.4	0.0%	1.4



John Day Solar Plant

No Export with BESS Fixed Tilt, 143 kWdc Capacity, 5 Units x 52 Modules, 1 Inverters

Collector and Inverter Electrical System

Photovoltaic Modules and Inverters

Photovoltaic Module Characteristics at STC			Inverter Characteristics		
Manufacturer:	Canadian Solar		Manufacturer:	SMA	
Model:	CS6W-550MS		Model:	PEAK3 125-US	
Nominal Power at STC (P_{mpp}):	550	Watts	Max DC input Power:	250	kWatts
Module Efficiency:	21.5%		Max Open Circuit Input Voltage:	1500	V_{dc}
Max Power Voltage at STC (V_{mpp}):	41.7	V_{dc}	Min Start Input Voltage:	684	V_{dc}
Open Circuit Voltage (V_{oc}):	49.6	V_{dc}	Min Tracking Input Voltage:	705	V_{dc}
Max System (String) Voltage:	1500	V_{dc}	Max Tracking Input Voltage:	1450	V_{dc}
Max Power Current (I_{mpp}):	13.20	A_{dc}	Max Input Current:	180	A_{dc}
Short Circuit Current (I_{sc}):	14.00	A_{dc}	Max AC Output Power:	125	kWatts
Max String Current (Fuse Rating):	25.00	A_{dc}	Nominal AC Output Voltage:	480	V_{ac}
Power Temp. Coef. (P_{max}):	-0.34%	% / °C	Max AC Output Current:	151.00	A_{rms}
Voltage Temp. Coef. (V_{oc}):	-0.26%	% / °C	Inverter Efficiency:	98.5%	
Current Temp. Coef. (I_{sc}):	0.050%	% / °C	Cost per Inverter:	$9,900	
Module Area:	2.57	m^2			
Cost per Module:	$150	CPL Estimated			

Array String Sizing

Solar Rad. Absorb. Coef. (α):	0.90	
Thermal Loss Factor (U):	32	$W / m^2 K$ (15 to 30 $W / m^2 K$ for insulated to free-standing arrays)
Min Starting Irrad. (W/m^2):	100	W/m^2
Module Per String:	26	
Strings Per Inverter:	10	

Conditions:	Ext. Cold	Min. Oper.	STC	NOCT	Max Oper.	Ext. Hot
Max Daily Panel Irrad. (W/m^2):	600	800	1000	1000	1000	1000
Air Temp.(°C):	-35	-20	-3	20	25	40
Max Oper. Panel Temp. (°C):	-22	-3	25	42	47	62
Min Start Panel Temp. (°C):	-32	-17	0	23	28	43
Max Panel Oper. Volt (V_{mpp}, V_{dc}):	46.8	44.7	41.7	39.9	39.3	37.7
Max String Oper. Volt (V_{mpp}, V_{dc}):	1216	1162	1084	1037	1023	980
Max String Oper. Current (I_{mpp}, A_{dc}):	12.89	13.02	13.20	13.31	13.34	13.44
Max Inverter Oper. Current (I_{mpp}, A_{dc}):	129	130	132	133	133	134
Max Panel Oper. Power(P_{mpp}, W):	638	602	550	519	509	481
Max String Oper. Power(P_{mpp}, kW):	16.6	15.6	14.3	13.5	13.2	12.5
Max Inverter Oper. Power(P_{mpp}, kW):	166	156	143	135	132	125
Array / Inverter Power Ratio:	66%	63%	57%	54%	53%	50%
Panel Open Circuit Volt (V_{oc}, V_{dc}):	57.0	55.0	52.9	49.9	49.2	47.3
String Open Circuit Volt (V_{oc}, V_{dc}):	1481	1431	1375	1297	1280	1230
String Short Circuit Current (I_{sc}, A_{dc}):	13.67	13.81	14.00	14.12	14.15	14.26

Notes:

1 - Nominal Operating Cell Temperature (NOCT) are at 20°C air temperature, 1 m/s wind speed, 800 W/m2, 1.5 air mass (AM) spectrum. Exact wind speed effect is difficult to evaluate and is considered included in the thermal loss factor (U).

2 - Standard Test Conditions (STC) are 25°C cell temperature, 1000 W/m^2, 1.5 air mass (AM) spectrum, which corresponds to clear day irradiance on 37° Tilted surface with sun at 42° above horizon.

John Day Solar Plant
No Export with BESS Fixed Tilt, 143 kWdc Capacity, 5 Units x 52 Modules, 1 Inverters

Electrical and Transmission Line Data and Losses

Array Electrical Losses

	Number Per Inv.	Average Length (m)	Maximum Current 1.25 I_{sc} (A)	Wire Size (kcmil)	Conductor Resistance (Ω/km)	Conductor Resistance (Ω)	Power Loss (W)	Power Loss (%)
String Wiring	10	40	13.2	10	3.390	0.136	47.3	0.33%
DC Comb. Box to Inv.	1	10	132	4	0.795	0.008	277.0	0.19%
Inv. to AC Comb. Box	1	50	151	4/0	0.197	0.010	673.8	0.54%
Total Array Loss								**1.06%**

* Array electrical losses are calculated here only for reference. Actual DC losses are calculated directly in PVSyst.

Transmission Line (AC Combiner Box to POC)

Input Data

Line Voltage	0.480	kV
Conductor Name	Kcmil 1750	
Wire Size	1750.0	kcmil
Resistance (per phase)	0.0190	Ω/km
Length	0.2	km
Plant Capacity	125.00	kW
Power Factor	0.90	cos ϕ

Calculations

Current per Phase	167.1	A
Resistance per Phase	0.00	Ω
Loss per Phase	0.11	kW
Total Tx Loss	0.32	kW
Total Tx Loss	**0.25%**	
Percent of Plant Capacity	**1.32%**	
Loss Factor	0.000105	

Conductor Resistance Table for DC use

Material	Gauge	Area (kcmil)	Resistance Ω/km	Ampacity 60°C (A)
Cu	12	6.53	5.090	55
Cu	10	26.3	3.390	70
Cu	8	104.5	1.950	98
Cu	6	133.0	1.240	132
Cu	4	166.1	0.795	176
Cu	2	210.4	0.565	218
Cu	1	250	0.393	276
Cu	2/0	350	0.277	347
Cu	3/0	500	0.210	416
Cu	4/0	750	0.164	488

Conductor Resistance Table for AC use

Material	Name	Size kcmil	Resistance Ω/km	Ampacity 90°C (A)
Al	Partridge	266.8	0.2136	
Al	Tulip	336.4	0.1693	
Al	Cosmos	477.0	0.1194	
Al	Orchid	636.0	0.0896	
Al	2/0	133.0	0.3250	230
Al	3/0	166.1	0.2230	261
Al	4/0	210.4	0.1970	298
Al	Kcmil 250	250.0	0.1388	324
Al	Kcmil 350	350.0	0.0990	390
Al	Kcmil 500	500.0	0.0694	473
Al	Kcmil 750	750.0	0.0463	586
Al	Kcmil 100C	1000.0	0.0347	677
Cu	Kcmil 175C	1750.0	0.0190	1017

John Day Solar Plant

No Export with BESS Fixed Tilt, 143 kWdc Capacity, 5 Units x 52 Modules, 1 Inverters

Capatial Cost (AACE Class 5)

	Capital Cost	Quantity		Unit Cost	Total*	% of Total	
Siteworks	Siteworks - Mob / Demob, Etc.	1	LS	$8,000	$8,000	2%	BOP Direct Costs (DC)
	Clearing / Site prep	0.13	ha	$15,000	$2,000		
	Access Roads - New	0	km	$64,000	$0		
	Access Roads - Upgrade	0	km	$47,000	$0		
	Onsite Roads	0	km	$50,000	$0		
	Office and Laydown Area / Rehab	0	ha	$80,000	$0		
	Granular Material - supply / Haul	0	m^2				
Mounting Sys	Mount. Structure - Pile Supply	43	EA	$30	$1,000	1%	
	Mount. Structure - Pile Install	43	EA	$30	$1,000		
	Mount. Structure - Raking Supply	148	m	$30	$4,000		
	Mount. Structure - Raking Install	148	m	$10	$1,000		
PV Array	Inst. - Mob / Demob, Etc.	1	LS	$4,000	$4,000	9%	
	PV Panel: CS6W-550MS, (CAD)	260	EA	$150	$39,000		
	PV Panel Installation	260	EA	$15	$4,000		
	DC Cable	0.4	km	$2,000	$1,000		
	DC Combiner Boxes	1	EA	$3,000	$3,000		
Inverter Side	Inverter: PEAK3 125-US (CAD)	1	EA	$9,900	$10,000	6%	
	Inverter Installation	1	EA	$200	$0		
	AC Cables	0.3	km	$79,300	$20,000		
	AC Combiner Boxes	1	EA	$2,900	$3,000		
BoS Com	Security (Fence)	100	m	$110	$11,000	3%	
	Comm. and Monitoring incl. installation	1	EA	$7,300	$7,000		
	Grounding	100	m	$10	$1,000		
BESS	Battery Units	500	kWh	$300	$150,000	37%	
	Battery Management System (BMS)	1	EA	$15,000	$15,000		
	Power Conversion System (PCS)	1	EA	$30,000	$30,000		
	BESS Housing and Cooling Systems	1	EA	$12,000	$12,000		
Interconn.	Interconnection / Metering	1	EA	$1,800	$2,000	1%	
	Padmount Transformers	0	Xformers	$11,000	$0		
	Protection (Breaker, Disconnect)	1	EA	$3,700	$4,000		
Commissioning	DC side commissioning (Polarity, Uov, Isc, IV curve, etc.)	1	EA	$1,000	$1,000	2%	
	Inverters Commissioning	1	EA	$500	$1,000		
	AC cables commissioning	1	EA	$2,000	$2,000		
	Comm. system commissioning	1	EA	$1,400	$1,000		
	BESS commissioning	1	EA	$8,280	$8,280		
Const.	Control / Electrical Building and Yard	0	LS	$0	$0		
	Construction Site Services	1.5%	Above BOP I	$346,280	$5,000	1%	
	End of Life	0%	Above BOP I	$351,280	$0	0%	
Owners, Eng, PM	PM and Engineering	15%	BOP DC	$351,280	$53,000	9%	Soft Costs
	Construction Mgmt	10%	BOP DC	$351,280	$35,000	6%	
	Owners Costs	2%	BOP DC	$351,280	$7,000	1%	
	Contingency on BOP	30%	BOP DC	$351,280	$105,000	19%	
	Escalation on BOP (1.5%/Yr)	3.0%	BOP DC	$351,280	$11,000	2%	
	Total Capital Cost (CC)	143	kWdc	$3,940	$563,000	100%	

* Extended total costs are rounded to the nearest thousand dollars.

Version 7.4.4

PVsyst - Simulation report

Grid-Connected System

Project: PVGIS

Variant: No Export with BESS

Sheds, single array

System power: 143 kWp

John Day - United States

Author

Tetra Tech Inc (United states)

Project summary

Geographical Site
John Day
United States

Situation

Latitude	44.41 °N
Longitude	-118.94 °W
Altitude	1032 m
Time zone	UTC-8

Project settings

Albedo	0.20

Meteo data
John Day
PVGIS TMY 5.2 - Synthetic

System summary

Grid-Connected System

Sheds, single array

PV Field Orientation
Fixed plane
Tilt/Azimuth 26 / 0 °

Near Shadings
Linear shadings : Fast (table)

User's needs
Unlimited load (grid)

System information

PV Array

Nb. of modules	260 units
Pnom total	143 kWp

Inverters

Nb. of units	1 unit
Pnom total	125 kWac
Pnom ratio	1.144

Results summary

Produced Energy	216251 kWh/year	Specific production	1512 kWh/kWp/year	Perf. Ratio PR	86.83 %

Table of contents

General parameters

Grid-Connected System

Sheds, single array

PV Field Orientation

Orientation

Fixed plane
Tilt/Azimuth 26 / 0 °

Sheds configuration

Nb. of sheds 10 units
Single array

Sizes

Sheds spacing 9.00 m
Collector width 4.54 m
Ground Cov. Ratio (GCR) 50.5 %
Top inactive band 0.02 m
Bottom inactive band 0.02 m

Shading limit angle

Limit profile angle 22.2 °

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Horizon

Average Height 6.4 °

Near Shadings

Linear shadings : Fast (table)

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer	CSI Solar
Model	CS6W-550MS 1500V
(Original PVsyst database)	
Unit Nom. Power	550 Wp
Number of PV modules	260 units
Nominal (STC)	143 kWp
Modules	10 string x 26 In series
At operating cond. (50°C)	
Pmpp	131 kWp
U mpp	977 V
I mpp	134 A

Inverter

Manufacturer	SMA
Model	Sunny Highpower SHP125-US-21-PEAK3
(Original PVsyst database)	
Unit Nom. Power	125 kWac
Number of inverters	1 unit
Total power	125 kWac
Operating voltage	684-1500 V
Pnom ratio (DC:AC)	1.14

Total PV power

Nominal (STC)	143 kWp
Total	260 modules
Module area	667 m²

Total inverter power

Total power	125 kWac
Number of inverters	1 unit
Pnom ratio	1.14

Array losses

Array Soiling Losses

Loss Fraction 2.0 %

Thermal Loss factor

Module temperature according to irradiance
Uc (const) 32.4 W/m²K
Uv (wind) 1.4 W/m²K/m/s

DC wiring losses

Global array res. 43 mΩ
Loss Fraction 0.5 % at STC

LID - Light Induced Degradation

Loss Fraction 1.1 %

Module Quality Loss

Loss Fraction -0.5 %

Module mismatch losses

Loss Fraction 1.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.2 %

IAM loss factor

Incidence effect (IAM): User defined profile

10°	20°	30°	40°	50°	60°	70°	80°	90°
0.998	0.998	0.995	0.992	0.986	0.970	0.917	0.763	0.000

AC wiring losses

Inv. output line up to injection point

Inverter voltage	480 Vac tri
Loss Fraction	0.52 % at STC
Inverter: Sunny Highpower SHP125-US-21-PEAK3	
Wire section (1 Inv.)	Alu 1 x 3 x 185 mm²
Wires length	50 m

Horizon definition

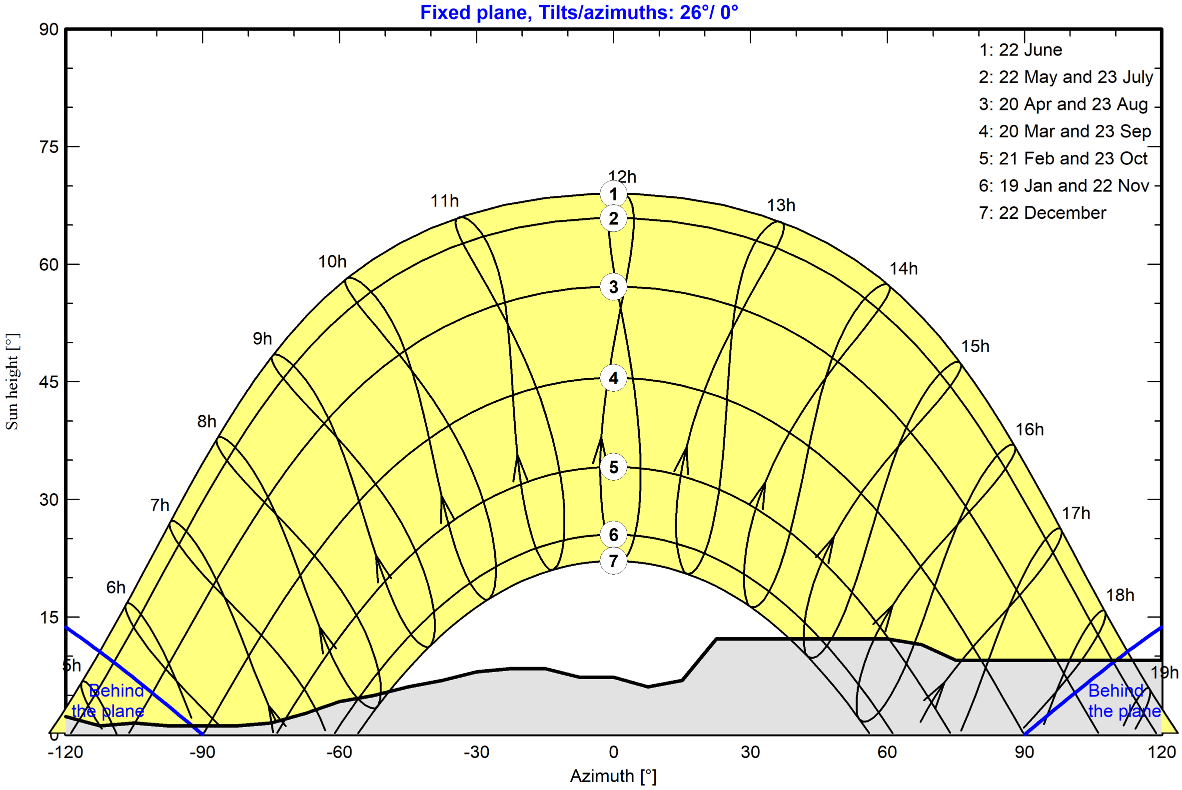
Horizon from PVGIS website API, Lat=44°24'44", Long=-118°56'9", Alt=1032m

Average Height	6.4 °	Albedo Factor	0.58
Diffuse Factor	0.95	Albedo Fraction	100 %

Horizon profile

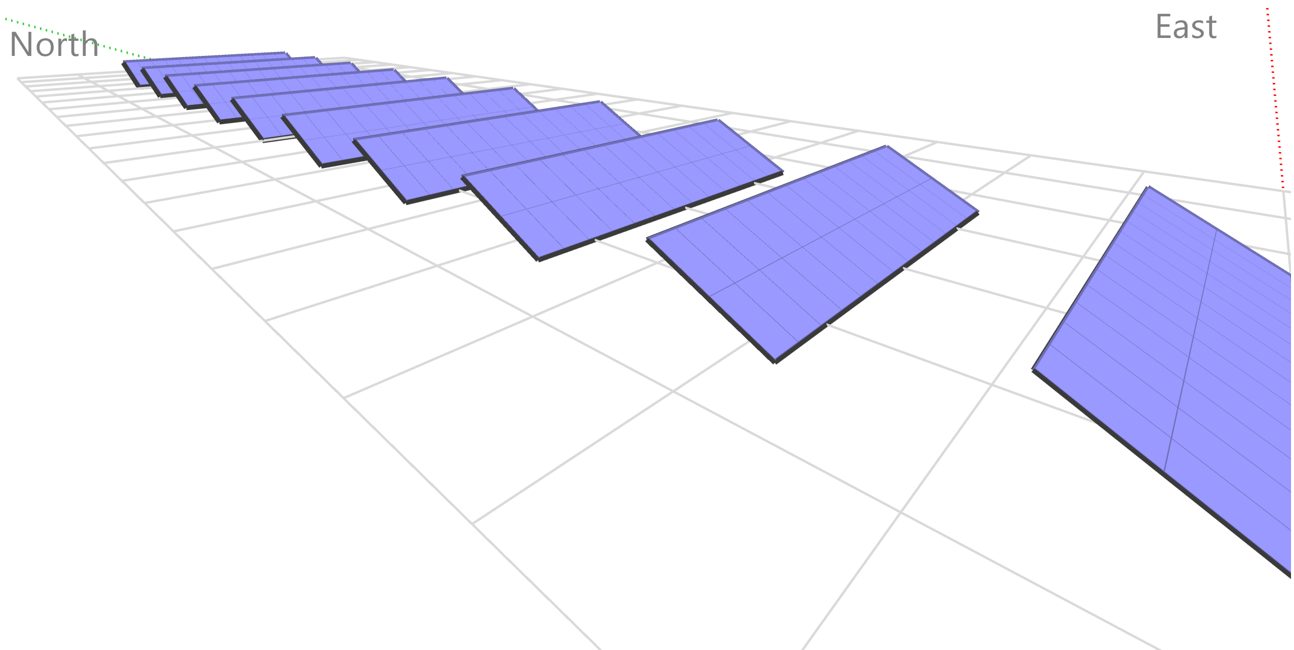
Azimuth [°]	-180	-173	-158	-150	-143	-135	-128	-120	-113	-105	-98	-83
Height [°]	3.4	3.1	3.8	3.4	4.2	4.6	4.2	2.3	1.1	1.5	1.1	1.1
Azimuth [°]	-75	-68	-60	-53	-45	-38	-30	-23	-15	-8	0	8
Height [°]	1.5	2.7	4.2	5.0	6.1	6.9	8.0	8.4	8.4	7.3	7.3	6.1
Azimuth [°]	15	23	60	68	75	143	150	158	173	180		
Height [°]	6.9	12.2	12.2	11.5	9.5	9.5	1.9	2.3	3.4	3.4		

Sun Paths (Height / Azimuth diagram)



Near shadings parameter

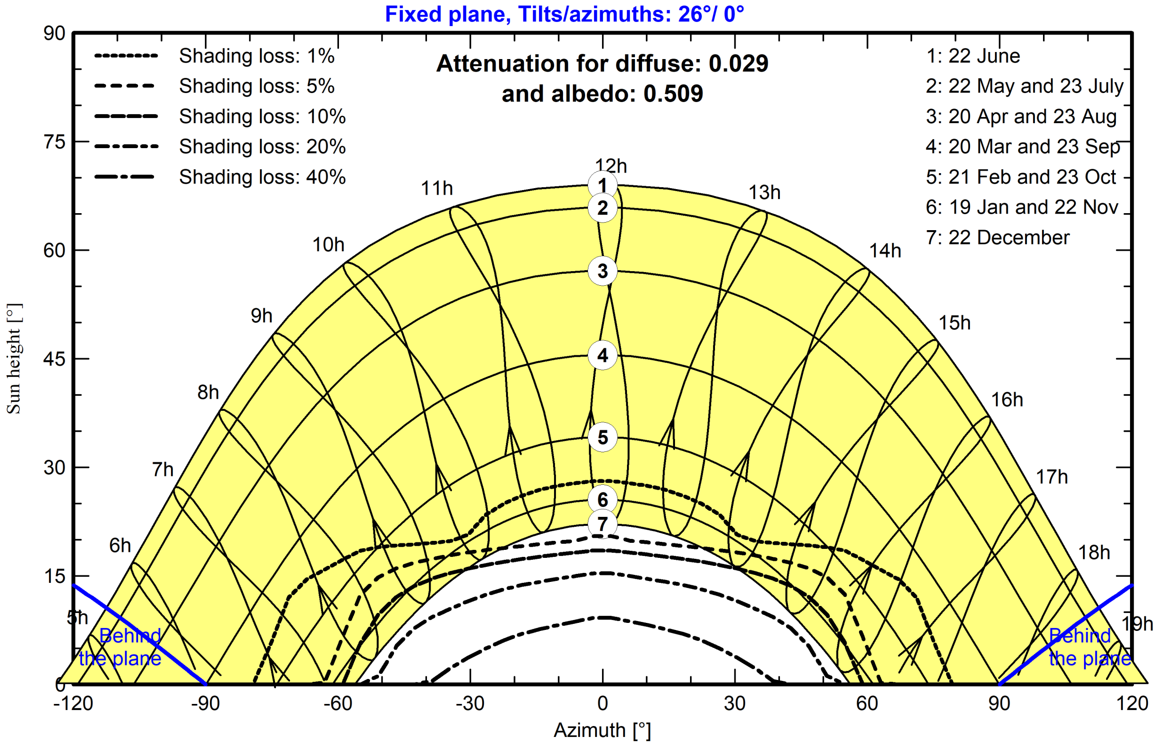
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

Fixed plane, Tilts/azimuths: 26°/ 0°



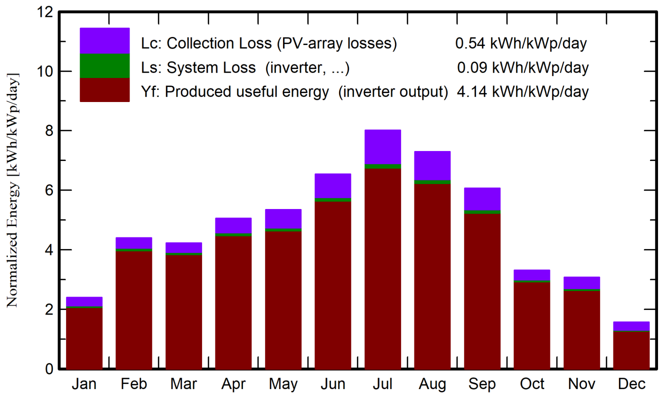
Main results

System Production

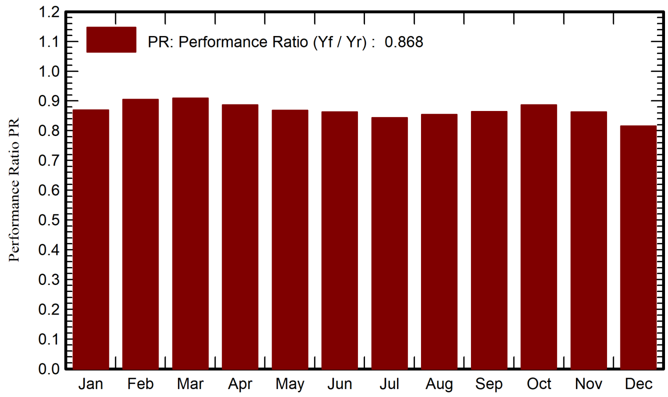
Produced Energy 216251 kWh/year

Specific production 1512 kWh/kWp/year
Perf. Ratio PR 86.83 %

Normalized productions (per installed kWp)



Performance Ratio PR



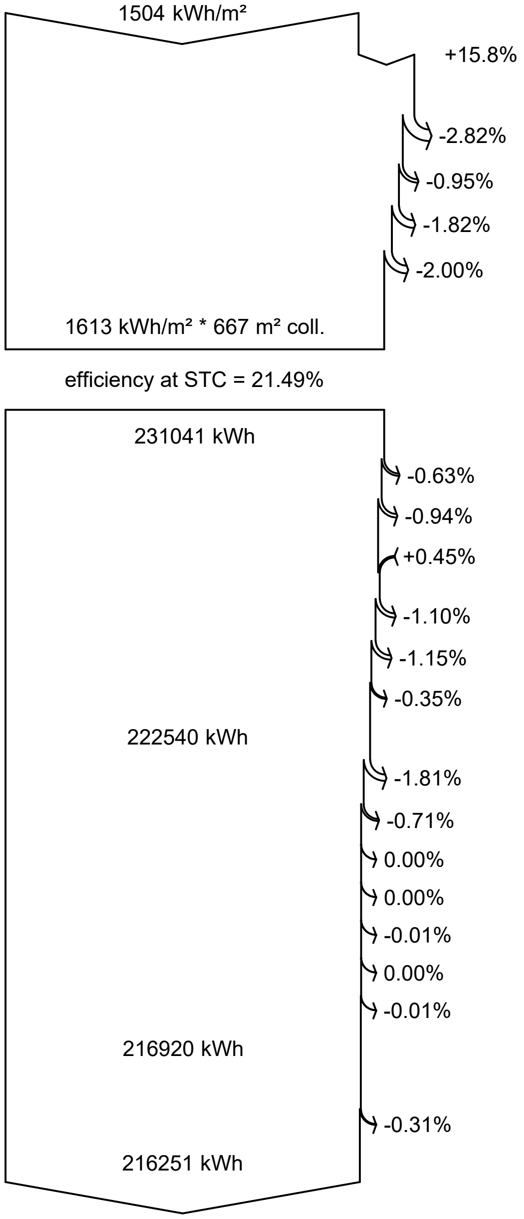
Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	46.6	23.10	-3.20	74.1	64.6	9406	9209	0.869
February	81.4	27.80	-1.00	123.0	112.3	16260	15912	0.904
March	107.0	52.10	-0.38	131.1	122.1	17419	17047	0.909
April	139.7	72.10	3.77	151.6	140.8	19642	19215	0.886
May	166.8	90.80	7.12	165.8	153.8	21038	20586	0.868
June	200.0	73.80	15.02	196.2	184.3	24751	24215	0.863
July	247.6	50.40	23.22	248.4	235.7	30611	29944	0.843
August	205.5	52.70	19.77	226.3	214.0	28250	27635	0.854
September	147.9	45.80	15.70	182.0	171.1	22958	22470	0.864
October	78.1	38.60	5.57	102.6	94.5	13272	13000	0.887
November	54.7	20.10	-1.02	92.1	80.0	11595	11353	0.862
December	28.4	15.00	-4.36	48.6	39.6	5789	5664	0.816
Year	1503.7	562.29	6.73	1741.6	1613.0	220991	216251	0.868

Legends

GlobHor Global horizontal irradiation
DiffHor Horizontal diffuse irradiation
T_Amb Ambient Temperature
GlobInc Global incident in coll. plane
GlobEff Effective Global, corr. for IAM and shadings
EArray Effective energy at the output of the array
E_Grid Energy injected into grid
PR Performance Ratio

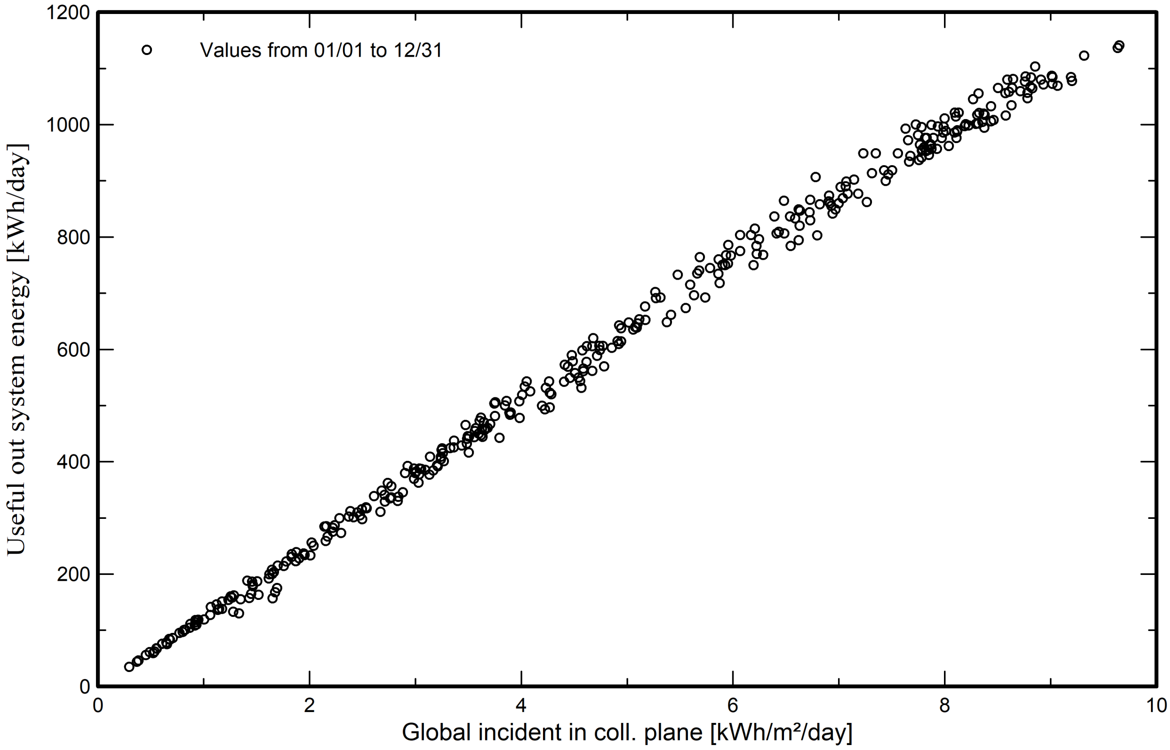
Loss diagram



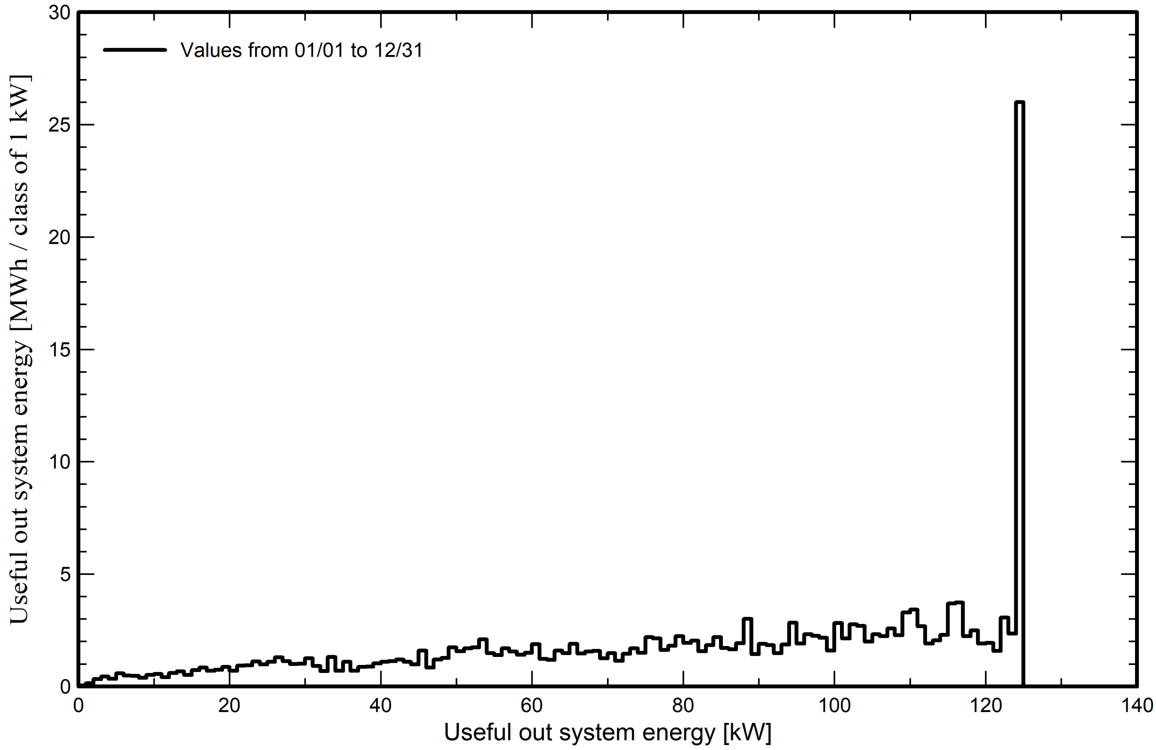
Global horizontal irradiation
Global incident in coll. plane
Far Shadings / Horizon
Near Shadings: irradiance loss
IAM factor on global
Soiling loss factor
Effective irradiation on collectors
PV conversion
Array nominal energy (at STC effic.)
PV loss due to irradiance level
PV loss due to temperature
Module quality loss
LID - Light induced degradation
Mismatch loss, modules and strings
Ohmic wiring loss
Array virtual energy at MPP
Inverter Loss during operation (efficiency)
Inverter Loss over nominal inv. power
Inverter Loss due to max. input current
Inverter Loss over nominal inv. voltage
Inverter Loss due to power threshold
Inverter Loss due to voltage threshold
Night consumption
Available Energy at Inverter Output
AC ohmic loss
Energy injected into grid

Predef. graphs

Daily Input/Output diagram



System Output Power Distribution



PVsyst V7.4.4
VCO, Simulation date:
05/01/24 15:08
with v7.4.4

Single-line diagram

PV module	CS6W-550MS 1500V
Inverter	Sunny Highpower SHP125-US-21-PEAK3
String	26 x CS6W-550MS 1500V

PVGIS	Tetra Tech Inc (United states)
VCO : No Export with BESS	05/01/24

APPENDIX F - POWER ENERGY AND PVSYST SIMULATION REPORT - MAXIMUM ARRAY SIZE SCENARIO.PDF

John Day Solar Plant

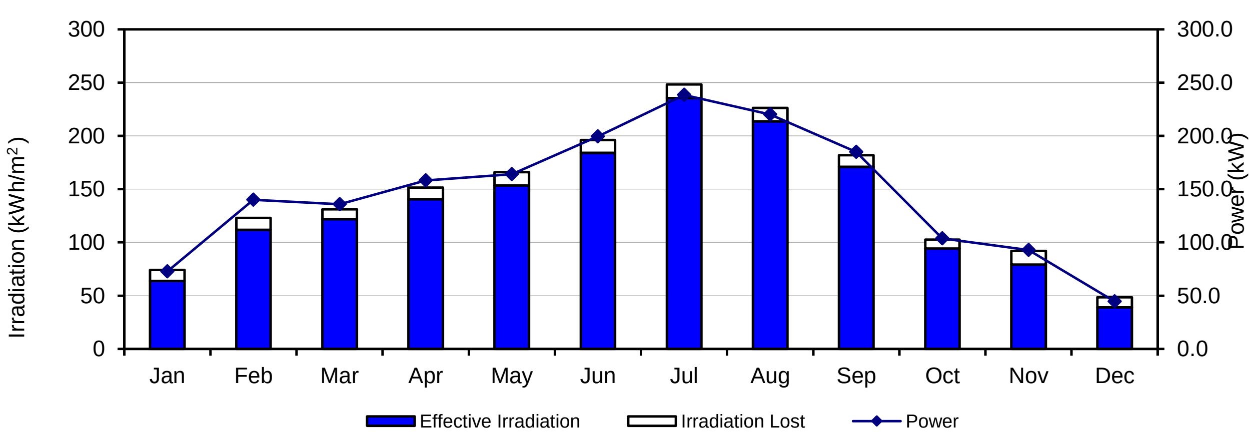
Maximum Array Size Fixed Tilt, 858 kWdc Capacity, 30 Units x 52 Modules, 6 Inverters

Solar Power and Energy Simulation Summary

Plant Capacity at STC:	858.0 kW_{dc}	750.0 kW_{ac}	Plant Characteristics				
Average Annual Energy Sold:	1,280,091 kWh			Qty	kW/Unit	kW
Capacity Factor:	17.0%	19.5%	Module Per String:	26	0.55	14.3
% of Horiz. Irradiation On Area:	10.72%		Strings Per Inverter:	10		143
			Inverters:	6	125	750
Project Latitude:	44.41 Deg		Total Number of Modules:	1,560	0.55	858
Extraterrestrial Irradiation:	2,696 $kWh/m^2/Yr$		Modules Per Support/Tracker Unit:	52	0.55	28.6
Yearly Horiz. Irradiation:	1,504 $kWh/m^2/Yr$		Supports/Trackers Units:	30	28.6	858
Average Clearness Index:	0.56		Total Plant Area:	0.794 ha		
			Total Module Area:	0.401 ha		
Simulation:	V01		Area Coverage:	51%		
Simulation Power Ratio:	1		Array Electrical Losses:	0.4%		
Tracking System:	Fixed Tilt		Inverter Losses:	2.2%		
Unit Tilt:	26 degrees		Interconnection Losses:	1.0%		
Unit Spacing:	9 m		Downtime Losses:	0.0%		
Shading Simulation:	None		Transmission Voltage:	0.48 kV		

	Horizontal Irradiation (kWh/m^2)	Incident Irradiation (kWh/m^2)	Ave. Amb. Temp. (˚C)	Shading Losses (%)	Effective Irradiation (kWh/m^2)	Module Power (kW_{dc})	Electrical Losses (%)	Plant Power (kW_{ac})	Capacity Factor (%)	Energy Sold (kWh)
Max	248	248	38.7	20%	235	952.16	5%	735.22	28%	177,383
Avg	125	145	6.7	9%	134	318.55	4%	146.13	17%	106,674
Min	28	49	-18.8	5%	39	0.93	3%	-0.03	5%	33,165
Jan	47	74	-1.6	14%	64	75.11	3.1%	72.75	8%	54,125
Feb	81	123	0.8	9%	112	145.01	3.5%	139.92	16%	94,026
Mar	107	131	1.8	7%	122	141.70	4.1%	135.86	16%	101,077
Apr	140	152	5.8	7%	141	166.16	4.8%	158.24	18%	113,934
May	167	166	8.8	7%	153	173.09	5.2%	164.06	19%	122,064
Jun	200	196	17.0	6%	184	208.68	4.5%	199.36	23%	143,540
Jul	248	248	25.6	5%	235	249.55	4.5%	238.42	28%	177,383
Aug	206	226	22.5	6%	214	229.21	4.0%	220.08	26%	163,742
Sep	148	182	18.5	6%	171	193.13	4.2%	184.98	22%	133,185
Oct	78	103	8.2	8%	94	107.01	3.2%	103.60	12%	77,079
Nov	55	92	0.9	14%	79	95.76	3.2%	92.74	11%	66,771
Dec	28	49	-2.8	20%	39	45.89	2.9%	44.58	5%	33,165

* Irradiation data for Typical Meteorological Years (TMY) with data from the National Solar Radiation Database (NSRDB)



John Day Solar Plant
Maximum Array Size Fixed Tilt, 858 kWdc Capacity, 30 Units x 52 Modules, 6 Inverters

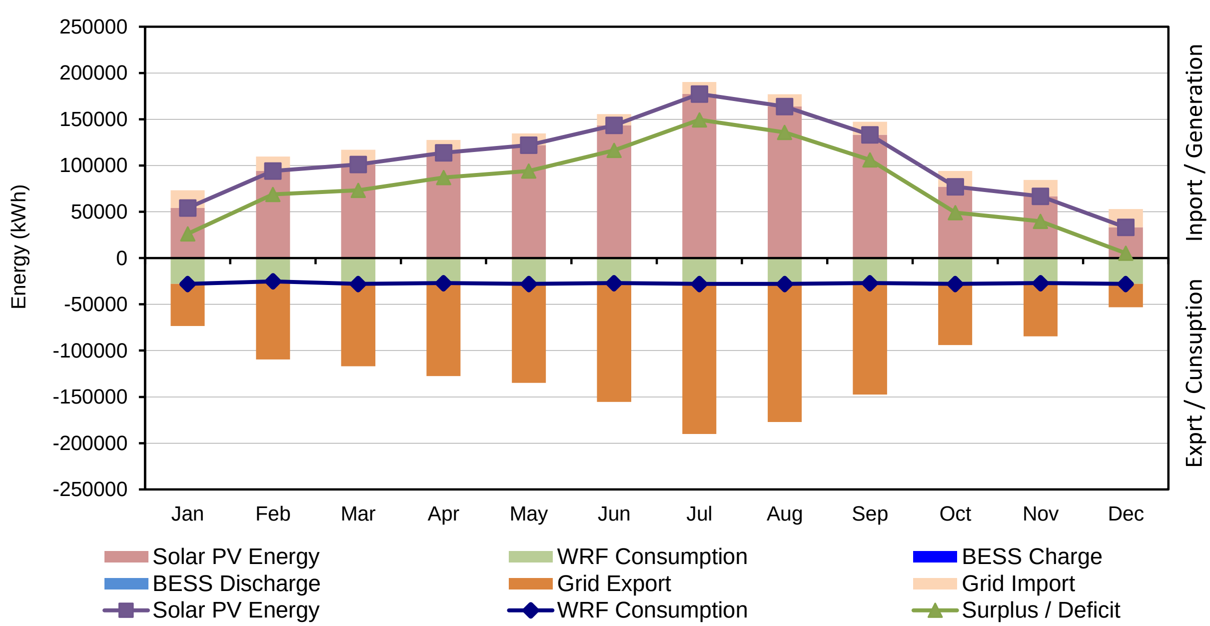
Power and Energy Scenarios

WRF Consuption	37.5	kWh
BESS Capacity	0	kWh
BESS Power	0	KWh
BESS C Rating	N/A	
BESS Efficiency	97%	(One direction)

Yearly Energy Summary (kWh)

Solar PV Energy	1,280,091	100%
WRF Consumption	-328,500	26%
BESS Total	0	0%
Grid Total	-951,591	74%
BESS Usage	N/A	

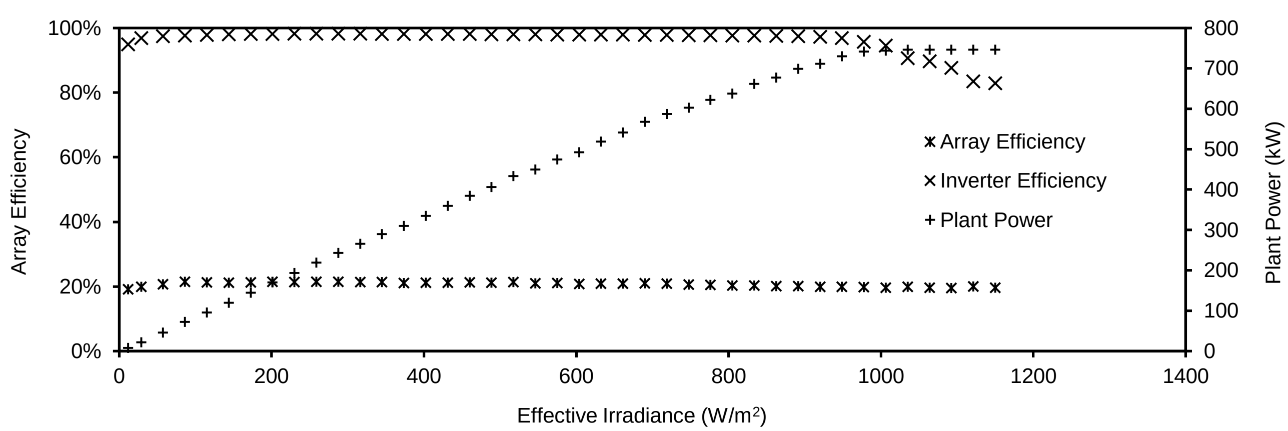
Month	Solar PV Energy (kWh)	WRF Consumption (kWh)	Surplus / Deficit (kWh)	BESS Charge (kWh)	BESS Discharge (kWh)	BESS Loss (kWh)	Grid Export (kWh)	Grid Import (kWh)
Jan	54,125	-27,900	26,225	0	0	0	-45,469	19,243
Feb	94,026	-25,200	68,826	0	0	0	-84,397	15,571
Mar	101,077	-27,900	73,177	0	0	0	-89,048	15,871
Apr	113,934	-27,000	86,934	0	0	0	-100,491	13,557
May	122,064	-27,900	94,164	0	0	0	-106,860	12,696
Jun	143,540	-27,000	116,540	0	0	0	-128,490	11,950
Jul	177,383	-27,900	149,483	0	0	0	-162,281	12,798
Aug	163,742	-27,900	135,842	0	0	0	-149,161	13,319
Sep	133,185	-27,000	106,185	0	0	0	-120,354	14,168
Oct	77,079	-27,900	49,179	0	0	0	-66,182	17,003
Nov	66,771	-27,000	39,771	0	0	0	-57,518	17,747
Dec	33,165	-27,900	5,265	0	0	0	-25,123	19,858
Total	1,280,091	-328,500	951,591	0	0	0	-1,135,373	183,782
Mth Min.	33,165	-27,900	5,265	0	0	0	-162,281	11,950
Yearly Ave.	106,674	-27,375	79,299	0	0	0	-94,614	15,315
Mth Max.	177,383	-25,200	149,483	0	0	0	-25,123	19,858



John Day Solar Plant
Maximum Array Size Fixed Tilt, 858 kWdc Capacity, 30 Units x 52 Modules, 6 Inverters

Performance Characteristics At Average Temperature

Percent Capacity	Effective Irradiation (W/m^2)	Module Efficiency (%)	Array Power (kW_{dc})	Electrical Loss (dc) (%)	Power to Inverter (kW_{dc})	Voltage To Inverter (V_{dc})	Current To Inverter (kA_{dc})	Inverter Efficiency (%)	Power to Substation (kW)	Sub/Line Loss (%)	Point of Sale (kW)
100%	1150	19.7%	906.1	0.7%	900.1	1094	701.2	82.9%	746.5	1.5%	735.2
97.5%	1121	20.0%	899.7	0.6%	893.9	1094	700.9	83.5%	746.5	1.5%	735.2
95.0%	1093	19.6%	856.8	0.6%	851.5	1071	716.6	87.7%	746.5	1.5%	735.2
92.5%	1064	19.6%	837.4	0.6%	832.2	1061	723.0	89.7%	746.5	1.5%	735.2
90.0%	1035	19.9%	827.7	0.6%	822.7	1068	718.5	90.7%	746.5	1.5%	735.2
87.5%	1006	19.6%	791.6	0.6%	787.1	1026	746.4	94.6%	744.6	1.5%	733.3
85.0%	978	19.9%	779.1	0.6%	774.7	1018	750.2	95.8%	742.0	1.5%	730.8
82.5%	949	19.9%	757.5	0.5%	753.4	1014	739.8	96.9%	730.3	1.5%	719.5
80.0%	920	19.9%	735.0	0.5%	731.1	1004	727.5	97.4%	711.8	1.4%	701.5
77.5%	891	20.2%	721.0	0.5%	717.3	1013	708.2	97.5%	699.7	1.4%	689.7
75.0%	863	20.2%	697.0	0.5%	693.6	1012	685.7	97.6%	677.2	1.4%	667.9
72.5%	834	20.4%	680.8	0.5%	677.6	1022	663.2	97.7%	661.8	1.3%	652.9
70.0%	805	20.3%	655.6	0.4%	652.6	1023	637.9	97.7%	637.8	1.3%	629.6
67.5%	776	20.6%	639.6	0.4%	636.8	1030	618.5	97.8%	622.7	1.3%	614.8
65.0%	748	20.7%	619.2	0.4%	616.7	1040	592.8	97.8%	603.3	1.2%	595.9
62.5%	719	20.9%	602.5	0.4%	600.1	1049	572.2	97.9%	587.3	1.2%	580.3
60.0%	690	21.1%	582.6	0.4%	580.5	1062	546.8	97.9%	568.4	1.2%	561.8
57.5%	661	20.9%	554.6	0.4%	552.6	1051	525.8	98.0%	541.4	1.1%	535.5
55.0%	633	21.0%	531.6	0.3%	529.8	1056	501.8	98.0%	519.2	1.1%	513.7
52.5%	604	20.8%	504.4	0.3%	502.8	1050	479.0	98.0%	492.9	1.0%	487.9
50.0%	575	21.1%	486.2	0.3%	484.7	1064	455.7	98.0%	475.2	1.0%	470.6
47.5%	546	21.0%	460.4	0.3%	459.0	1061	432.6	98.1%	450.2	0.9%	446.1
45.0%	518	21.4%	443.7	0.3%	442.5	1082	408.8	98.1%	434.0	0.9%	430.1
42.5%	489	21.2%	415.2	0.3%	414.1	1069	387.6	98.1%	406.3	0.8%	403.0
40.0%	460	21.3%	392.9	0.2%	391.9	1076	364.4	98.1%	384.6	0.8%	381.6
37.5%	431	21.2%	367.3	0.2%	366.5	1073	341.5	98.2%	359.8	0.7%	357.1
35.0%	402	21.2%	342.4	0.2%	341.7	1074	318.3	98.2%	335.5	0.7%	333.2
32.5%	374	21.1%	316.6	0.2%	316.0	1069	295.6	98.2%	310.4	0.6%	308.4
30.0%	345	21.4%	295.7	0.2%	295.1	1083	272.5	98.2%	289.9	0.6%	288.2
27.5%	316	21.4%	271.5	0.2%	271.1	1087	249.4	98.3%	266.4	0.5%	264.9
25.0%	287	21.5%	248.0	0.2%	247.6	1091	227.1	98.3%	243.4	0.5%	242.2
22.5%	259	21.5%	223.2	0.1%	222.9	1092	204.1	98.3%	219.1	0.4%	218.2
20.0%	230	21.4%	197.5	0.1%	197.3	1085	181.8	98.3%	193.9	0.4%	193.1
17.5%	201	21.5%	173.7	0.1%	173.5	1090	159.2	98.2%	170.4	0.3%	169.8
15.0%	172	21.3%	147.4	0.1%	147.2	1078	136.6	98.2%	144.6	0.3%	144.1
12.5%	144	21.2%	122.4	0.1%	122.3	1077	113.6	98.1%	120.0	0.2%	119.7
10.0%	115	21.3%	98.2	0.1%	98.1	1082	90.6	97.9%	96.1	0.2%	95.9
7.5%	86	21.5%	74.2	0.0%	74.2	1091	68.0	97.7%	72.5	0.1%	72.4
5.0%	57	20.7%	47.8	0.0%	47.8	1065	44.9	97.5%	46.6	0.1%	46.6
2.5%	29	19.9%	23.0	0.0%	23.0	1036	22.2	97.0%	22.3	0.0%	22.3
1.0%	12	19.2%	8.9	0.0%	8.9	1029	8.6	95.0%	8.4	0.0%	8.4



John Day Solar Plant

Maximum Array Size Fixed Tilt, 858 kWdc Capacity, 30 Units x 52 Modules, 6 Inverters

Collector and Inverter Electrical System

Photovoltaic Modules and Inverters

Photovoltaic Module Characteristics at STC			Inverter Characteristics		
Manufacturer:	Canadian Solar		Manufacturer:	SMA	
Model:	CS6W-550MS		Model:	PEAK3 125-US	
Nominal Power at STC (P_{mpp}):	550	Watts	Max DC input Power:	250	kWatts
Module Efficiency:	21.5%		Max Open Circuit Input Voltage:	1500	V_{dc}
Max Power Voltage at STC (V_{mpp}):	41.7	V_{dc}	Min Start Input Voltage:	684	V_{dc}
Open Circuit Voltage (V_{oc}):	49.6	V_{dc}	Min Tracking Input Voltage:	705	V_{dc}
Max System (String) Voltage:	1500	V_{dc}	Max Tracking Input Voltage:	1450	V_{dc}
Max Power Current (I_{mpp}):	13.20	A_{dc}	Max Input Current:	180	A_{dc}
Short Circuit Current (I_{sc}):	14.00	A_{dc}	Max AC Output Power:	125	kWatts
Max String Current (Fuse Rating):	25.00	A_{dc}	Nominal AC Output Voltage:	480	V_{ac}
Power Temp. Coef. (P_{max}):	-0.34%	% / °C	Max AC Output Current:	151.00	A_{rms}
Voltage Temp. Coef. (V_{oc}):	-0.26%	% / °C	Inverter Efficiency:	98.5%	
Current Temp. Coef. (I_{sc}):	0.050%	% / °C	Cost per Inverter:	$9,900	
Module Area:	2.57	m^2			
Cost per Module:	$150	CPL Estimated			

Array String Sizing

Solar Rad. Absorb. Coef. (α):	0.90		
Thermal Loss Factor (U):	32	$W / m^2 K$	(15 to 30 $W / m^2 K$ for insulated to free-standing arrays)
Min Starting Irrad. (W/m^2):	100	W/m^2	
Module Per String:	26		
Strings Per Inverter:	10		

Conditions:	Ext. Cold	Min. Oper.	STC	NOCT	Max Oper.	Ext. Hot
Max Daily Panel Irrad. (W/m^2):	600	800	1000	1000	1000	1000
Air Temp.(°C):	-35	-20	-3	20	25	40
Max Oper. Panel Temp. (°C):	-22	-3	25	42	47	62
Min Start Panel Temp. (°C):	-32	-17	0	23	28	43
Max Panel Oper. Volt (V_{mpp}, V_{dc}):	46.8	44.7	41.7	39.9	39.3	37.7
Max String Oper. Volt (V_{mpp}, V_{dc}):	1216	1162	1084	1037	1023	980
Max String Oper. Current (I_{mpp}, A_{dc}):	12.89	13.02	13.20	13.31	13.34	13.44
Max Inverter Oper. Current (I_{mpp}, A_{dc}):	129	130	132	133	133	134
Max Panel Oper. Power(P_{mpp}, W):	638	602	550	519	509	481
Max String Oper. Power(P_{mpp}, kW):	16.6	15.6	14.3	13.5	13.2	12.5
Max Inverter Oper. Power(P_{mpp}, kW):	166	156	143	135	132	125
Array / Inverter Power Ratio:	66%	63%	57%	54%	53%	50%
Panel Open Circuit Volt (V_{oc}, V_{dc}):	57.0	55.0	52.9	49.9	49.2	47.3
String Open Circuit Volt (V_{oc}, V_{dc}):	1481	1431	1375	1297	1280	1230
String Short Circuit Current (I_{sc}, A_{dc}):	13.67	13.81	14.00	14.12	14.15	14.26

Notes:

1 - Nominal Operating Cell Temperature (NOCT) are at 20°C air temperature, 1 m/s wind speed, 800 W/m2, 1.5 air mass (AM) spectrum. Exact wind speed effect is difficult to evaluate and is considered included in the thermal loss factor (U).

2 - Standard Test Conditions (STC) are 25°C cell temperature, 1000 W/m^2, 1.5 air mass (AM) spectrum, which corresponds to clear day irradiance on 37° Tilted surface with sun at 42° above horizon.

John Day Solar Plant
Maximum Array Size Fixed Tilt, 858 kWdc Capacity, 30 Units x 52 Modules, 6 Inverters

Electrical and Transmission Line Data and Losses

Array Electrical Losses

	Number Per Inv.	Average Length (m)	Maximum Current 1.25 I_{sc} (A)	Wire Size (kcmil)	Conductor Resistance (Ω/km)	Conductor Resistance (Ω)	Power Loss (W)	Power Loss (%)
String Wiring	10	40	13.2	10	3.390	0.136	47.3	0.33%
DC Comb. Box to Inv.	1	10	132	4	0.795	0.008	277.0	0.19%
Inv. to AC Comb. Box	0.16667	50	151	4/0	0.197	0.010	673.8	0.54%
Total Array Loss								**1.06%**

* Array electrical losses are calculated here only for reference. Actual DC losses are calculated directly in PVSyst.

Transmission Line (AC Combiner Box to POC)

Input Data

Line Voltage	0.480	kV
Conductor Name	Kcmil 1750	
Wire Size	1750.0	kcmil
Resistance (per phase)	0.0190	Ω/km
Length	0.2	km
Plant Capacity	750.00	kW
Power Factor	0.90	cos ϕ

Calculations

Current per Phase	1002.3	A
Resistance per Phase	0.00	Ω
Loss per Phase	3.81	kW
Total Tx Loss	11.42	kW
Total Tx Loss	**1.52%**	
Percent of Plant Capacity	**2.59%**	
Loss Factor	0.000034	

Conductor Resistance Table for DC use

Material	Gauge	Area (kcmil)	Resistance Ω/km	Ampacity 60°C (A)
Cu	12	6.53	5.090	55
Cu	10	26.3	3.390	70
Cu	8	104.5	1.950	98
Cu	6	133.0	1.240	132
Cu	4	166.1	0.795	176
Cu	2	210.4	0.565	218
Cu	1	250	0.393	276
Cu	2/0	350	0.277	347
Cu	3/0	500	0.210	416
Cu	4/0	750	0.164	488

Conductor Resistance Table for AC use

Material	Name	Size kcmil	Resistance Ω/km	Ampacity 90°C (A)
Al	Partridge	266.8	0.2136	
Al	Tulip	336.4	0.1693	
Al	Cosmos	477.0	0.1194	
Al	Orchid	636.0	0.0896	
Al	2/0	133.0	0.3250	230
Al	3/0	166.1	0.2230	261
Al	4/0	210.4	0.1970	298
Al	Kcmil 250	250.0	0.1388	324
Al	Kcmil 350	350.0	0.0990	390
Al	Kcmil 500	500.0	0.0694	473
Al	Kcmil 750	750.0	0.0463	586
Al	Kcmil 100C	1000.0	0.0347	677
Cu	Kcmil 175C	1750.0	0.0190	1017

John Day Solar Plant
Maximum Array Size Fixed Tilt, 858 kWdc Capacity, 30 Units x 52 Modules, 6 Inverters

Capatial Cost (AACE Class 5)

	Capital Cost	Quantity		Unit Cost	Total*	% of Total	
Siteworks	Siteworks - Mob / Demob, Etc.	1	LS	$8,000	$8,000		BOP Direct Costs (DC)
	Clearing / Site prep	0.79	ha	$15,000	$12,000		
	Access Roads - New	0	km	$64,000	$0		
	Access Roads - Upgrade	0	km	$47,000	$0	2%	
	Onsite Roads	0	km	$50,000	$0		
	Office and Laydown Area / Rehab	0	ha	$80,000	$0		
	Granular Material - supply / Haul	0	m^2				
Mounting Sys	Mount. Structure - Pile Supply	258	EA	$30	$8,000		
	Mount. Structure - Pile Install	258	EA	$30	$8,000	6%	
	Mount. Structure - Raking Supply	885	m	$30	$27,000		
	Mount. Structure - Raking Install	885	m	$10	$9,000		
PV Array	Inst. - Mob / Demob, Etc.	1	LS	$4,000	$4,000		
	PV Panel: CS6W-550MS, (CAD)	1560	EA	$150	$234,000		
	PV Panel Installation	1560	EA	$15	$23,000	33%	
	DC Cable	2.4	km	$2,000	$5,000		
	DC Combiner Boxes	6	EA	$3,000	$18,000		
Inverter Side	Inverter: PEAK3 125-US (CAD)	6	EA	$9,900	$59,000		
	Inverter Installation	6	EA	$200	$1,000	11%	
	AC Cables	0.5	km	$69,900	$35,000		
	AC Combiner Boxes	1	EA	$2,900	$3,000		
BoS Com	Security (Fence)	400	m	$110	$44,000		
	Comm. and Monitoring incl. installation	1	EA	$7,300	$7,000	6%	
	Grounding	400	m	$10	$4,000		
BESS	Battery Units	0	kWh	$300	$0		
	Battery Management System (BMS)	1	EA	$0	$0	0%	
	Power Conversion System (PCS)	1	EA	$0	$0		
	BESS Housing and Cooling Systems	1	EA	$0	$0		
Interconn.	Interconnection / Metering	1	EA	$1,800	$2,000		
	Padmount Transformers	0	Xformers	$11,000	$0	1%	
	Protection (Breaker, Disconnect)	1	EA	$3,700	$4,000		
Commissioning	DC side commissioning (Polarity, Uov, Isc, IV curve, etc.)	1	EA	$5,000	$5,000		
	Inverters Commissioning	1	EA	$3,000	$3,000	2%	
	AC cables commissioning	1	EA	$3,500	$4,000		
	Comm. system commissioning	1	EA	$1,400	$1,000		
	BESS commissioning	1	EA	$0	$0		
Const.	Control / Electrical Building and Yard	0	LS	$0	$0		
	Construction Site Services	1.5%	Above BOP I	$528,000	$8,000	1%	
	End of Life	0%	Above BOP I	$536,000	$0	0%	
Owners, Eng, PM	PM and Engineering	15%	BOP DC	$536,000	$80,000	9%	Soft Costs
	Construction Mgmt	10%	BOP DC	$536,000	$54,000	6%	
	Owners Costs	2%	BOP DC	$536,000	$11,000	1%	
	Contingency on BOP	30%	BOP DC	$536,000	$161,000	19%	
	Escalation on BOP (1.5%/Yr)	3.0%	BOP DC	$536,000	$16,000	2%	
	Total Capital Cost (CC)	858	kWdc	$1,000	$858,000	100%	

* Extended total costs are rounded to the nearest thousand dollars.

Version 7.4.4

PVsyst - Simulation report

Grid-Connected System

Project: PVGIS

Variant: Maximum Array Size

Sheds, single array

System power: 858 kWp

John Day - United States

Author

Tetra Tech Inc (United states)

Project summary

Geographical Site
John Day
United States

Situation

Latitude	44.41 °N
Longitude	-118.94 °W
Altitude	1032 m
Time zone	UTC-8

Project settings
Albedo 0.20

Meteo data
John Day
PVGIS TMY 5.2 - Synthetic

System summary

Grid-Connected System

Sheds, single array

PV Field Orientation
Fixed plane
Tilt/Azimuth 26 / 0 °

Near Shadings
Linear shadings : Fast (table)

User's needs
Unlimited load (grid)

System information

PV Array

Nb. of modules	1560 units
Pnom total	858 kWp

Inverters

Nb. of units	6 units
Pnom total	750 kWac
Pnom ratio	1.144

Results summary

Produced Energy	1293182 kWh/year	Specific production	1507 kWh/kWp/year	Perf. Ratio PR	86.54 %

Table of contents

General parameters

Grid-Connected System — **Sheds, single array**

PV Field Orientation

Orientation

Fixed plane
Tilt/Azimuth 26 / 0 °

Sheds configuration

Nb. of sheds 13 units
Single array

Sizes

Sheds spacing 9.00 m
Collector width 4.54 m
Ground Cov. Ratio (GCR) 50.5 %
Top inactive band 0.02 m
Bottom inactive band 0.02 m

Shading limit angle

Limit profile angle 22.2 °

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Horizon

Average Height 6.4 °

Near Shadings

Linear shadings : Fast (table)

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer	CSI Solar
Model	CS6W-550MS 1500V
(Original PVsyst database)	
Unit Nom. Power	550 Wp
Number of PV modules	1560 units
Nominal (STC)	858 kWp
Modules	60 string x 26 In series
At operating cond. (50°C)	
Pmpp	786 kWp
U mpp	977 V
I mpp	804 A

Inverter

Manufacturer	SMA
Model	Sunny Highpower SHP125-US-21-PEAK3
(Original PVsyst database)	
Unit Nom. Power	125 kWac
Number of inverters	6 units
Total power	750 kWac
Operating voltage	684-1500 V
Pnom ratio (DC:AC)	1.14

Total PV power

Nominal (STC)	858 kWp
Total	1560 modules
Module area	4000 m²

Total inverter power

Total power	750 kWac
Number of inverters	6 units
Pnom ratio	1.14

Array losses

Array Soiling Losses

Loss Fraction 2.0 %

Thermal Loss factor

Module temperature according to irradiance
Uc (const) 32.4 W/m²K
Uv (wind) 1.4 W/m²K/m/s

DC wiring losses

Global array res. 7.2 mΩ
Loss Fraction 0.5 % at STC

LID - Light Induced Degradation

Loss Fraction 1.1 %

Module Quality Loss

Loss Fraction -0.5 %

Module mismatch losses

Loss Fraction 1.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.2 %

IAM loss factor

Incidence effect (IAM): User defined profile

10°	20°	30°	40°	50°	60°	70°	80°	90°
0.998	0.998	0.995	0.992	0.986	0.970	0.917	0.763	0.000

AC wiring losses

Inv. output line up to injection point

Inverter voltage	480 Vac tri
Loss Fraction	0.52 % at STC
Inverter: Sunny Highpower SHP125-US-21-PEAK3	
Wire section (6 Inv.)	Alu 6 x 3 x 185 mm²
Average wires length	50 m

Horizon definition

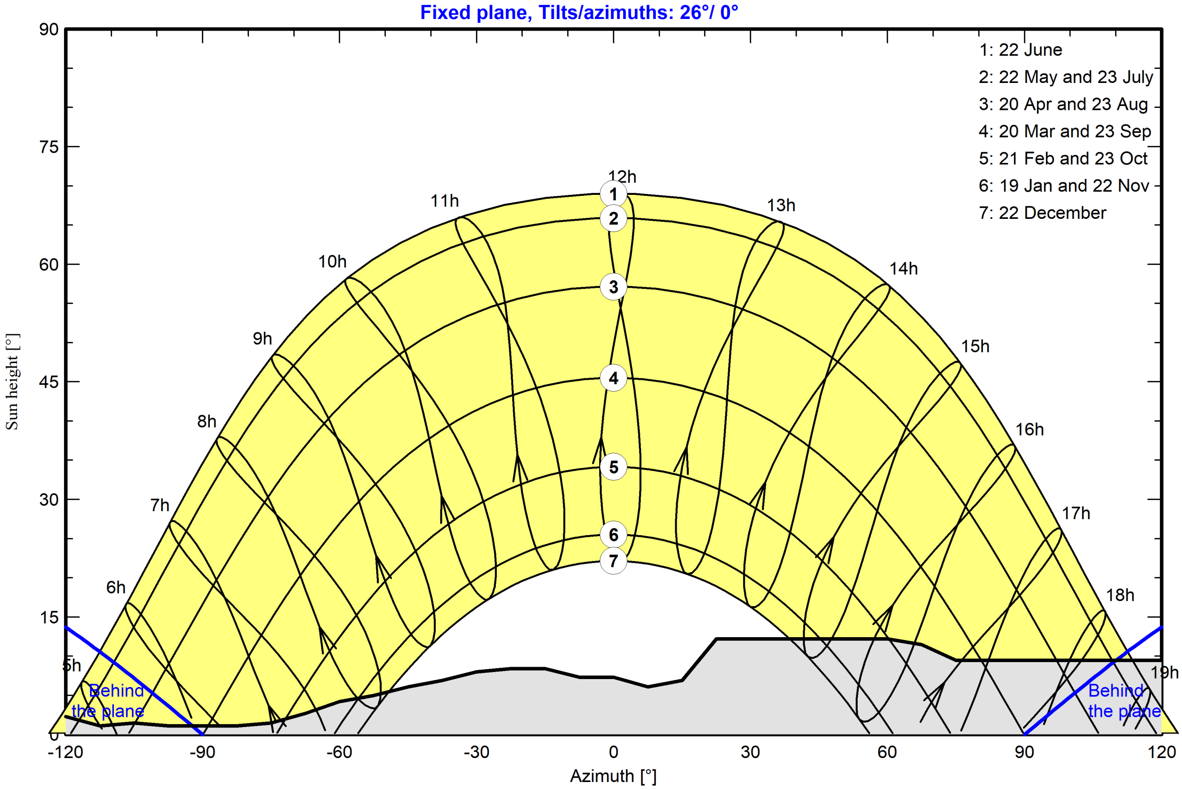
Horizon from PVGIS website API, Lat=44°24'44", Long=-118°56'9", Alt=1032m

Average Height	6.4 °	Albedo Factor	0.58
Diffuse Factor	0.95	Albedo Fraction	100 %

Horizon profile

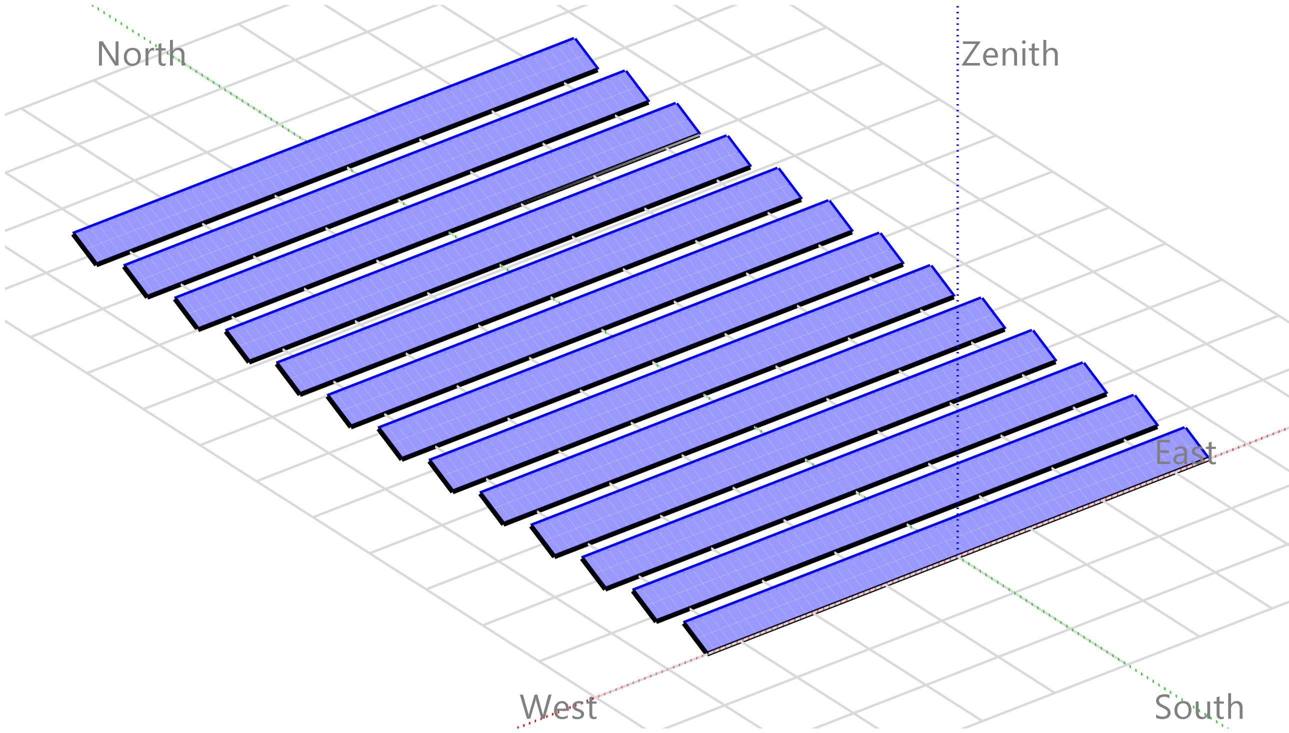
Azimuth [°]	-180	-173	-158	-150	-143	-135	-128	-120	-113	-105	-98	-83
Height [°]	3.4	3.1	3.8	3.4	4.2	4.6	4.2	2.3	1.1	1.5	1.1	1.1
Azimuth [°]	-75	-68	-60	-53	-45	-38	-30	-23	-15	-8	0	8
Height [°]	1.5	2.7	4.2	5.0	6.1	6.9	8.0	8.4	8.4	7.3	7.3	6.1
Azimuth [°]	15	23	60	68	75	143	150	158	173	180		
Height [°]	6.9	12.2	12.2	11.5	9.5	9.5	1.9	2.3	3.4	3.4		

Sun Paths (Height / Azimuth diagram)



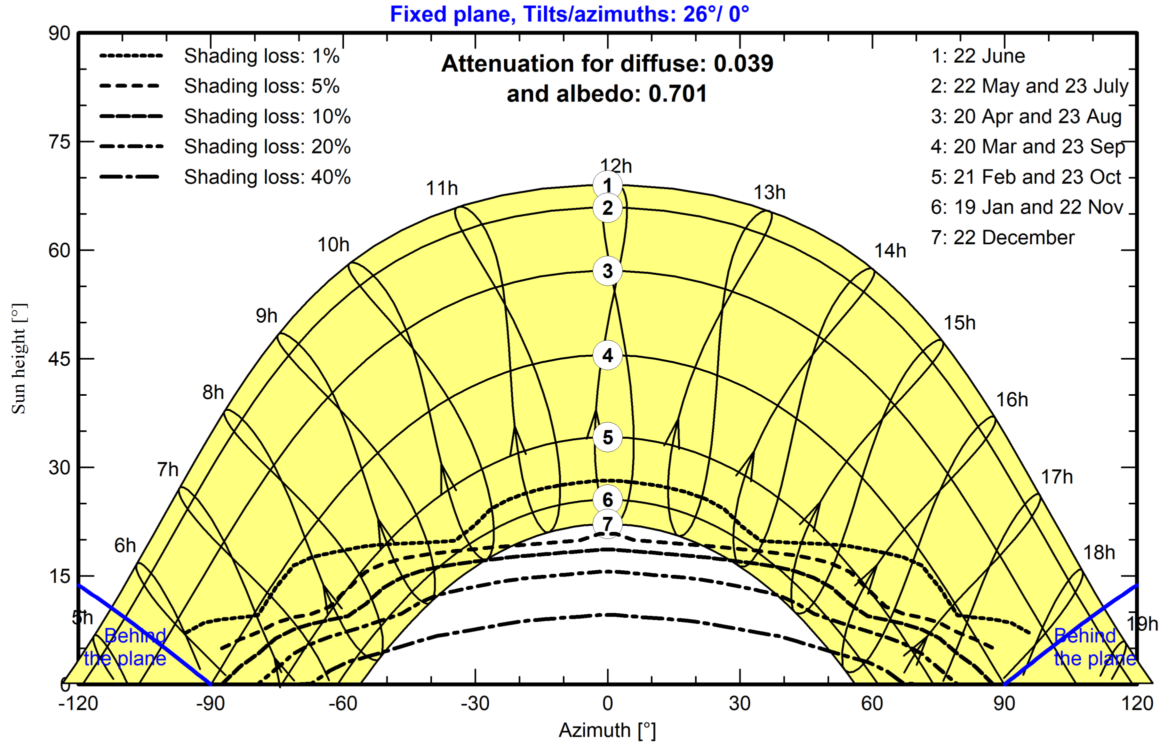
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

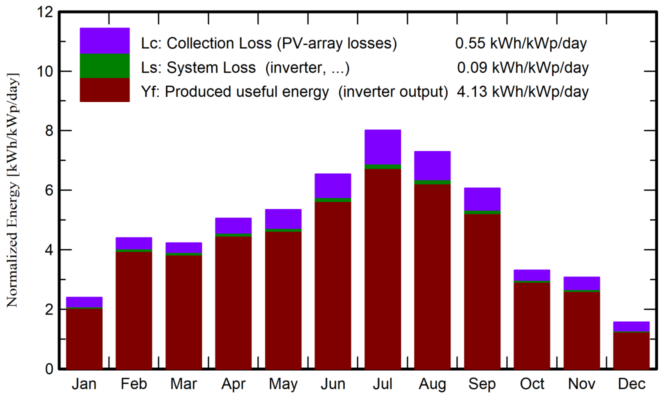


Main results

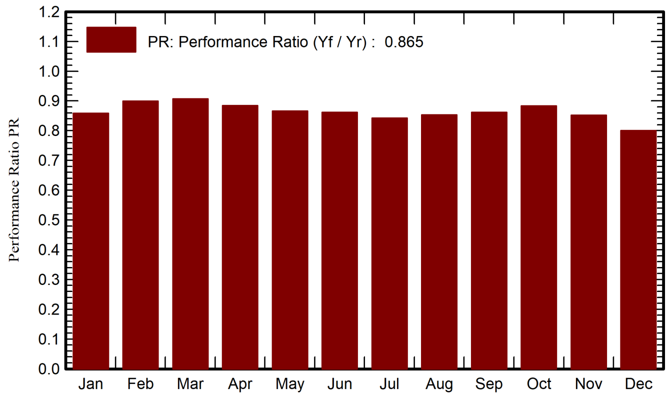
System Production

Produced Energy	1293182 kWh/year	Specific production	1507 kWh/kWp/year
		Perf. Ratio PR	86.54 %

Normalized productions (per installed kWp)



Performance Ratio PR



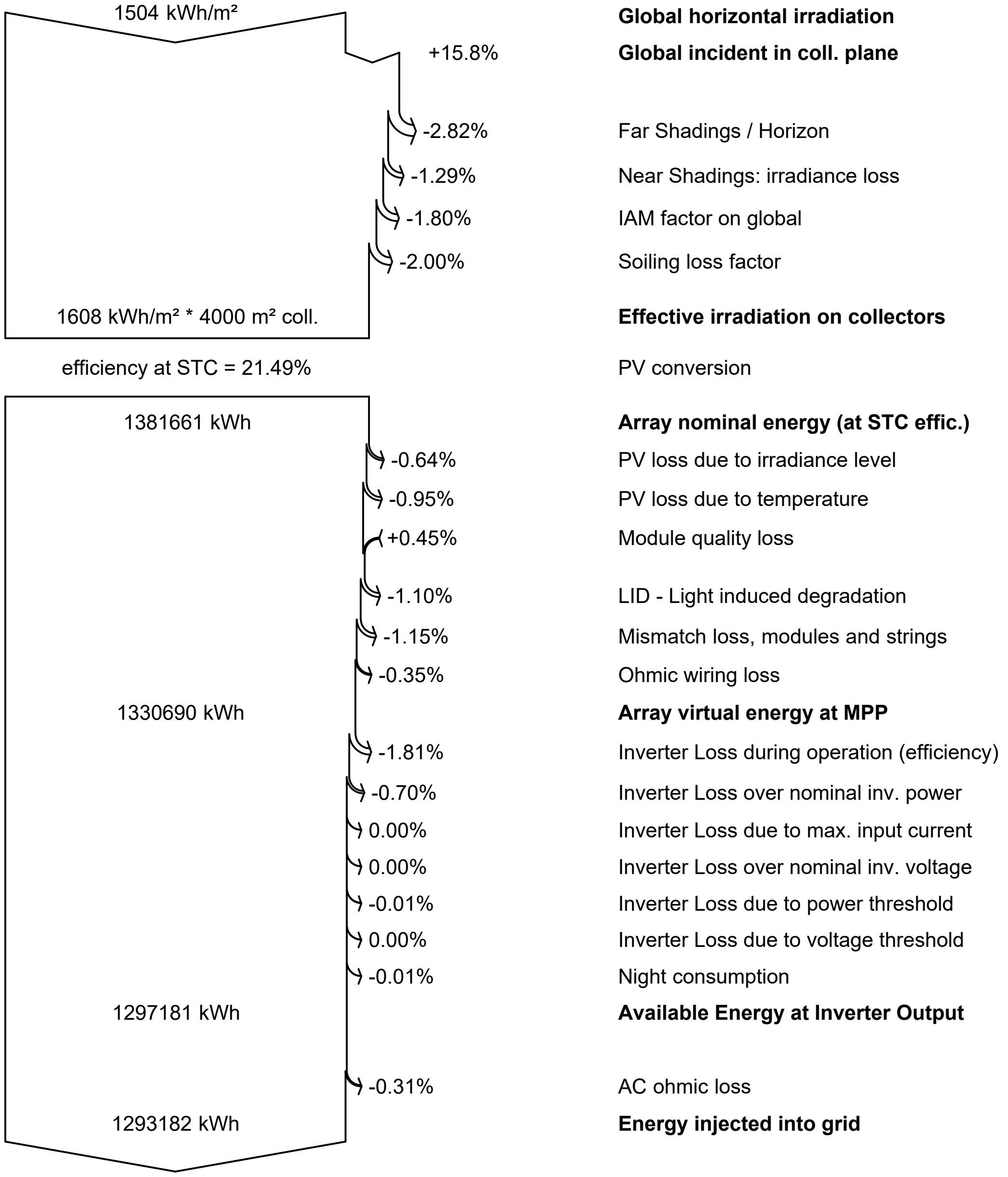
Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	46.6	23.10	-3.20	74.1	63.8	55745	54577	0.858
February	81.4	27.80	-1.00	123.0	111.8	97069	94992	0.900
March	107.0	52.10	-0.38	131.1	121.8	104290	102062	0.907
April	139.7	72.10	3.77	151.6	140.6	117642	115086	0.885
May	166.8	90.80	7.12	165.8	153.5	125981	123270	0.866
June	200.0	73.80	15.02	196.2	184.0	148279	145068	0.862
July	247.6	50.40	23.22	248.4	235.4	183456	179461	0.842
August	205.5	52.70	19.77	226.3	213.8	169299	165618	0.853
September	147.9	45.80	15.70	182.0	170.9	137539	134616	0.862
October	78.1	38.60	5.57	102.6	94.2	79383	77751	0.884
November	54.7	20.10	-1.02	92.1	79.1	68774	67335	0.853
December	28.4	15.00	-4.36	48.6	38.9	34091	33346	0.800
Year	1503.7	562.29	6.73	1741.6	1607.7	1321547	1293182	0.865

Legends

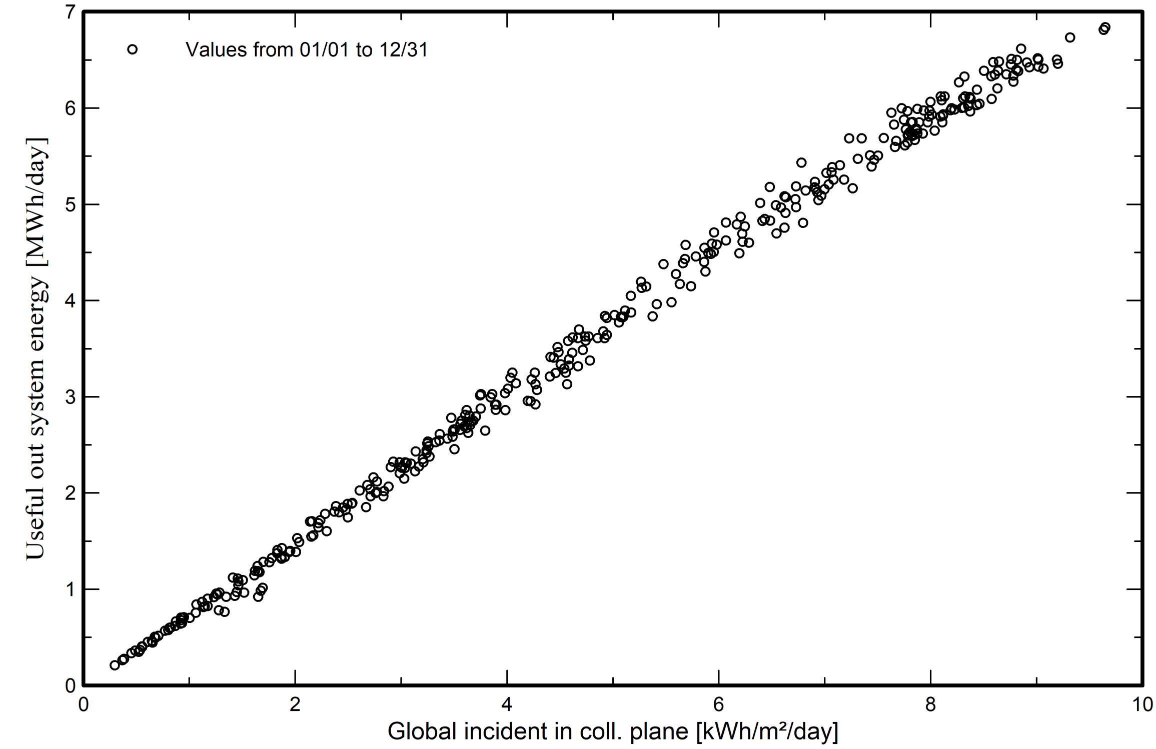
GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane		
GlobEff	Effective Global, corr. for IAM and shadings		

Loss diagram

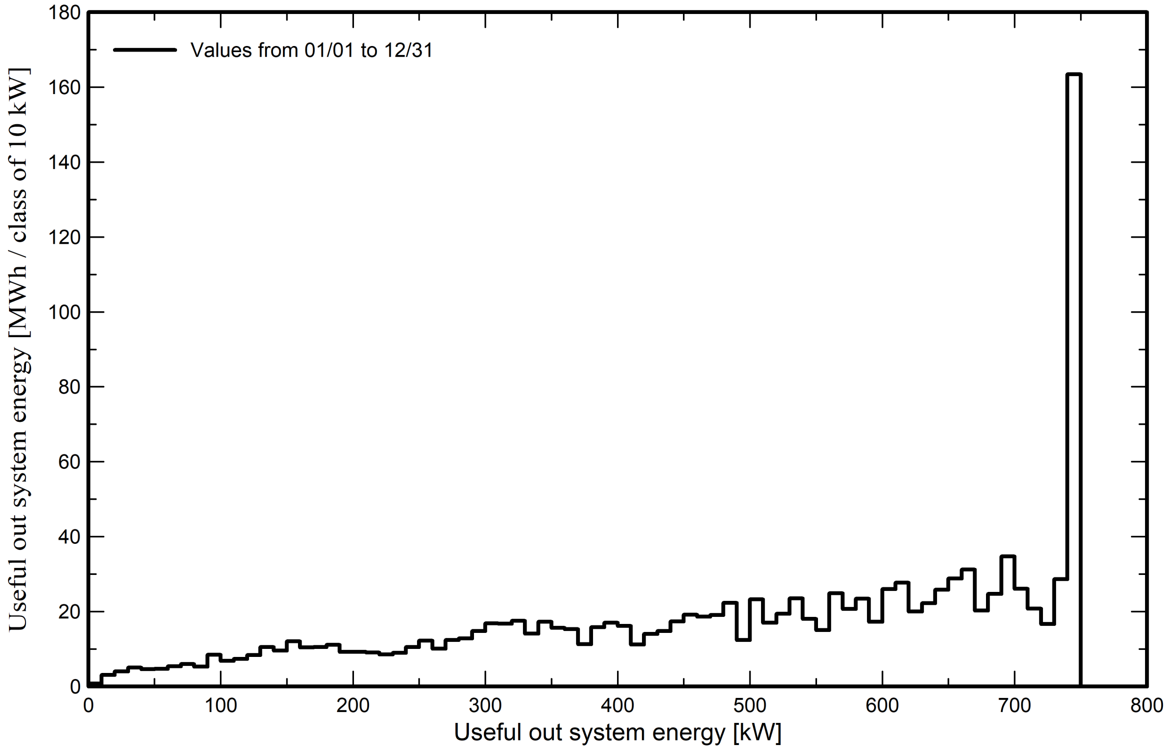


Predef. graphs

Daily Input/Output diagram

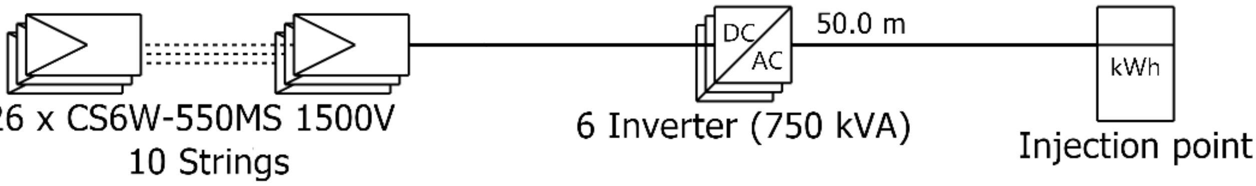


System Output Power Distribution



Single-line diagram

PVsyst V7.4.4
VCR, Simulation date:
05/01/24 15:09
with v7.4.4



PV module	CS6W-550MS 1500V
Inverter	Sunny Highpower SHP125-US-21-PEAK3
String	26 x CS6W-550MS 1500V

	PVGIS	Tetra Tech Inc (United states)
	VCR : Maximum Array Size	05/01/24

Appendix B

Technical Memorandum – Pump Storage Hydro Option

TETRA TECH

Technical Memorandum

Date:	2024-05-03
To:	Casey Meyers – Public Works Director
Cc:	Tom Wilcox, PE – Project Manager
From:	Mohammad Mohammadi, EIT (AB, Canada) - Hydrotechnical Remi Sasseville, PE (AB, Canada) - Project Engineer
Project:	John Day Renewable Energy — ***Project Number:*** 200-654565-24003
Subject:	Pump Storage Hydro Option Assessment

1. Introduction

The City of John Day (City) received a grant from the Oregon Department of Energy (ODOE) under the Community Renewable Energy Grant Program. The purpose of the grant is to develop a community planning document that outlines renewable energy and energy resilience for the City as developed in the Innovation Gateway Area Plan (2019). This grant is in support of nearly two-decades of process embarked by the City to construct a new Wastewater Reclamation Center (WRC) and community redevelopment that sets the standard for renewable, sustainable, and resilient power.

From the ODOE grant application, the planning document must: determine the extent of a Solar Power Plant (SPP) that meets the daily operation energy demand of the new WRC and determine the energy storage potential utilizing inline Pump Storage Hydro (PSH) with an impoundment of reclaimed water to an elevation of about 800'. This technical memo provides a conceptual design of the PSH with the operation assessment for four (4) reclaimed water demand flow options as follows:

1. Option 1 Low Demand within the City: Current water demand within the City (low demand).
2. Option 2 Yearly Supply and Demand Balance: Yearly balance of water demand with the WRC supply.
3. Option 3 Supply and Demand Balance: Daily water balance with the WRC supply.
4. Option 4 High Demand (All Reused): Future water demand (All reused demand).

2. Background

A City-owned SPP that provides energy to the new WRC is the result of years of collaboration between the City, the local energy provider, Oregon Trail Electric Cooperative [OTEC], and conversations with residents. The City and OTEC decided the SPP was the most feasible method to provide energy at no cost (or offset part of the energy) to run the WRC. The SPP will provide renewable energy to power the WRC, either in part or in totality over the year, and possibly even more, pending the final array size. The feasibility of storing wastewater to a high elevation reservoir via the PSH using the surplus of energy from SPP was also explored with the intent of balancing out the wastewater supply and demand while generating renewable energy. The excess energy not used by the SPP and/or

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the PSH that will be returned to the OTEC grid will reduce the energy bills of low-income residents within the City. A Battery Energy Storage System (BESS) was to be reviewed as an optional component to be added based upon feasibility results. The energy stored using either a BESS and/or the PSH would be used to power the treatment plant operation or other future electrical demands such as electric fleet vehicles or public charging stations.

Per the current design, secondary treated wastewater is injected into groundwater aquifers as the final method of disposal when there is little demand. However the new WRC will provide clean water for the environment which can be used as low-cost water supply input for commercial and agricultural uses, including controlled environment agriculture, wood products, and more. The innovative re-use of reclamation water is already moving forward in the City with the design of a piping system, the Purple pipe, to distribute the water within the City to improve access to the water resource for residents and businesses.

The City has already catalyzed a controlled environment agriculture business that will draw on the reclaimed water, and is courting firms that work in highly innovative industries, such as 3D printed housing, autonomous vehicles, wood product manufacturing, pharmaceuticals and more. The City also has laid the groundwork to provide reclaimed water to key employers, including Malheur Lumber, in preparing for this project. Per the City's 2015 Water Conservation and Management Plan, roughly 3.5% of the approximately 100 to 120 million gallons of potable water currently produced annually is put to industrial and other uses not intended for direct human consumption. Reclaimed water could replace the potable water consumption of these users by a portion of the estimated 28%, thereby providing more water for residents and the environment. Furthermore, according to the Sustainable Water Facility Report, (2018), reclaimed water demand could be equal to or greater than the current water treatment system capacity, upwards of 140 million gallons per year, compared to the 100 to 120 MG. Any excess reclaimed effluent (water) will be returned to the environment through percolation ponds.

The proposed PSH would redirect 270,000 gallons per day of tertiary treated wastewater from the new WRC first to an equalization tank, and then to the surface impoundment at an elevation of approximately 800 to 1,000 feet above the WRC. The impoundment could potentially hold 120 million gallons which could be returned to the equalization tank and be available during the summer for agricultural irrigation and livestock needs and industrial reclaimed water uses.

Over the course of the past few years, the City has experienced significant staff turnover. The new City manager, who started at the beginning of January 2024, is not aware of past involvement of staff on the project. As a result, Tetra Tech had little to no interaction with City staff to coordinate and get clear directions to complete this renewable assessment. Tetra Tech moved forward with its understanding of the renewable energy assessment and the information in the planning document required by the ODOE grant application.

3. DESIGN BASIS AND OPTIONS

3.1 DESIGN BASIS

The Wastewater Reuse / Facility Plan Update Working Session presentation, 2018, provided the profiles of the wastewater monthly resource from the WRC, and two profiles of water demands: Reuse Demands Within John Day and All Reuse Demands. Figure 1 and Figure 2 show these profiles for each month in gallons per day. These profiles were used as the flow inputs for the PSH modeling.

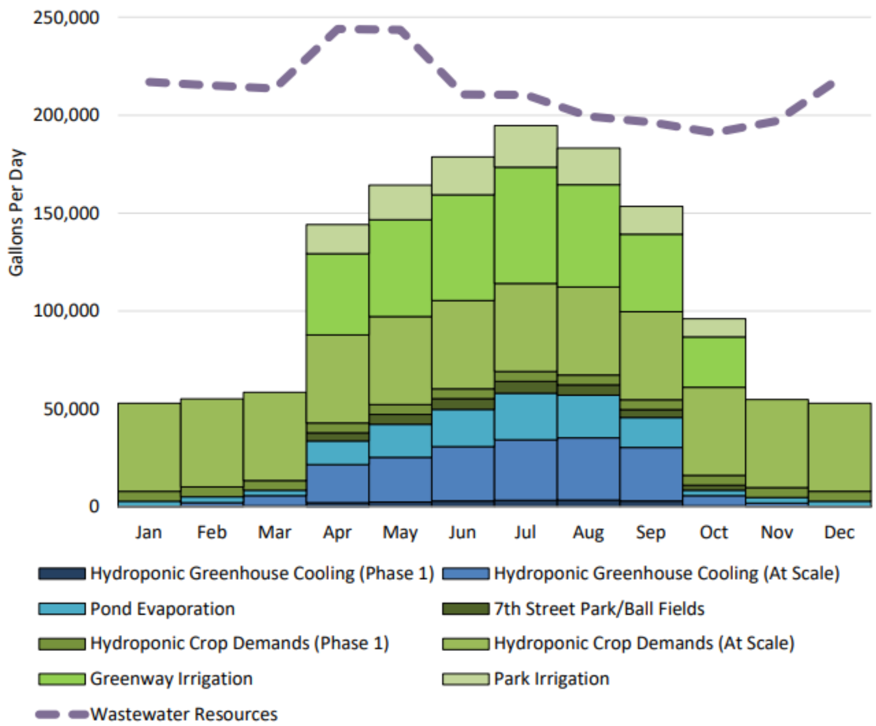

Figure 1: WRC resource and 'Reuse Demands Within John Day'

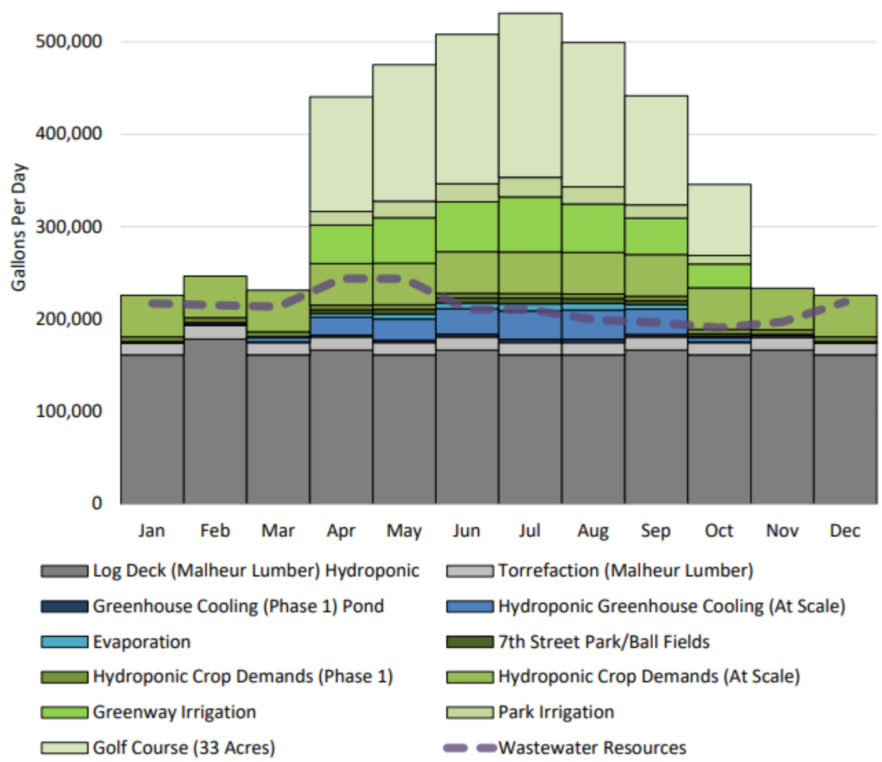

Figure 2: WRC resource and 'All Reuse Demands'

The design of the PSH uses the following design criteria:

- The location for the PSH, including powerhouse, penstock and upper reservoir, is based on the Innovation Gateway Business Area planning documents.
- The PSH pump and turbine modes have the same flow capacity with both modes provided by the same unit.
- The PSH is grid-connected, either via the WRC or directly to the gird, and can inject unlimited energy into the grid during surplus of hydro power energy generation.
- The grid can provide power to the PSH during pumping operation, either if connected directly to the grid or via the WRC with the SPP.
- The available flow is based on the monthly average WRC resource flow provided.
- The demand flows vary between scenarios and were set between the ‘Reuse Demands Within John Day’ up to the ‘All Reuse Demands’ profiles.
- The flow rates for the pump and turbine modes are assumed to be the same at a flow rate of 200 GPM.
- The upper reservoir is assumed to have infinite capacity in order to estimate the required reservoir size and volume change for each option.
- The lower reservoir was assumed to have a capacity of 500,000 gallons. An upper and lower reservoir deadband volume was set such that whenever the reservoir volume exceeds the upper deadband threshold, water is pumped to the upper reservoir. Conversely, if the lower reservoir volume falls below the lower deadband threshold, water from the upper reservoir is turbined to the lower reservoir. This is to maintain the lower reservoir volume within the specified deadband range used for short term storage.
- Water levels in the upper and lower reservoirs are assumed to remain constant for the gross head calculation since the fluctuations in these reservoirs is negligible in comparison to the head.
- Precipitation and evaporation have not been considered for this study.

3.2 PUMP STORAGE HYDRO OPTIONS

Based on the project description in the Grant Application, and the design criteria outlined above, four (4) primary design options were evaluated to cover the major approaches the City could move forward with the PSH:

Option 1: Low Demand within the City

This option simulates the WRC supply with existing water demand within the City. The demand within the City is lower than the WRC supply throughout the year, and as a result, the surplus water will be pumped to the upper reservoir and would need to be used there.

Option 2: Yearly Supply and Demand Balance

In this option, WRC supply is balanced with the demand over the year. A synthetic demand profile was generated with a yearly demand between the City and the All Reuse Demands profiles. The demand profile demonstrates a higher average demand during shoulder season and lower demand throughout the remainder of the year. During the shoulder season, the demand exceeds the WRC supply, thus the water must be directed to the lower reservoir from the upper reservoir to meet the demand. During the rest of the year there is a WRC surplus that is pumped to the upper reservoir such that it can be used during the shoulder season.

Option 3: Daily Supply and Demand Balance

In this option, the WRC supply and demand are balanced each day. A synthetic demand profile was generated with the average demand profile being the same as the WRC supply. The lower reservoir would be used to store water during low daily demand and provide it during high daily demand. Where there is excess, the WRC supply will be pumped to the upper reservoir during periods of low demand, to be reused at another time during the high period demand during the day.

Option 4: High Demand (All Reused)

This option considers the total demand of All Reuse Demands, which includes larger water users such as the Golf Course, the log deck hydroponic, and the torrefaction, in addition to the demand within the City. The demand exceeds the WRC supply throughout the year, and there is no surplus water to pump to the upper reservoir; new water will need to be provided to the system.

Figure 3 shows the daily average WRC supply and demand for all four (4) options.

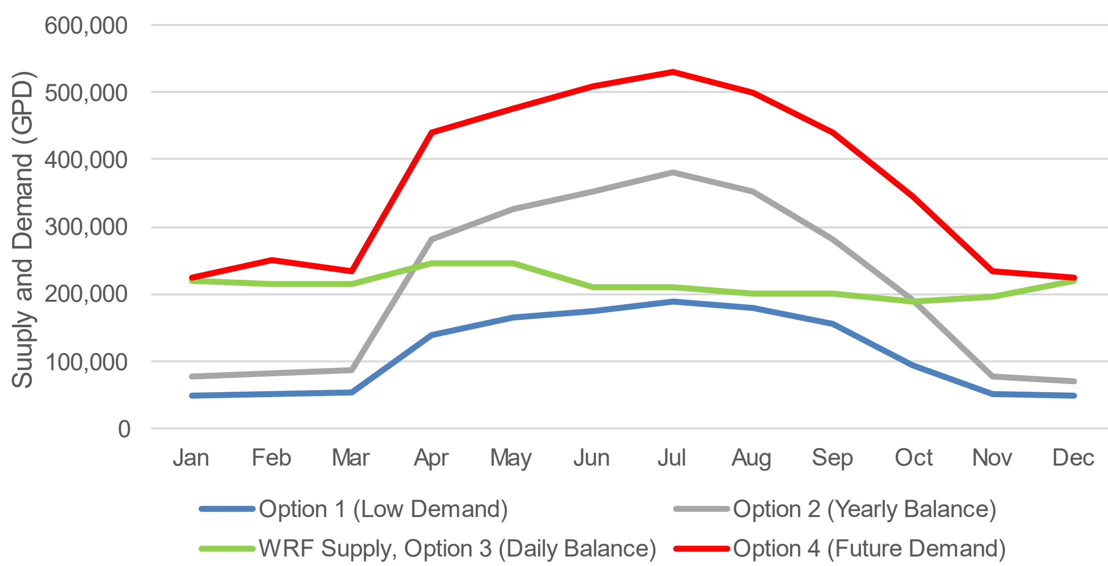

Figure 3: WRC Supply and Demand for All Options (Daily Average)

Even though the demand and supply data are daily averages, the simulation is on an hourly basis to capture demand fluctuation throughout the day to more realistically simulate the options. Daily peak and low demand factors were defined for each scenario as given in Table 1. The factors are set such that the daily demand matches the daily average demand. Daily average demand for each option is multiplied by the factors provided in Table 1 to create the hourly time series for the simulation. Peak period is defined as 8 am to 4 pm, and the rest of the day is considered as low demand period.

For Option 1 and Option 3, it is assumed that the demand is mostly for purposes such as irrigation, meaning a considerably higher demand throughout the peak period and lower demand during low demand hours. For Option 4 (future demand), it is assumed that most of the demand is from industrial sector and is expected to remain constant throughout the day and daily demand fluctuation is relatively low. Option 2 lies between the two cases explained above.

Table 1: Daily Peak and Low Demand Factors

Scenario	Peak Demand Factor	Low Demand Factor
Option 1 – Low Demand	0.5	2
Option 2 – Yearly Balance	0.75	1.5
Option 3 – Daily Balance	0.5	2
Option 4 – Future Demand	0.9	1.2

4. PROJECT SETTING

4.1 PUMP STORAGE HYDRO LOCATION

The project site is located within the municipal boundaries of the City of John Day, OR, USA. The new purple line pumping station and tank will be located on the same property. Figure 4 shows the location of the pump storage hydro facilities. Access to the PSH plant will be through existing municipal roads. The upper storage reservoir area can be accessed through offroad trails that connect to Northwest Valley View Drive, north of the City. The road appears to be part of an access easement for the radio tower site.

It is assumed that there are no major constraints about the topographic, geological, hydrological, or seismic site conditions that need to be considered at this stage of the study.

Figure 4: Location of the Pump Storage Hydro Facilities

5. System Design

5.1 PUMP AS TURBINE (PAT)

Pumps operate by transferring energy to the fluid, typically by rotating an impeller or propeller, which increases the fluid's kinetic energy and pressure allowing it to be transported through pipes or channels. Pumps can also be operated in reverse, to function as turbines, converting the pressure and kinetic energy of flowing water into mechanical energy, which can then be used to generate electricity. This approach, known as Pumps As Turbines (PAT) offers a cost-effective and adaptable solution for harnessing hydropower, where traditional turbine installations may not be feasible or economical. PAT is a common solution for mini-hydro projects, where a regular pump will be able to generate energy by running in reverse mode. Figure 5 shows a centrifugal pump in both pumping and turbine modes of operation.

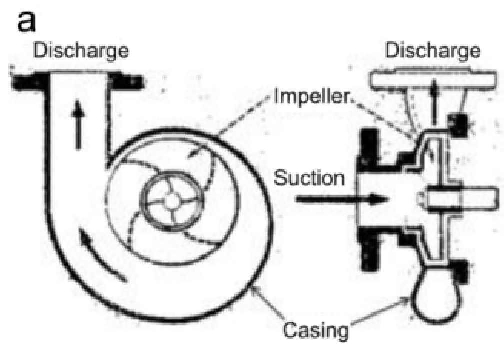

Figure 5: A Centrifugal Pump Operating in a) Pump, and b) Turbine Modes (Øyvind Albert, 2018)

Pumps offer a considerable cost advantage over turbines and are widely accessible throughout the world. It has been reported that for small-scale hydro projects (up to 500 kW), installation of PATs may reduce the capital cost by approximately a factor of 10 compared to traditional hydro turbines (Øyvind Albert, 2018). Pumps are easy to install and maintain, with readily available spare parts, making PATs a viable option for mini-hydro projects.

However, there are disadvantages associated with using PATs for hydro projects. The main disadvantage is that while PATs may achieve maximum efficiency comparable to that of the pump mode of operation, they will certainly not perform as well as a custom made turbine. Turbines are engineered with very smooth surfaces to minimize losses, while pumps often feature higher levels of roughness on the impeller. Another challenge is the difficulty of predicting PAT performance characteristics, which can complicate the selection process for pumps in hydro projects.

Considering the small capacity required in both pump and turbine mode, and that generating is secondary to the operation of the PSH compared to managing the water, a single pump used as PAT has been used for this project. If higher pumping or generation of energy in the future is required, a separate and specific unit could be evaluated.

The key consideration in the selection of the appropriate pump technology and configuration is the head and flow range. Different pump types have a target operating head where better efficiency is achieved; operating near or outside the range results in poor efficiency and potential cavitation damage. Figure 6 provide suggested pump type for various flows and head, for a flow rate of 200 GPM (~0.013 m^3/s) and a gross head of approximately 800 ft (~244 m). Multistage pumps are best suited for this project.

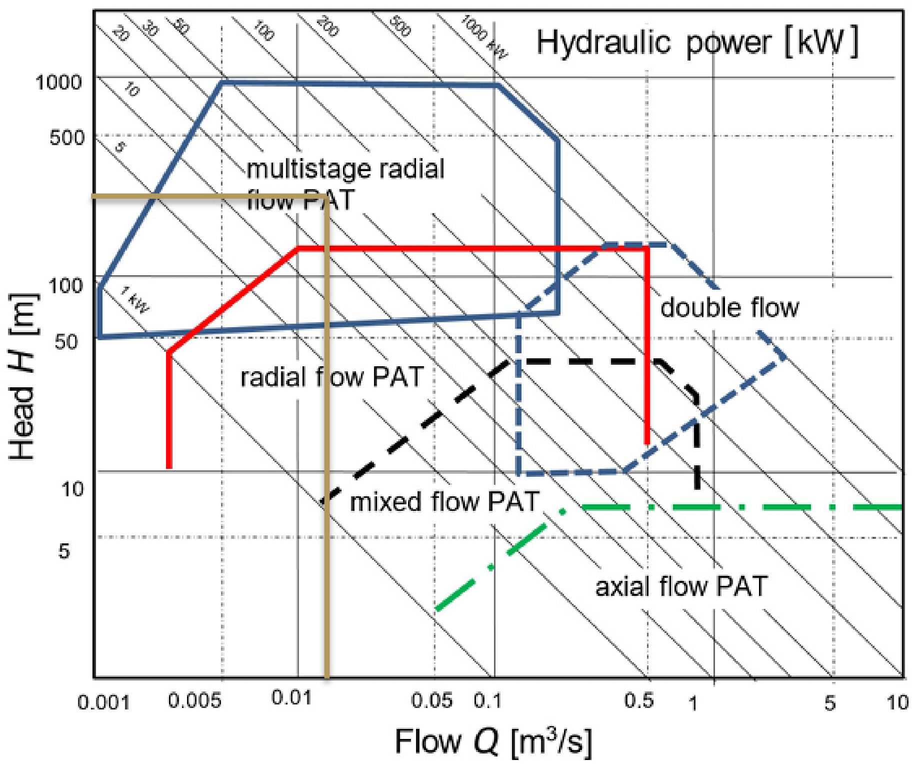

Figure 6: PAT Selection Chart (Barbarelli, 2018)

The performance of the PAT can be predicted either by using the pump performance or model testing. When using the pump performance, conversion factors for the rated head and flow, expressed as a simple function of efficiency at Best Efficiency Point (BEP), are used to move the efficient curve of the pump to where the same unit will operate as PAT. According to Williams (1994), Sharma's method (1985) proved to be the most accurate method among the basic models using the performance at BEP. Sharma's correction factors are given below; where, p and t indexes correspond to pump and turbine modes of operation.

$$Q_t = K_Q Q_p \qquad H_t = K_H H_p$$

For this study, Sharma's approach was used to predict PAT performance for a vertical multistage centrifugal pump. The correction factors, based on Sharma's method, are given in Table 2.

Table 2: Sharma's PAT Correction Factors

Coefficient	Value
K_Q, Coefficient of Flow	$\frac{1}{\eta_p^{0.8}}$
K_H, Coefficient of Head	$\frac{1}{\eta_p^{1.2}}$

The project requires a rated head of 850 ft and a rated flow of 200 GPM for the both the pump and the turbine. For the turbine to have the BEP at this rated head and flow, the selected pump and PAT, assuming a pump best efficiency of 76%, would need to have rated head and rated flow as follows.

$$H_t = K_H H_p = \frac{1}{0.76^{1.2}} \times 850 = 1187\ ft$$

$$Q_t = K_Q Q_p = \frac{1}{0.76^{0.8}} \times 200 = 250\ GPM$$

These are higher than the project head and flow, which indicates that a larger PAT is required than the pump size for pumping operation.

When using the same unit as a pump / PAT, it is not possible to have the BEP in both pump and turbine modes for the gross head and flow of the project. Since the pump requires more energy to pump the water than the energy generated in turbine mode for the same flow, the unit was selected for its pump characteristics. Therefore the BEP in turbine mode is at a lower head and flow than in pump mode, with overall lower operation efficiency in that mode. It is also possible that the plant flow in turbine mode will not be fully achievable without major generation losses. The preliminary selection of a pump / PAT for this project is a vertical turbine pump (Figure 7) with a rated head of 850 ft and a rated flow of 200 GPM corresponding to the project. It was selected for its better performances, i.e., best efficiency of 76%, compared to other pumps. The pump can also operate in sump mode disconnecting hydraulically the high pressure from the purple piping system.

Information on other projects using a PAT are not readily available, and although there appears to be many small projects using this approach, the design and operating approaches will need to be clarified. Further investigations and engineering will need to be completed to properly select and size a PAT for the project, as well as define the associated equipment to operate the unit.

Figure 7: Vertical Turbine Pump

5.2 LOWER RESERVOIR

The lower reservoir for the PSH is a new 500,000-gal water tank with an approximate water surface elevation of 3,100-ft. The pump and turbine facility will be housed in a building located at the existing wastewater treatment facility, and will be connected to the new 500,000-gal tank likely with a smaller transfer pump from the PAT sump. The sump will provide full hydraulic separation between the PSH hydraulic grade line with associated high operating pressures and new water tank / purple pipe with lower operating pressures. Water will be supplied to the PSH system by the purple pipe booster pumps, which are supplied by the 500,000-gal water tank.

From the purple pipe to the PSH facility ,an 8-inch pipe is proposed between the existing and future WRC, that will stay within property owned by the City. This pipe would be on undeveloped land, then around the existing lagoons until reaching the PHS facility. The total pipe length from the purple pipe to PSH facility is approximately 5,000 ft.

5.3 PENSTOCK AND UPPER RESERVOIR

From the PSH facility to the lagoon storage (upper reservoir), the proposed 8-inch pipe crosses Trowbridge Ditch and then follows Boulder Lane to NW Valley View Dr and continues up to the road's furthest north point. The road appears to be part of an access easement for the radio tower site. At the point in the road furthest north, the pipe leaves the apparent easement area and continues north on undeveloped rangeland until it reaches the lagoon storage. The precise alignment of the off-road pipeline would be evaluated in subsequent design phases, and a new access road and easement should be provided over the pipeline alignment. The total pipe length from the pump and turbine facility to lagoon storage is approximately 15,500 ft. The head loss at 200 gpm is around 1.5% with a velocity of 1.3 ft/s.

Operating pressures in the pipe will range from near atmospheric at the lagoon storage site to a gross head of approximately 370 psi at the PSH facility. Assuming the surge in the PSH system will be limited to 50% for the gross head, the maximum pressure in the pipe will be approximately 550 psi. Because the pipe pressure is driven by elevation change, two different specifications for the pipe material have been considered. This study assumes HDPE pipe for the upper section from the upper reservoir at lower pressure and steel for the higher pressure down to the PSH facility.

A previous planning effort by Anderson Perry & Associates in 2016 indicated, there is a proposed lagoon storage located on private property approximately 2-miles to the north with a pivot type irrigation system. Looking at the general topography of the area, shown in published USGS maps, it appears that a water surface elevation of approximately 3,900-ft is likely. The 120-Mgal of storage is proposed to be divided into four equal lagoon cells with approximate dimensions of 1000-ft by 1000-ft with a water depth of 4-ft. An HDPE or similar liner system is assumed to be required for geotechnical considerations. A small gatehouse would be required to house flow gate control equipment, telemetry and irrigation control equipment to control the flow to, from and between the lagoons, and for the PSH pipe.

5.4 ELECTRICAL SYSTEM AND CONTROLS

Operation design of the PSH was not part of the study and will need be to completed. It is assumed that the PAT will be able to operate between a range of flows, although operation at a fixed capacity would likely be possible by using the lower reservoir as storage. It is expected that operation of the PAT would require a regenerative drive to control the pump speed to start and shutdown the system, and adjust the flow in both pump and turbine modes, The drive would also provide a more efficient operation of the PAT. Mechanical equipment, such as an automatic control valve, will be required to shut-down the system between operations or in the event of a fault requiring emergency shut-down.

5.5 PUMP STORAGE HYDRO INTERCONNECTION

The Point of Interconnection (POI) for the PSH is assumed to be through the existing water treatment facility at 480V/3ph. A new electrical service entrance might be provided with a bidirectional meter. The PSH could also be connected to the new WRC and SPP such that the power and energy, including the grid connections, are all managed in one location.

It is assumed that the supply of energy over the year will be credited to the community while the deficiency to operate the PSH will be charged. The cost of energy was not evaluated as part of the study. The feasibility of the PSH will need to be evaluated against the technical limitations and commercial implications with OTEC.

6. POWER AND ENERGY

6.1 POWER AND ENERGY MODEL

A Power and Energy (P&E) model was setup in Microsoft Excel to calculate the PSH energy generation in turbine mode, and consumption in pump mode for the options by hourly timesteps. At every timestep, the P&E model evaluated the wastewater supply and water demand, and managed the flows to maintain the lower reservoir within the operating deadband by operating the PSH either in pump or turbine modes, or shutting it down. The model used this information to calculate the pump or turbine flows, the reservoir volume changes, and the power flow at the PSH facility interconnection.

In addition to the water supply and demand profile inputs for each option, the following general parameters and settings were used in the PSH model:

- **Head losses** are calculated as a function of the flow through the pipe (penstock) for each timestep. The friction loss is calculated based on the diameter and length using Colebrook-White equation and a wall roughness of 4.92×10^{-4} ft and 9.84×10^{-5} ft for new steel and HDPE penstocks respectively. Minor losses as a function of the velocity head such as for the trashrack, penstock bends and transitions are also included.
- **Maximum Pump / Turbine Flow** is the unit flow at the maximum net head at which the unit can operate, and is set at 200 gpm (45 m^3/h) in both pump and turbine mode.
- **Minimum Pump / Turbine Flow** is set as a percentage of the rated pump / turbine flow and was set at 40% of the maximum flow in both pump and turbine modes, or 80 gpm (18 m m^3/h).
- **Pump Efficiency** is derived from datasheet provided by the pump supplier.
- **Turbine Efficiency** for PAT is calculated based on the pump BEP with the rated flow and head adjusted.
- **Generator Efficiency** is assumed to be constant at 95% over the full range of operation.
- **Electrical Efficiency** accounts for losses in the buses and a typical new transformer efficiency up to the transmission line connection, and is assumed to be 98%.
- **Transmission Line Losses** are calculated up to the POI. Transmission line voltage is assumed to be 0.48 kV. A 2/0 AWG conductor is assumed for all scenarios.
- **Forced Outage Losses** are assumed to be 2% based on experience with multiple hydro developments to facilitate maintenance outage and new electrical and controls equipment.

6.2 SIMULATION RESULTS

6.2.1 Power and Energy Results

Appendix A includes P&E results with the simulation summary, scenario (option) daily low and peak PSH flows, time series graphs showing flow and reservoir volumes variations over the year, hydraulic calculations, and pump / PAT and interconnection parameters and performances.

The summary flow and power figures, which are reproduced in this technical memorandum, provide the monthly summary of the system operation. The figures include monthly average flows for water supply, demand, PSH plant, and system surplus / deficit, as well as the average PSH, pump and turbine powers. In the figure or tables, positive flows indicate water supplied to the system (lower reservoir or purple pipe) either from the WRC, the PSH in turbine mode form the upper reservoir, or water from an external source when there is deficit. Negative flows indicate water demand from the system by the purple pipe (City or industries), or pump to the upper reservoir. Positive power or energy are either generated (turbine mode) by the PSH or exported to the grid, while negative power or energy are either consumed by the PSH (pump mode) or imported from the grid to supply the PSH facility.

6.2.2 Option 1: Low Demand within the City

The water demand from within the City is lower than the WRC supply except during the peak periods of late spring to late fall. As shown on Figure 8, the average monthly PSH flows are negative during the entire year, which indicates that the PSH operates in pump mode, filling the upper reservoir. The lower reservoir has enough capacity to provide the additional water during the periods of high demand and fluctuates slightly without requiring the PSH to operate in turbine mode to bring water back from the upper reservoir. Water is recovered in the lower reservoir during low demand periods. This option only requires pumping at a capacity factor of 39% over the year, below the maximum pump capacity, with a maximum power required of 37 kW (consumption). The annual net energy required to pump the water is 148 MWh per year, which shall be supplied by either by the grid or the SPP.

The net volume of water pumped to the upper reservoir is about 37 M-Gal per year (139,000 m^3), which represents about a quarter of the upper reservoir expected capacity. The maximum lower reservoir fluctuation remains at approximately 61,000 gal, which occurs mostly during peak periods of late spring to late fall, during which time the upper reservoir volume is relatively constant.

For this option, there would be no requirements to have the PSH set to operate in turbine mode, and a simpler high head pumping station would be less expensive to construct. The pump could also be selected to operate at maximum efficiency to reduce the cost of pumping the water to the upper reservoir. However, the PSH would not be able to provide any power back and all the water stored would need to be used near the upper reservoir, likely for irrigation.

If City demand increases, using the water storage in the upper reservoir to balance the demand over the year may be required. The PSH would then need to operate in turbine mode, moving toward operation similar to the Option 2, with a early supply and demand balance.

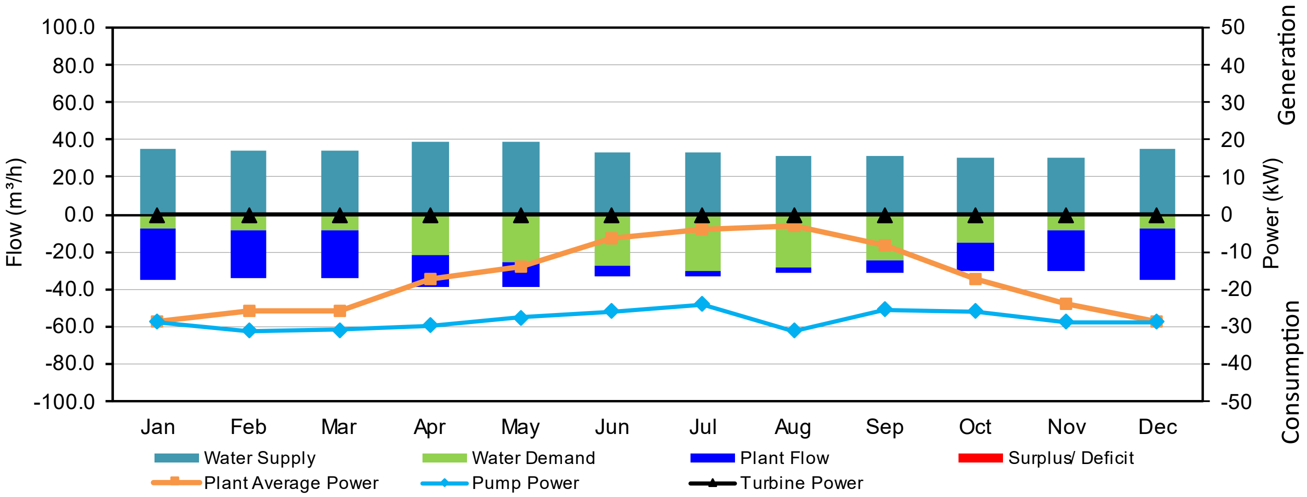

Figure 8: P&E Result Summary for Option 1

6.2.3 Option 2: Yearly Supply and Demand Balance

The annual water supplied by the WRC is balanced with the annual demand. As shown on Figure 9, this requires the PSH to operate in both pump (consumption) and turbine (generation) modes. Maximum power in turbine and pump mode are 20.0 kW (generation) and -34.6 kW (consumption), with low capacity factors of 18% and 22% respectively. The net annual energy to operate the PSH is about -50,000 kWh (consumption), which must be provided by the grid or the SPP. Although the volume of water pumped and turbined is the same, because of the losses and efficiency of the systems, mainly with the pump overcoming the system losses, the energy consumption is higher than the generation.

The upper reservoir volume fluctuates by a maximum of 20 M-Gal (77,000 m³) in this option during the year. During the high-demand season (April-November), the upper reservoir volume decreases as the turbine operates to supply the demand. For the rest of the year, supply exceeds the demand and the surplus water will be pumped to the upper reservoir. The lower reservoir provides daily water storage during the year for daily low and high demands, and fluctuates between the deadband within a volume of approximately 433,077 Gal (1,600 m³) throughout the year, mainly due the deadband setting. Actual storage required for daily demand fluctuation is minimal and comparable to Option 1. The upper reservoir fluctuation represents about a one sixth of the upper reservoir expected capacity.

Option 2 represents a case for a higher water demand within the City than Option 1, and where the surplus of water from the WRC during the low consumption season could be stored for long terms, even over few years, to be resused later within the City. Because of the loss in efficiency with pumping water to high elevation, the net cost of operation will have to be economically evaluated against the benefit of reusing the water within the City. Pump and turbine modes could also be scheduled to consume energy at times of lower rates and generate at times of higher rates to offset the net operation costs.

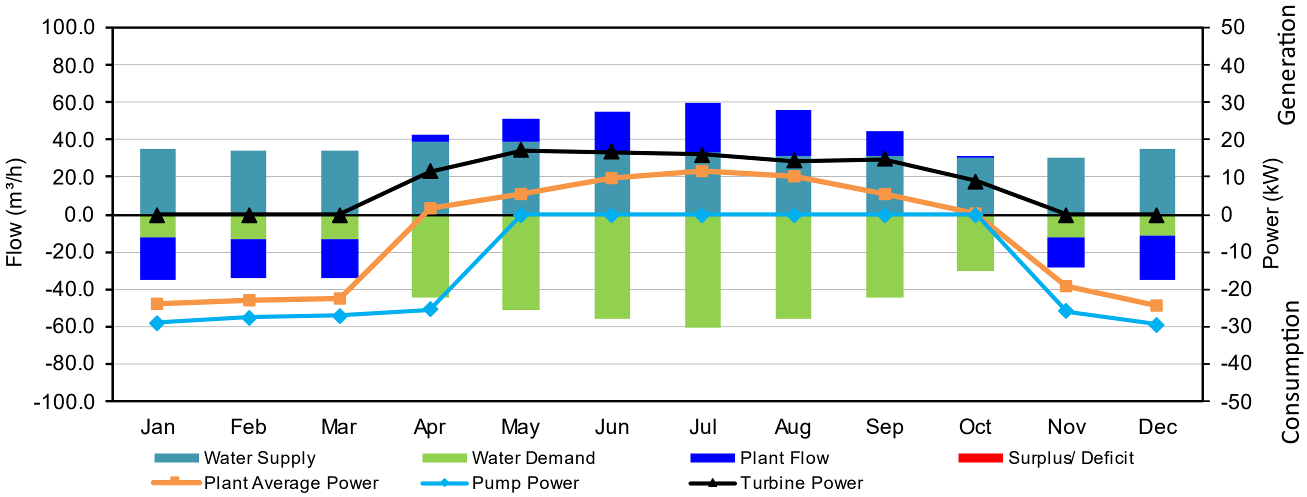

Figure 9: P&E Result Summary for Option 2

6.2.4 Option 3: Daily Supply and Demand Balance

The daily supply and demand are balanced. As shown on Figure 10, the PSH does not require operation in either pump or turbine mode. The lower reservoir has sufficient capacity within the deadband to provide the required demand during peak demand hours, and store water during low demand hours. Changes in the lower reservoir volume remains within the defined threshold to trigger the PSH to operate. The lower reservoir fluctuates within a maximum volume of approximately 81,600 Gal (300 m³) during the year, well below its maximum capacity of 500,000 Gal.

For this option the PSH would not be required, even if the daily water fluctuation between the low and high demand periods would be higher than assumed for this study.

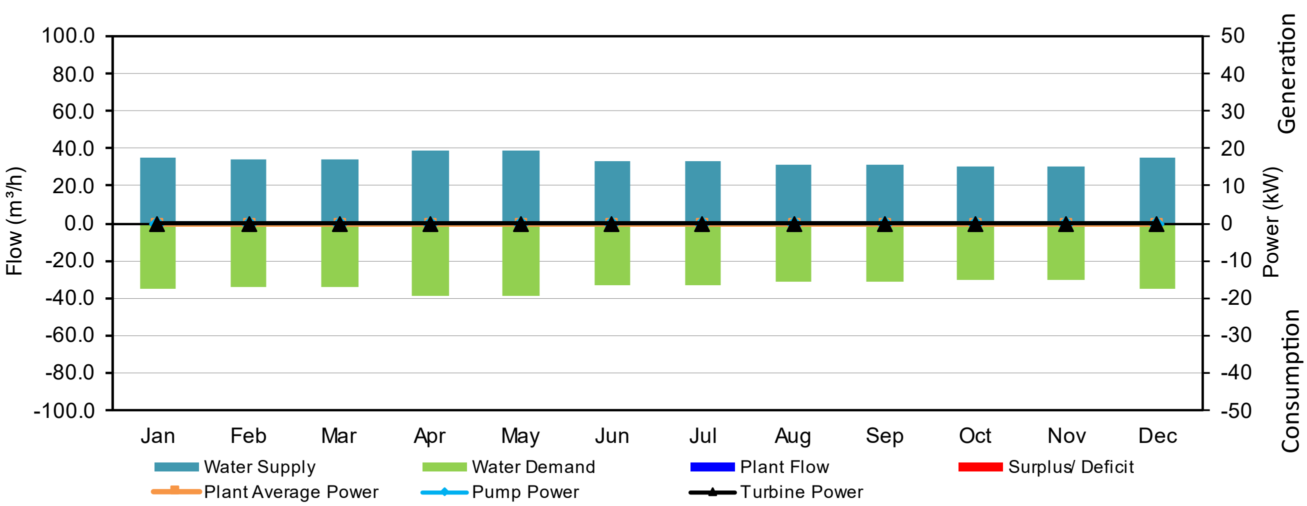

Figure 10: P&E Result Summary for Option 3

6.2.5 Option 4: High Demand (All Reused)

The daily average demand of the All Reused profile far exceeds the daily average supply of the WRC for all months of the year. As shown in Figure 11, the positive surplus indicates that water will need to be provided from an additional source other than the WRC. The lower reservoir never fills to a point where water would be pumped to the upper reservoir. Only minimal storage is used in the lower reservoir to balance the low and high demands during the few months when the monthly minimal demand is similar to the supply from the WRC. The surplus of water during low demand period causes fluctuations of around 11,600 Gal throughout the year, barely filling the 500,000 Gal reservoir.

The PSH would not be required, even if the daily water fluctuation between the low and high demand periods would be higher than assumed for this study. If the capacity of the WRC increases, water storage in the upper reservoir could become possible with operation of the PHS moving toward a PSH operation similar to the Option 2, with an early supply and demand balance, but with a higher fixed base water consumption.

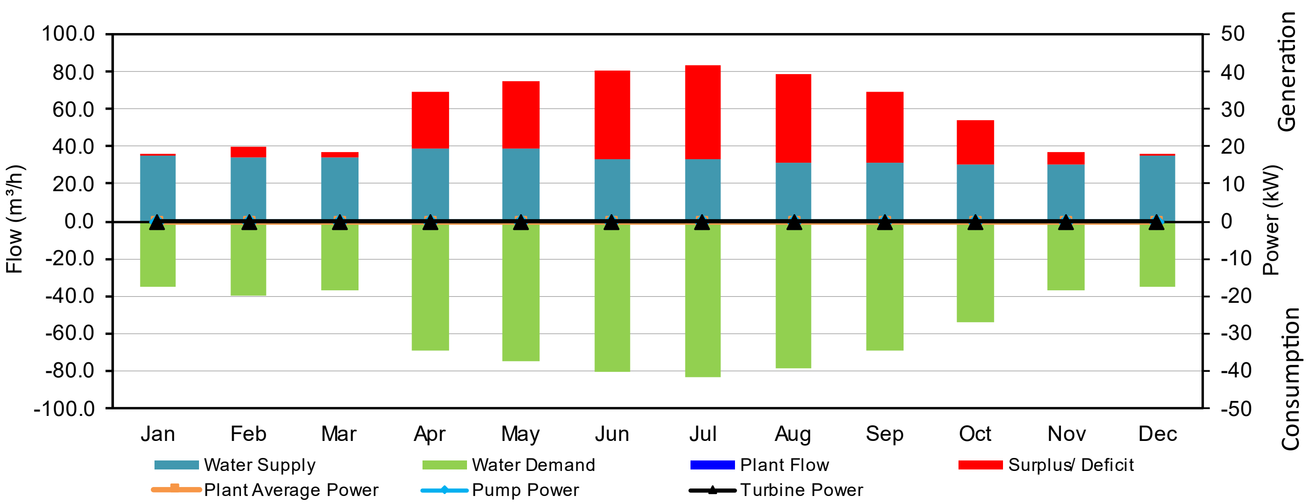

Figure 11: P&E Result Summary for Option 4

7. COST ESTIMATE

The same PSH design with a 200 gpm pump and turbine is assumed for all options. Only the operation and usage of the PSH changes between the options. A cost estimate for the PHS facility, including the pipeline connection to the new WRC and the lagoon storage, is provided in the Pump Storage Pipeline Alignment technical memorandum.

The cost estimate is an AACE Class 5 Opinion of Probable Construction Cost (OPCC) with a low accuracy of –20% to –50% and high accuracy of +30% to +100% depending on the complexity and scale of the project. Considering this project is large in scale but relatively simple in complexity, a low and high range of -25% and +50% range was used, respectively. The total project cost for the project is estimated at $44 million, with a probable range of $33 to $66 million.

8. OPTION SUMMARY TABLE

Table 3 summarizes the key parameters and results of the PSH assessment options. Positive flows indicate water supplied to the system (lower reservoir or purple pipe) either from the WRC, the PSH in turbine mode form the upper reservoir, or water from an external source when there is a deficit. Negative flows indicate water demand from the system by the purple pipe, to fill the reservoir, or pump to the upper reservoir. Positive power or energy are either generated (turbine mode) by the PSH or exported to the grid, while negative power or energy are either consumed by the PSH (pump mode) or imported from the grid to supply the PSH facility.

Table 3: PSH Option Summary

Parameter	Option 1 (Low Demand)	Option 2 (Yearly Balance)	Option 3 (Daily Balance)	Option 4 (Future Demand)
FLOWS				
WRC Supply Flows				
Yearly Average WRC Supply, GPD	213,750 (100%)			
Daily Average WRC Supply, GPD (% of Yearly Average)				
January	220,000 (103%)			
February	215,000 (101%)			
March	215,000 (101%)			
April	245,000 (115%)			
May	245,000 (115%)			
June	210,000 (98%)			
July	210,000 (98%)			
August	200,000 (94%)			
September	200,000 (94%)			
October	190,000 (89%)			
November	195,000 (91%)			

Parameter	Option 1 (Low Demand)	Option 2 (Yearly Balance)	Option 3 (Daily Balance)	Option 4 (Future Demand)
December	220,000 (103%)			
Water Demand Flows				
Yearly Average Demand, GPD	-113,167 (100%)	-213,050 (100%)	-213,750 (100%)	-367,500 (100%)
Daily Average Demand, GPD (% of Yearly Average)				
January	-50,000 (44%)	-76,384 (36%)	-220,000 (103%)	-225,000 (61%)
February	-52,000 (46%)	-81,384 (38%)	-215,000 (101%)	-250,000 (68%)
March	-54,000 (48%)	-86,384 (41%)	-215,000 (101%)	-235,000 (64%)
April	-140,000 (124%)	-281,384 (132%)	-245,000 (115%)	-440,000 (120%)
May	-165,000 (146%)	-326,384 (153%)	-245,000 (115%)	-475,000 (129%)
June	-175,000 (155%)	-351,384 (165%)	-210,000 (98%)	-510,000 (139%)
July	-190,000 (168%)	-381,384 (179%)	-210,000 (98%)	-530,000 (144%)
August	-180,000 (159%)	-351,384 (165%)	-200,000 (94%)	-500,000 (136%)
September	-155,000 (137%)	-281,384 (132%)	-200,000 (94%)	-440,000 (120%)
October	-95,000 (84%)	-191,384 (90%)	-190,000 (89%)	-345,000 (94%)
November	-52,000 (46%)	-76,384 (36%)	-195,000 (91%)	-235,000 (64%)
December	-50,000 (44%)	-71,384 (34%)	-220,000 (103%)	-225,000 (61%)
Daily Flow Factors				
Daily Low Demand Flow Factor	0.50	0.75	0.50	0.90
Daily Peak Demand Flow Factor	2.00	1.50	2.00	1.20
Surplus / Deficit Flows Between WRC Supply and Demand				
Yearly Average Surplus/Deficit, GPD	100,583	700	0	-153,750
Daily Average Surplus/Deficit, GPD				
January	170,000	143,616	0	-5,000
February	163,000	133,616	0	-35,000
March	161,000	128,616	0	-20,000
April	105,000	-36,384	0	-195,000
May	80,000	-81,384	0	-230,000
June	35,000	-141,384	0	-300,000
July	20,000	-171,384	0	-320,000
August	20,000	-151,384	0	-300,000
September	45,000	-81,384	0	-240,000

Parameter	Option 1 (Low Demand)	Option 2 (Yearly Balance)	Option 3 (Daily Balance)	Option 4 (Future Demand)
October	95,000	-1,384	0	-155,000
November	143,000	118,616	0	-40,000
December	170,000	148,616	0	-5,000
PUMP STORAGE HYDRO (PSH) FACILITY PARAMETERS				
Elevations and PSH Head				
Upper Reservoir, ft	3,900			
Lower Reservoir, ft	3,100			
Turbine / Pump, ft	3,100			
Gross Head, ft	800	800	800	800
Pump				
Pump Type	Multistage Vertical Turbine Centrifugal Pump			
Number of Pumps	1			
Rated Flow, GPM	200			
Maximum Flow, GPM	200			
Minimum Flow, GPM (% of Maximum Flow)	80 (40%)			
Rated Head, ft	850			
Turbine				
Turbine Type	Multistage Vertical Centrifugal Pump Used as Turbine (PAT)			
Number of Turbines	1			
Rated Flow, GPM	250			
Maximum Flow, GPM	200			
Minimum Flow, GPM (% of Maximum Flow)	80 (40%)			
Rated Head, ft	1,187			
PSH FACILITY OPERATION				
Plant Flow				
Yearly Average Plant Flow, GPD	-100,274	0	0	0
Daily Average WRC Supply, GPD				
January	-170,000	-143,616	0	0
February	-163,000	-133,616	0	0
March	-161,000	-128,616	0	0
April	-105,000	23,440	0	0
May	-80,000	81,021	0	0
June	-35,194	141,381	0	0
July	-20,403	171,281	0	0

Parameter	Option 1 (Low Demand)	Option 2 (Yearly Balance)	Option 3 (Daily Balance)	Option 4 (Future Demand)
August	-19,946	151,486	0	0
September	-44,306	81,261	0	0
October	-95,134	1,957	0	0
November	-143,000	-105,766	0	0
December	-170,000	-148,616	0	0
Reservoir Volumes				
Upper Reservoir Max Capacity, Gal	120,000,000 (100%)			
Upper Reservoir Max Volume Change / Stored, Gal	37,000,000 (31%)	20,000,000 (17%)	0	0
Lower Reservoir Max Capacity, Gal	500,000 (100%)			
Lower Reservoir Max Volume Change, Gal	61,292 (12%)	433,077 (86%)	81,666 (16%)	11,667 (2%)
Pump Operation				
Maximum Flow, GPM	-170	-157	0	0
Average Flow, GPM	-118	-113	0	0
Minimum Plant Flow, GPM	-80	-79	0	0
Average Net Head, ft	804.9	804.4	0.0	0.0
Maximum Power Achieved, kW	-37.0	-34.6	0.0	0.0
Capacity Factor	39%	22%	0%	0%
Turbine Operation				
Maximum Flow, GPM	0	198	0	0
Average Flow, GPM	0	158	0	0
Minimum Plant Flow, GPM	0	84	0	0
Average Net Head, ft	0.0	790.9	0.0	0.0
Maximum Power Achieved, kW	0.0	20.0	0.0	0.0
Capacity Factor	0%	18%	0%	0%
PSH POWER AND ENERGY				
Yearly Average Power				
PSH Facility Ave Power, kW	-17.0	-5.7	0.0	0.0
Pump Max Power, kW	-37.0	-34.6	0.0	0.0
Turbine Max Power, kW	0.0	20.0	0.0	0.0
Annual Energy				
PSH Facility Annual Energy, kWh	-147,742 (100%)	-50,320 (100%)	0 (0%)	0 (0%)
PSH Capacity Factor (Pump + Turbine)	39%	40%	0%	0%

Parameter	Option 1 (Low Demand)	Option 2 (Yearly Balance)	Option 3 (Daily Balance)	Option 4 (Future Demand)
Ave Energy per Water Pumped, kWh/1000 Gal	-3.99	-2.52	N/A	N/A
Pump Annual Energy Consumption, kWh	-147,742	-82,055	0	0
Pump Capacity Factor	39%	22%	0%	0%
Turbine Annual Energy Generation, kWh	0	31,735	0	0
Turbine Capacity Factor	0%	18%	0%	0%
PSH Facility Monthly Net Energy, kWh (% of Annual)				
January	-21,273 (14%)	-17,823 (35%)	0 (0%)	0 (0%)
February	-17,419 (12%)	-15,423 (31%)	0 (0%)	0 (0%)
March	-19,117 (13%)	-16,714 (33%)	0 (0%)	0 (0%)
April	-12,399 (8%)	1,041 (-2%)	0 (0%)	0 (0%)
May	-10,227 (7%)	4,094 (-8%)	0 (0%)	0 (0%)
June	-4,680 (3%)	6,781 (-13%)	0 (0%)	0 (0%)
July	-3,002 (2%)	8,441 (-17%)	0 (0%)	0 (0%)
August	-2,385 (2%)	7,341 (-15%)	0 (0%)	0 (0%)
September	-5,967 (4%)	3,899 (-8%)	0 (0%)	0 (0%)
October	-12,830 (9%)	88 (0%)	0 (0%)	0 (0%)
November	-17,169 (12%)	-13,822 (27%)	0 (0%)	0 (0%)
December	-21,273 (14%)	-18,222 (36%)	0 (0%)	0 (0%)
COST ESTIMATE				
AACE Class 5 OPCC	$44 million			
Low Range (-25%)	$33 million			
High Range (50%)	$66 million			
Capital Cost per Yearly Water Pumped, $/1000 Gal	$1,190	$2,190	N/A	N/A

9. Conclusion

The four options evaluated in this study provide the expected operations of a 200 gpm PSH with the flows to be provided by the new WRC and the current water consumption for irrigation within the City, and possible future consumption by industries. The model assumed daily variations in demand flows and usage of the lower reservoir to attenuate the requirements of using the PSH to store water in the upper reservoir.

The locations of the PSH facility and upper reservoir, including reservoir capacities and penstock route are based on the Innovation Gateway Business Area planning documents. The high elevation of the upper reservoir results in a high head for the PSH facility. To reduce the complexity and associated cost of the PSH facility, a high pressure multistage PAT was selected for the project. It is assumed that the PSH will be interconnected to the grid either at the new WRC or via a new electrical service entrance with a bidirectional meter at the location of the PSH facility.

Option 1, with a low demand of water within the City, generates a surplus of water with the PSH operating in pump mode and filling the upper reservoir. The lower reservoir has enough capacity to provide the additional water during the periods of high demand and fluctuates slightly without requiring the PSH to operate in turbine mode. The net volume of water pumped to the upper reservoir represents about a quarter of the upper reservoir expected capacity. The annual net energy required to pump the water is 148 MWh per year, which shall be supplied by either by the grid or the SPP.

Option 2, with an annual water supply by the WRC balanced with the annual demand, uses PSH to its maximum capacity with the PSH operating in both pump (consumption) and turbine (generation) modes. Option 1 would move towards Option 2 as water demand increases within the City. During the high demand season (April-November), the upper reservoir volume decreases as the turbine operates to supply the demand. For the rest of the year, the surplus of water is pumped to the upper reservoir. The yearly upper reservoir volume fluctuation is about one sixth of the upper reservoir expected capacity, therefore water from the WRC during the low consumption season could be stored for long terms, even over few years. The net annual energy to operate the PSH is about -50,000 kWh (consumption), however a total of 82,000 kWh will be consumed over the year which is offset by 32,000 kWh of generation exported to the grid.

Option 3, with a daily supply and demand balance, does not require the PSH to operate in either pump or turbine mode. The lower reservoir has sufficient capacity within the deadband to provide the required demand during peak demand hours, and store water during low demand hours. Similarly, Option 4 with high demand exceeding the expect the WRC supply, the PSH would also not be required since all water is used throughout the year. Only minimal storage is used in the lower reservoir to balance the low and high demands. If the capacity of the WRC increases, water storage in the upper reservoir could become possible with the PHS operation moving toward the operation in Option 2.

Option 1 net energy required (to be consumed) to pump the water in the is 3.99 kWh per 1000 gal. Option 2 net energy required to store the water and supply it back to the system is 2.52 kWh per 1000 gal. Although the turbine mode recuperates some energy from the stored water, there is a net deficit due the efficiency of the pump / PAT and the losses in the system.

The total project cost based on AACE Class 5 Opinion of Probable Construction Cost (OPCC) is estimated at $44 million, with a low and high range of $33 (-25%) to $66 (+50%) million.

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A. Power and Energy Simulation Results

John Day Renewable - Pump Storage Hydro

Low Demand Within John Day Scenario, 45 m³/hr Pump-Turbine Capacity

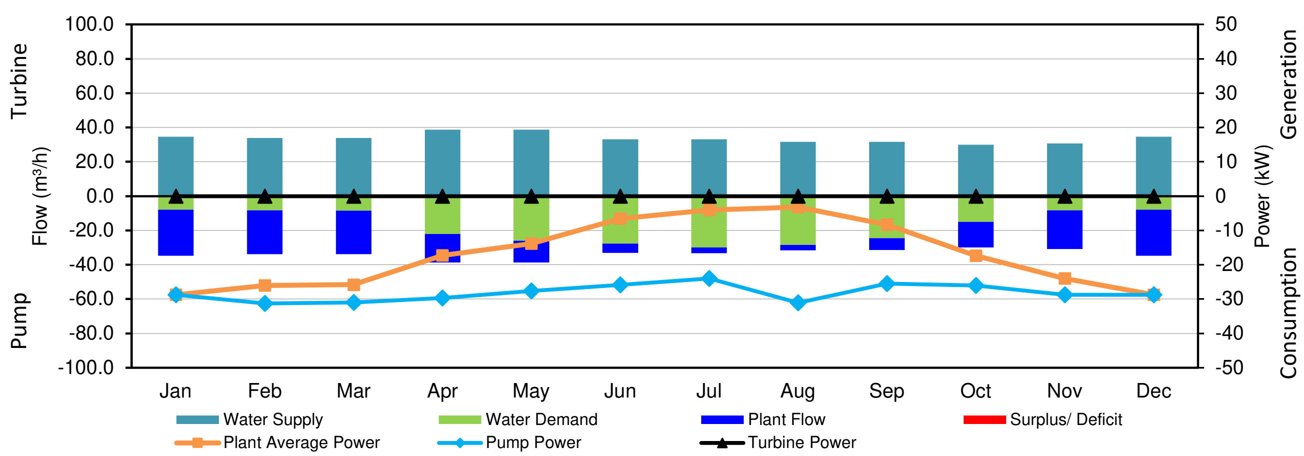
Power and Energy Simulation Summary

	Turbine	Pump	Ave. Plant	
Max Plant Capacity:	0.0	-37.0	-17.0	kW
Average Annual Energy:	0	-147,742	-147,742	kWh
Yearly Capacity Factor:	0%	39%	39%	
Generator Efficiency:	95.0%			
Plant Electrical Efficiency:	98.0%			
Downtime Losses:	2%			
Maximum Flow:	45.0	45.0	m³/h	
Minimum Flow:	18.0	18.0	m³/h	
Max Capacity:	20.0	-43.0	kW	
Interconnection Voltage:	0.480 kV			
Interconnection Line Length:	0.3 km			
Interconnection Loss at Capacity:	2.2%			

Normal Upper Reservoir El.:	1189	m
Turbine / Pump El.:	945	m
Lower Reservoir El.:	945	m
Gross Head:	244	m
Headloss at Maximum Flow:	4.1	m
Headloss Percentage:	1.7%	
Total Penstock Length:	4800	m
Total Tailrace Conduit Length:	0	m
Penstock Diameter:	0.203	m or 8"
Penstock Velocity:	0.39	m/s
Upper Reservoir Max Capacity:	N/A	m³
Upper Reservoir Max Volume Change:	138,546	m³
Upper Reservoir Start / Finish Vol. Change:	138,546	m³
Lower Reservoir Max Capacity:	1,893	m³
Lower Reservoir Pump/Tur. Dead Band:	190	m³
Lower Reservoir Max Volume Change:	232	m³
Lower Reservoir Start / Finish Vol. Change:	0	m³

Selected Turbine:	Turbine: Vert. Turb as Turbine		Pump: Vert. Turb. as Pump	
	Flow	Efficiency	Flow	Efficiency
Minimum	40%	58.0%	40%	55.0%
Peak	95%	73.0%	95%	76.0%
Maximum	100%	73.0%	100%	76.0%

	Water Supply	Water Demand	Plant Flow (m³/h)	Surplus/ Deficit (m³/h)	Turbine Power (kW)	Turbine Capacity Factor	Pump Power (kW)	Pump Capacity Factor	Energy Turbine (kWh)	Energy Pump (kWh)	Energy Total (kWh)
Max	38.6	-3.9	0.00	0.00	0.00	0%	-37.02	73%	0	-21,273	-21,273
Avg	33.7	-17.9	-15.82	0.00	#DIV/0!	0%	-28.69	66%	0	-12,312	-12,312
Min	30.0	-59.9	-38.64	0.00	0.00	0%	-23.50	56%	0	-2,385	-2,385
Jan	34.7	-7.9	-26.8	0.0	0.0	0%	-28.7	67%	0	-21,273	-21,273
Feb	33.9	-8.2	-25.7	0.0	0.0	0%	-31.2	73%	0	-17,419	-17,419
Mar	33.9	-8.5	-25.4	0.0	0.0	0%	-31.0	72%	0	-19,117	-19,117
Apr	38.6	-22.1	-16.6	0.0	0.0	0%	-29.7	69%	0	-12,399	-12,399
May	38.6	-26.0	-12.6	0.0	0.0	0%	-27.7	64%	0	-10,227	-10,227
Jun	33.1	-27.6	-5.6	0.0	0.0	0%	-25.9	60%	0	-4,680	-4,680
Jul	33.1	-30.0	-3.2	0.0	0.0	0%	-24.0	56%	0	-3,002	-3,002
Aug	31.5	-28.4	-3.1	0.0	0.0	0%	-31.1	72%	0	-2,385	-2,385
Sep	31.5	-24.4	-7.0	0.0	0.0	0%	-25.5	59%	0	-5,967	-5,967
Oct	30.0	-15.0	-15.0	0.0	0.0	0%	-26.0	61%	0	-12,830	-12,830
Nov	30.8	-8.2	-22.6	0.0	0.0	0%	-28.8	67%	0	-17,169	-17,169
Dec	34.7	-7.9	-26.8	0.0	0.0	0%	-28.7	67%	0	-21,273	-21,273



Rev	Description	Date	ENG	CHK
A	Draft Issued for Review	3-May-24	MM	RS

John Day Renewable - Pump Storage Hydro

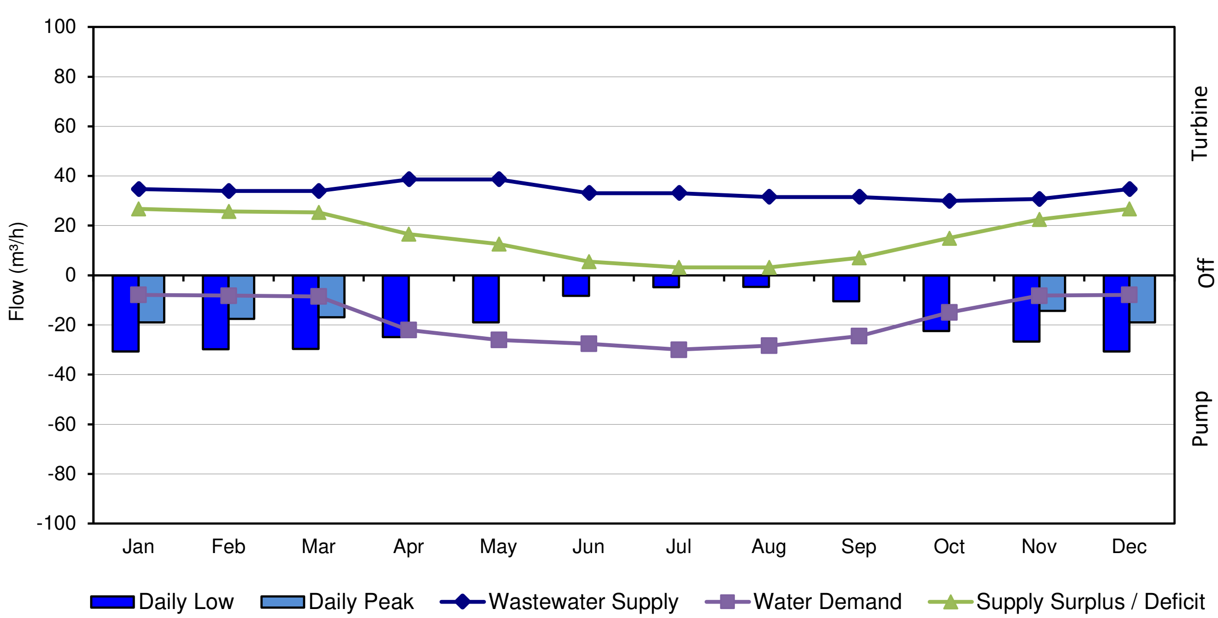
Low Demand Within John Day Scenario, 45 m³/hr Pump-Turbine Capacity

Power and Energy Scenarios

	Daily Low	Daily Peak
Start Hour	16	8
End Hour	8	16
Duration (hr)	16	8
Water Demand Var. From Avg.	0.50	2.00

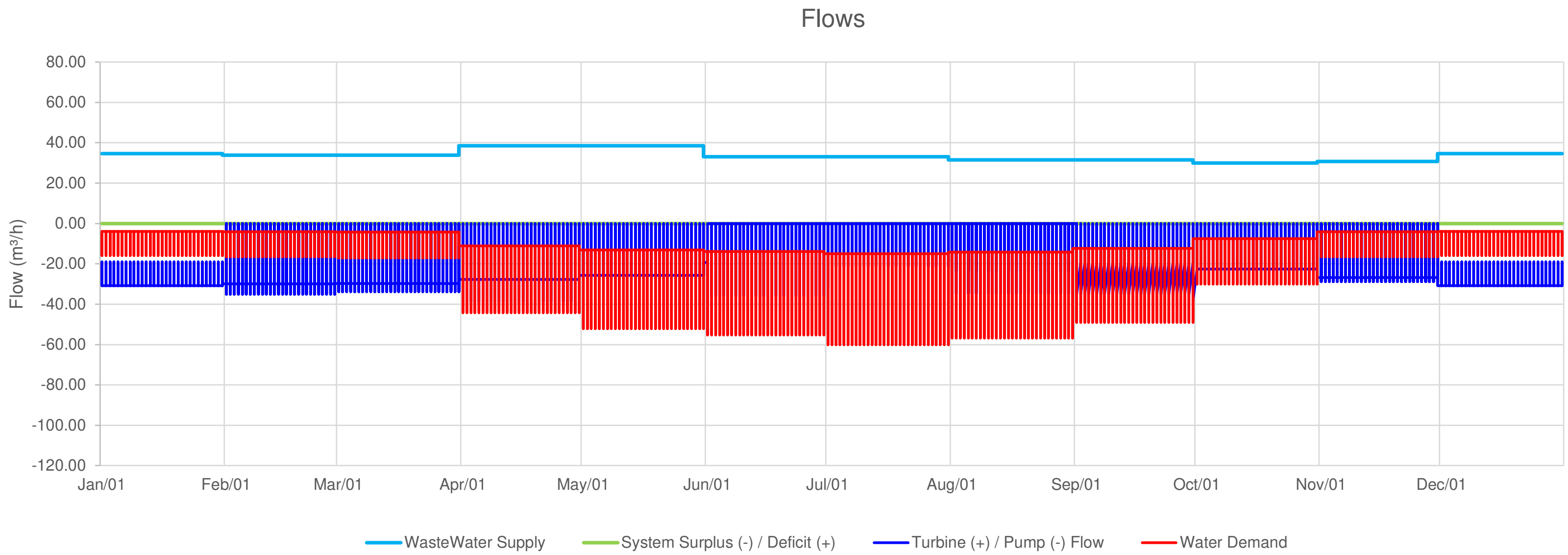
Yearly Volume Summary (m³)		
Water Supply	295,337	100%
Water Demand	-156,791	53%
Surplus/ Deficit	138,546	47%
Turbine	0	0%
Pump	-138,546	47%
Pump / Turbine Var.	0	0%

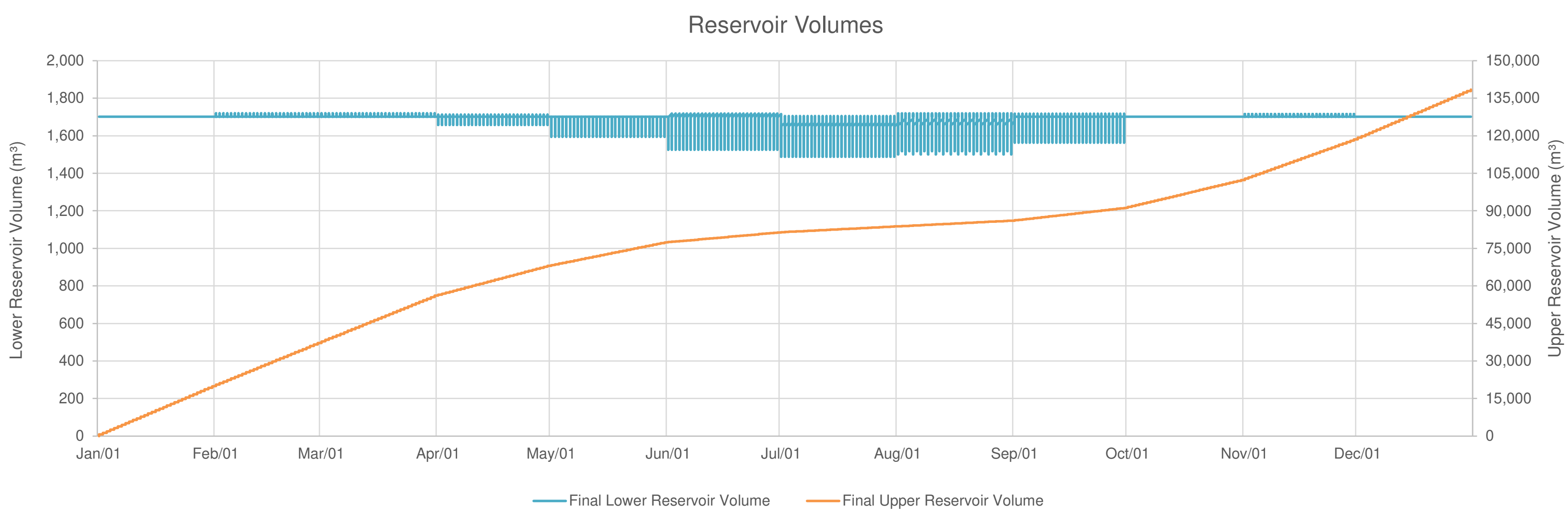
Month	Daily Average			Daily Low		Daily Peak		Daily Ave	
	Wastewater Supply (m³/h)	Water Demand (m³/h)	Supply Surplus / Deficit (m³/h)	Pumping / Turb / Off	Ave. Flow (m³/h)	Pumping / Turb / Off	Ave. Flow (m³/h)	Pumping / Turb / Off	Ave. Flow (m³/h)
Jan	34.7	-7.9	26.8	Pump	-30.8	Pump	-18.9	Pump	-26.8
Feb	33.9	-8.2	25.7	Pump	-29.8	Pump	-17.5	Pump	-25.7
Mar	33.9	-8.5	25.4	Pump	-29.7	Pump	-16.9	Pump	-25.4
Apr	38.6	-22.1	16.6	Pump	-24.8	Off	0.0	Pump	-16.6
May	38.6	-26.0	12.6	Pump	-18.9	Off	0.0	Pump	-12.6
Jun	33.1	-27.6	5.5	Pump	-8.3	Off	0.0	Pump	-5.6
Jul	33.1	-30.0	3.2	Pump	-4.8	Off	0.0	Pump	-3.2
Aug	31.5	-28.4	3.2	Pump	-4.7	Off	0.0	Pump	-3.1
Sep	31.5	-24.4	7.1	Pump	-10.5	Off	0.0	Pump	-7.0
Oct	30.0	-15.0	15.0	Pump	-22.5	Off	0.0	Pump	-15.0
Nov	30.8	-8.2	22.6	Pump	-26.7	Pump	-14.4	Pump	-22.6
Dec	34.7	-7.9	26.8	Pump	-30.8	Pump	-18.9	Pump	-26.8
Mth Min.	30.0	-7.9	3.2	Pump	-38.6	Pump	-35.0	Pump	-38.6
Yearly Ave.	33.7	-17.8	15.9	Pump	-20.1	Pump	-7.2	Pump	-15.8
Mth Max.	38.6	-30.0	26.8	Off	0.0	Off	0.0	Off	0.0
Day Low		-3.9							
Day Peak		-59.9							
Yearly Volume (m³)	295,337	-156,791	138,546	-117,606		-20,940		-138,546	



John Day Renewable - Pump Storage Hydro
Low Demand Within John Day Scenario, 45 m³/hr Pump-Turbine Capacity

Time Series Graphs





John Day Renewable - Pump Storage Hydro
Low Demand Within John Day Scenario, 45 m³/hr Pump-Turbine Capacity

Conveyance System Hydraulics

Penstock Losses

Friction	Section	Length (m)	Diameter (m)	Velocity (m/s)	Rough (mm)	Factor	Headloss (m)	Percent
	HDPE Pipe	2000	0.203	0.39	0.03	0.0212	1.58	38.9%
	Steel Pipe	2800	0.203	0.39	0.15	0.0232	2.44	59.8%

Transitions		Coefficient	Velocity (m/s)	Headloss (m)	
	Trashrack	1.00	0.40	0.01	0.2%
	Intake - Penstock Transition	0.00	0.39	0.00	0.0%
	HDPE Pipe - Steel Pipe Transition		0.39	0.00	0.0%
			0.39	0.00	
			0.00	0.00	

Bends	Section	No.	Coefficient	Total Coef.	Velocity (m/s)	Headloss (m)	
	HDPE Pipe	20	0.15	3.0	0.39	0.02	0.6%
	Steel Pipe	28	0.10	2.8	0.39	0.02	0.5%
	0	0	0.10	0.0	0.00	0.00	0.0%
	0	0	0.10	0.0	0.00	0.00	0.0%

Total Headloss: 4.07 m 100%

Penstock Headloss Coefficient: 0.0020 m/(m³/hr)2

Tailrace Losses

Friction	Section	Length (m)	Diameter (m)	Velocity (m/s)	Rough (mm)	Factor	Headloss (m)	Percent
	Steel Pipe	0	0.203	0.39	0.15	0.0232	0.00	

Transitions		Coefficient	Velocity (m/s)	Headloss (m)
	Trashrack	0.00	0.40	0.00
	Intake - Penstock Transition	0.00	0.39	0.00
		0.00	0.39	0.00

Bends	Section	No.	Coefficient	Total Coef.	Velocity (m/s)	Headloss (m)
	Steel Pipe	0	0.10	0.0	0.39	0.00
	0	0	0.10	0.0	0.00	0.00

Total Headloss: 0.00 m

Tailrace Headloss Coefficient: 0.0000 m/(m³/hr)2

Turbine and Transmission Line Data and Calculations

Transmission Line

Input Data		
Line Voltage	0.480	kV
Conductor Name	2/0	
Wire Size	133.0	kcmil
Resistance (per phase)	0.3250	Ω/km
Length	0.3	km
Plant Capacity	42.97	kW
Power Factor	0.90	cos φ

Calculations		
Current per Phase	57.4	A
Resistance per Phase	0.10	Ω
Loss per Phase	0.32	kW
Total Loss	0.96	kW
Percent of Plant Capacity	2.2%	
Loss Factor	0.000522	

Conductor Resistance Table

Name	Size kcmil	Resistance Ω/km	Ampacity 90°C (A)
Partridge	266.8	0.2136	
Tulip	336.4	0.1693	
Cosmos	477.0	0.1194	
Orchid	636.0	0.0896	
2/0	133.0	0.3250	
3/0	166.1	0.2230	
4/0	210.4	0.1970	
Kcmil 250	250.0	0.1388	
Kcmil 350	350.0	0.0990	
Kcmil 500	500.0	0.0694	
Kcmil 750	750.0	0.0463	
Kcmil 100(	1000.0	0.0347	

Turbine Efficiency

Turbine	Min Q	Min E	Peak Q	Peak E	Max E
Horz Split as Pump	20%	27.0%	95%	58.0%	58.0%
Horz Split as Turbine	20%	27.0%	95%	76.0%	55.0%
Vert. Turb. as Pump	40%	55.0%	95%	76.0%	76.0%
Vert. Turb as Turbine	40%	58.0%	95%	73.0%	73.0%

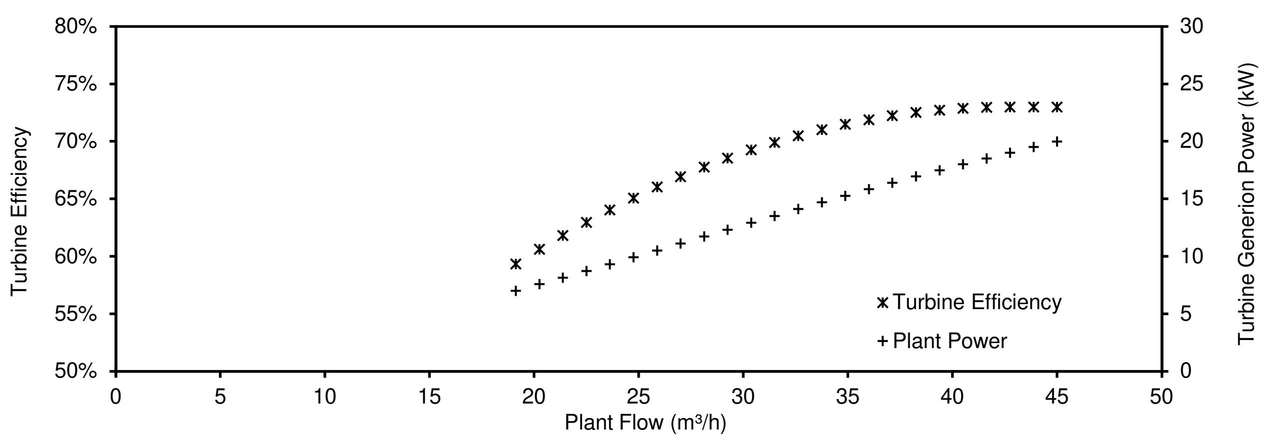
Generator Efficiency

Synchron Generator	95.0%

John Day Renewable - Pump Storage Hydro
Low Demand Within John Day Scenario, 45 m³/hr Pump-Turbine Capacity

Turbine Performance Characteristics

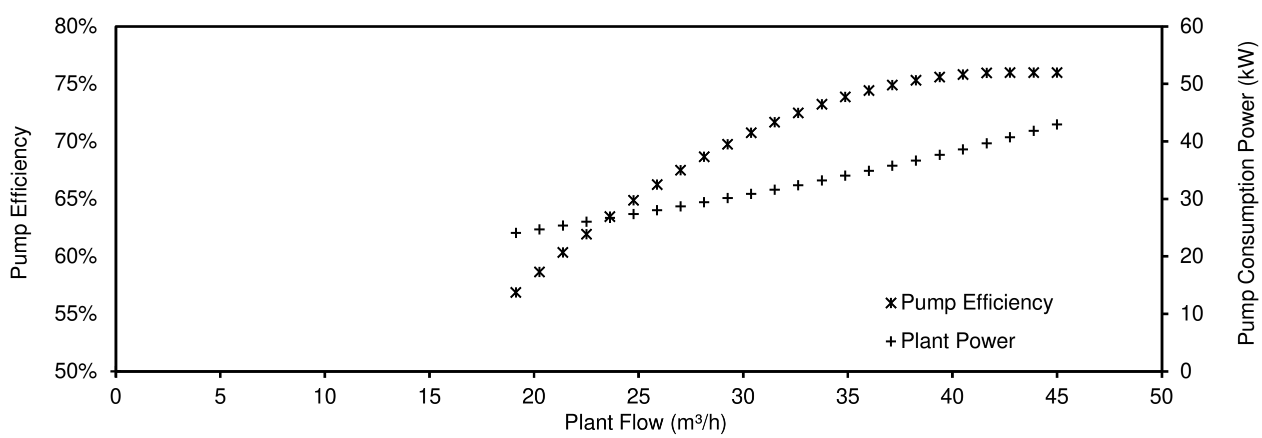
Percent Capacity	Plant Flow m³/h	Head Loss m	Net Head m	Jet / Run On	Turbine Efficiency	Generator Efficiency	Generator Power kW	Electrical Efficiency	Plant Power kW	Line Loss kW	Point of Sale kW
100%	45.00	-4.07	239.77	1	73.0%	95.0%	20.39	98.0%	19.98	0.209	19.77
97.5%	43.88	-3.87	239.97	1	73.0%	95.0%	19.90	98.0%	19.50	0.199	19.30
95.0%	42.75	-3.68	240.16	1	73.0%	95.0%	19.40	98.0%	19.01	0.189	18.83
92.5%	41.63	-3.48	240.36	1	73.0%	95.0%	18.90	98.0%	18.52	0.179	18.34
90.0%	40.50	-3.30	240.54	1	72.9%	95.0%	18.38	98.0%	18.01	0.169	17.84
87.5%	39.38	-3.12	240.72	1	72.7%	95.0%	17.84	98.0%	17.49	0.160	17.33
85.0%	38.25	-2.94	240.90	1	72.5%	95.0%	17.29	98.0%	16.95	0.150	16.80
82.5%	37.13	-2.77	241.07	1	72.2%	95.0%	16.73	98.0%	16.40	0.141	16.26
80.0%	36.00	-2.61	241.23	1	71.9%	95.0%	16.16	98.0%	15.84	0.131	15.71
77.5%	34.88	-2.45	241.39	1	71.5%	95.0%	15.58	98.0%	15.27	0.122	15.15
75.0%	33.75	-2.29	241.55	1	71.0%	95.0%	14.99	98.0%	14.69	0.113	14.58
72.5%	32.63	-2.14	241.70	1	70.5%	95.0%	14.39	98.0%	14.10	0.104	14.00
70.0%	31.50	-2.00	241.84	1	69.9%	95.0%	13.79	98.0%	13.51	0.095	13.41
67.5%	30.38	-1.86	241.98	1	69.3%	95.0%	13.18	98.0%	12.91	0.087	12.83
65.0%	29.25	-1.72	242.12	1	68.5%	95.0%	12.57	98.0%	12.31	0.079	12.23
62.5%	28.13	-1.59	242.25	1	67.8%	95.0%	11.95	98.0%	11.71	0.072	11.64
60.0%	27.00	-1.47	242.37	1	66.9%	95.0%	11.34	98.0%	11.11	0.065	11.05
57.5%	25.88	-1.35	242.49	1	66.0%	95.0%	10.72	98.0%	10.51	0.058	10.45
55.0%	24.75	-1.23	242.61	1	65.1%	95.0%	10.11	98.0%	9.91	0.051	9.86
52.5%	23.63	-1.12	242.72	1	64.0%	95.0%	9.51	98.0%	9.32	0.045	9.27
50.0%	22.50	-1.02	242.82	1	63.0%	95.0%	8.90	98.0%	8.73	0.040	8.69
47.5%	21.38	-0.92	242.92	1	61.8%	95.0%	8.31	98.0%	8.14	0.035	8.11
45.0%	20.25	-0.82	243.02	1	60.6%	95.0%	7.72	98.0%	7.57	0.030	7.54
42.5%	19.13	-0.74	243.10	1	59.3%	95.0%	7.14	98.0%	7.00	0.026	6.97
40.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
37.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
35.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
32.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
30.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
27.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
25.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
22.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
20.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
17.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
15.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
12.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
10.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
7.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
5.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
2.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
0.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00



John Day Renewable - Pump Storage Hydro
Low Demand Within John Day Scenario, 45 m³/hr Pump-Turbine Capacity

Pump Performance Characteristics

Percent Capacity	Plant Flow m³/h	Head Loss m	Net Head m	Jet / Run On	Pump Efficiency	Generator Efficiency	Generator Power kW	Electrical Efficiency	Plant Power kW	Line Loss kW	Point of Sale kW
100%	45.00	4.07	247.91	1	76.0%	95.0%	42.11	98.0%	42.97	0.964	42.00
97.5%	43.88	3.87	247.71	1	76.0%	95.0%	41.02	98.0%	41.86	0.915	40.94
95.0%	42.75	3.68	247.52	1	76.0%	95.0%	39.94	98.0%	40.75	0.868	39.88
92.5%	41.63	3.48	247.32	1	76.0%	95.0%	38.88	98.0%	39.67	0.822	38.85
90.0%	40.50	3.30	247.14	1	75.8%	95.0%	37.86	98.0%	38.64	0.780	37.86
87.5%	39.38	3.12	246.96	1	75.6%	95.0%	36.89	98.0%	37.64	0.740	36.90
85.0%	38.25	2.94	246.78	1	75.3%	95.0%	35.96	98.0%	36.69	0.703	35.99
82.5%	37.13	2.77	246.61	1	74.9%	95.0%	35.06	98.0%	35.77	0.669	35.10
80.0%	36.00	2.61	246.45	1	74.4%	95.0%	34.19	98.0%	34.89	0.636	34.25
77.5%	34.88	2.45	246.29	1	73.9%	95.0%	33.35	98.0%	34.03	0.605	33.43
75.0%	33.75	2.29	246.13	1	73.2%	95.0%	32.54	98.0%	33.21	0.576	32.63
72.5%	32.63	2.14	245.98	1	72.5%	95.0%	31.76	98.0%	32.41	0.549	31.86
70.0%	31.50	2.00	245.84	1	71.7%	95.0%	31.00	98.0%	31.63	0.523	31.11
67.5%	30.38	1.86	245.70	1	70.8%	95.0%	30.26	98.0%	30.87	0.498	30.38
65.0%	29.25	1.72	245.56	1	69.8%	95.0%	29.54	98.0%	30.14	0.475	29.67
62.5%	28.13	1.59	245.43	1	68.7%	95.0%	28.83	98.0%	29.42	0.452	28.97
60.0%	27.00	1.47	245.31	1	67.5%	95.0%	28.15	98.0%	28.72	0.431	28.29
57.5%	25.88	1.35	245.19	1	66.2%	95.0%	27.47	98.0%	28.03	0.411	27.62
55.0%	24.75	1.23	245.07	1	64.9%	95.0%	26.81	98.0%	27.36	0.391	26.97
52.5%	23.63	1.12	244.96	1	63.5%	95.0%	26.16	98.0%	26.69	0.372	26.32
50.0%	22.50	1.02	244.86	1	61.9%	95.0%	25.51	98.0%	26.03	0.354	25.68
47.5%	21.38	0.92	244.76	1	60.3%	95.0%	24.87	98.0%	25.38	0.337	25.04
45.0%	20.25	0.82	244.66	1	58.6%	95.0%	24.23	98.0%	24.73	0.319	24.41
42.5%	19.13	0.74	244.58	1	56.9%	95.0%	23.59	98.0%	24.08	0.303	23.77
40.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
37.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
35.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
32.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
30.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
27.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
25.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
22.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
20.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
17.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
15.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
12.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
10.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
7.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
5.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
2.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
0.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00



John Day Renewable - Pump Storage Hydro

Yearly Supply and Demand Balance Scenario, 45 m³/hr Pump-Turbine Capacity

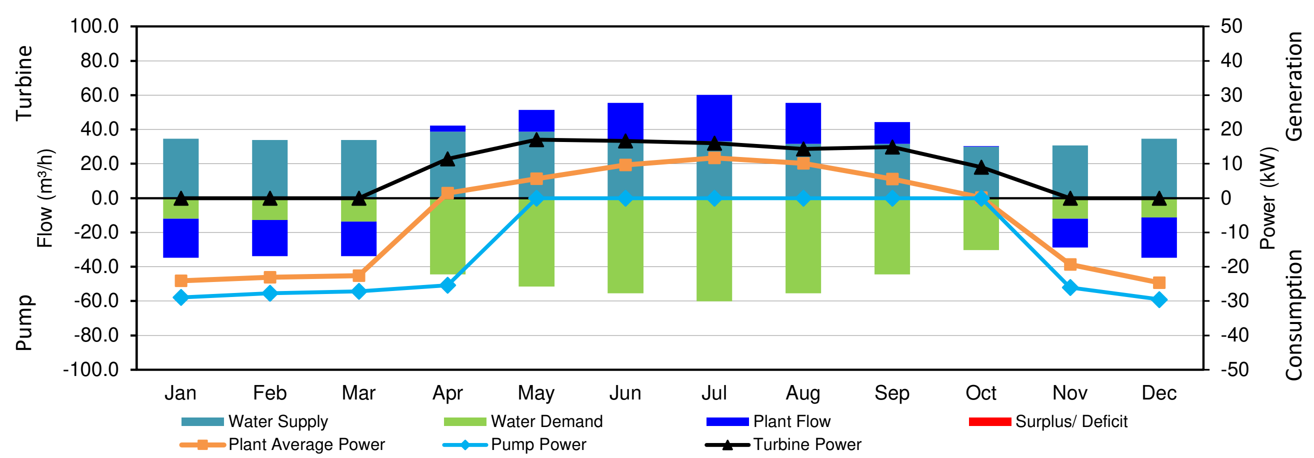
Power and Energy Simulation Summary

	Turbine	Pump	Ave. Plant	
Max Plant Capacity:	20.0	-34.6	-5.7	kW
Average Annual Energy:	31,735	-82,055	-50,320	kWh
Yearly Capacity Factor:	18%	22%	40%	
Generator Efficiency:	95.0%			
Plant Electrical Efficiency:	98.0%			
Downtime Losses:	2%			
Maximum Flow:	45.0	45.0	m³/h	
Minimum Flow:	18.0	18.0	m³/h	
Max Capacity:	20.0	-43.0	kW	
Interconnection Voltage:	0.480 kV			
Interconnection Line Length:	0.3 km			
Interconnection Loss at Capacity:	2.2%			

Normal Upper Reservoir El.:	1189 m
Turbine / Pump El.:	945 m
Lower Reservoir El.:	945 m
Gross Head:	244 m
Headloss at Maximum Flow:	4.1 m
Headloss Percentage:	1.7%
Total Penstock Length:	4800 m
Total Tailrace Conduit Length:	0 m
Penstock Diameter:	0.203 m or 8"
Penstock Velocity:	0.39 m/s
Upper Reservoir Max Capacity:	N/A m³
Upper Reservoir Max Volume Change:	75,602 m³
Upper Reservoir Start / Finish Vol. Change:	0 m³
Lower Reservoir Max Capacity:	1,893 m³
Lower Reservoir Pump/Tur. Dead Band:	190 m³
Lower Reservoir Max Volume Change:	1,639 m³
Lower Reservoir Start / Finish Vol. Change:	0 m³

	Turbine		Pump	
Selected Turbine:	Vert. Turb as Turbine		Vert. Turb. as Pump	
	Flow	Efficiency	Flow	Efficiency
Minimum	40%	58.0%	40%	55.0%
Peak	95%	73.0%	95%	76.0%
Maximum	100%	73.0%	100%	76.0%

	Water Supply	Water Demand	Plant Flow (m³/h)	Surplus/ Deficit (m³/h)	Turbine Power (kW)	Turbine Capacity Factor	Pump Power (kW)	Pump Capacity Factor	Energy Turbine (kWh)	Energy Pump (kWh)	Energy Total (kWh)
Max	38.6	-8.4	45.00	0.00	19.98	85%	-34.60	69%	8,441	-18,222	-18,222
Avg	33.7	-33.7	0.00	0.00	15.46	41%	-27.91	32%	2,645	-6,838	-4,193
Min	30.0	-90.2	-35.62	0.00	7.01	0%	-23.44	0%	0	0	8,441
Jan	34.7	-12.0	-22.7	0.0	0.0	0%	-28.9	67%	0	-17,823	-17,823
Feb	33.9	-12.8	-21.1	0.0	0.0	0%	-27.7	64%	0	-15,423	-15,423
Mar	33.9	-13.6	-20.3	0.0	0.0	0%	-27.1	63%	0	-16,714	-16,714
Apr	38.6	-44.4	3.7	0.0	11.4	57%	-25.4	59%	1,091	-50	1,041
May	38.6	-51.5	12.8	0.0	17.1	85%	0.0	0%	4,094	0	4,094
Jun	33.1	-55.4	22.3	0.0	16.6	83%	0.0	0%	6,781	0	6,781
Jul	33.1	-60.2	27.0	0.0	16.0	80%	0.0	0%	8,441	0	8,441
Aug	31.5	-55.4	23.9	0.0	14.3	72%	0.0	0%	7,341	0	7,341
Sep	31.5	-44.4	12.8	0.0	14.9	75%	0.0	0%	3,899	0	3,899
Oct	30.0	-30.2	0.3	0.0	9.0	45%	0.0	0%	88	0	88
Nov	30.8	-12.0	-16.7	0.0	0.0	0%	-26.0	61%	0	-13,822	-13,822
Dec	34.7	-11.3	-23.4	0.0	0.0	0%	-29.5	69%	0	-18,222	-18,222



Rev	Description	Date	ENG	CHK
A	Draft Issued for Review	3-May-24	MM	RS

John Day Renewable - Pump Storage Hydro

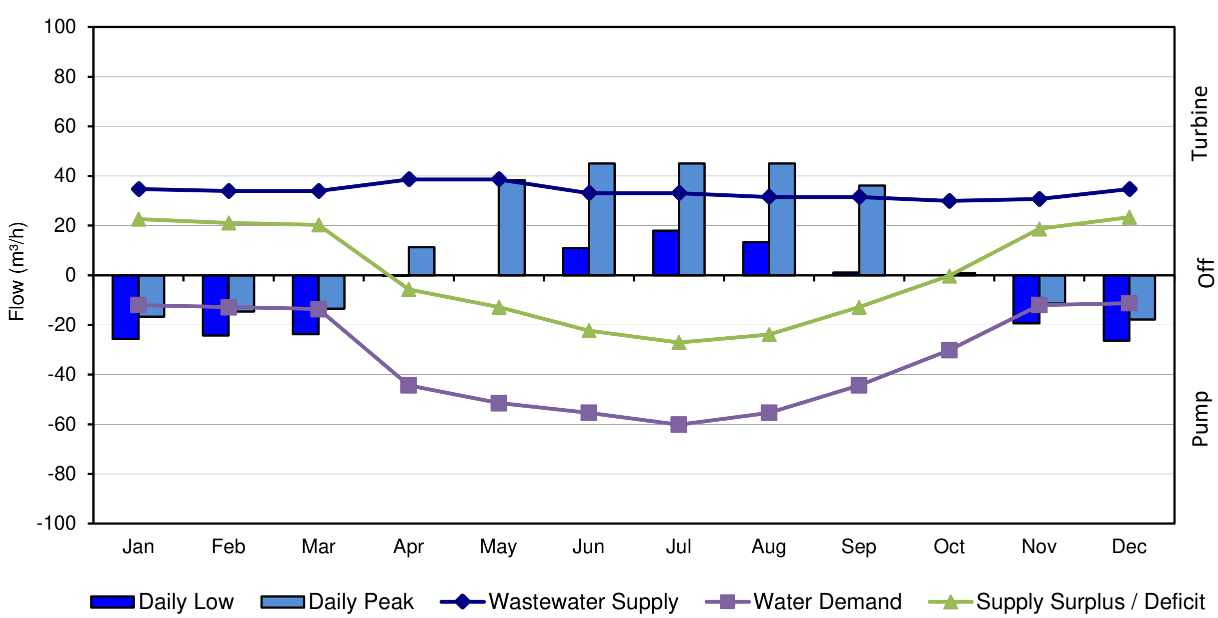
Yearly Supply and Demand Balance Scenario, 45 m³/hr Pump-Turbine Capacity

Power and Energy Scenarios

	Daily Low	Daily Peak
Start Hour	16	8
End Hour	8	16
Duration (hr)	16	8
Water Demand Var. From Avg.	0.75	1.50

Yearly Volume Summary (m³)		
Water Supply	295,337	100%
Water Demand	-295,337	100%
Surplus/ Deficit	0	0%
Turbine	75,602	26%
Pump	-75,602	26%
Pump / Turbine Var.	0	0%

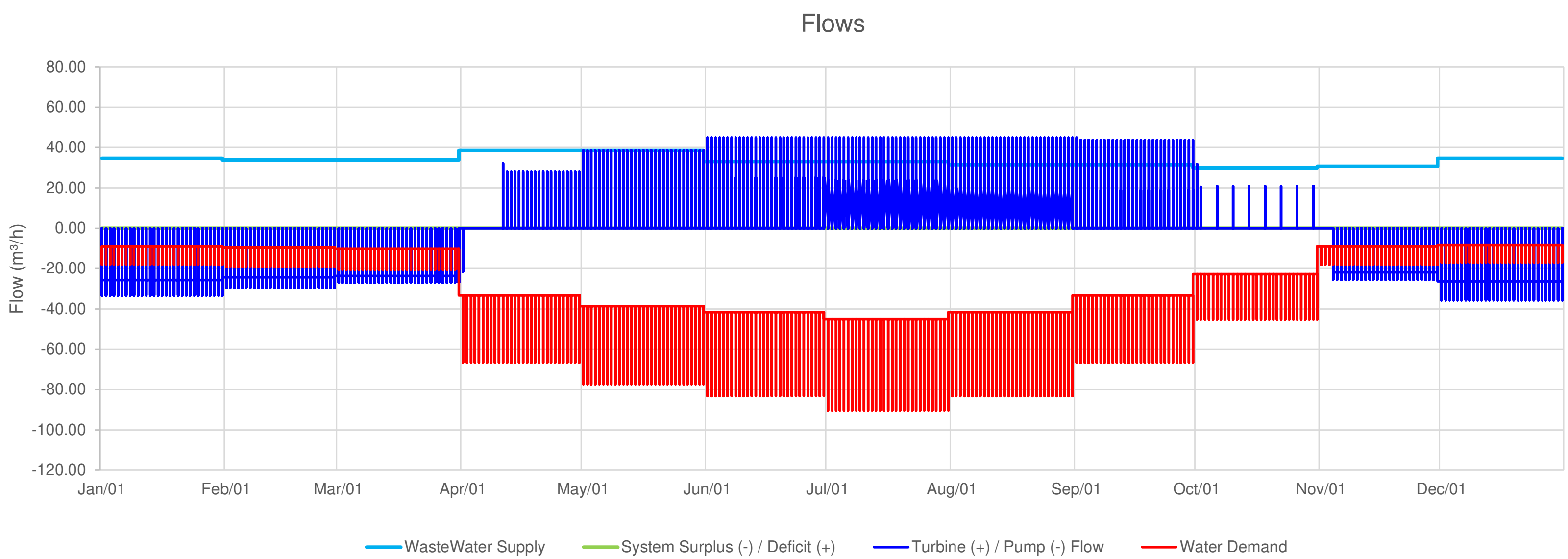
Month	Daily Average			Daily Low		Daily Peak		Daily Ave	
	Wastewater Supply (m³/h)	Water Demand (m³/h)	Supply Surplus / Deficit (m³/h)	Pumping / Turb / Off	Ave. Flow (m³/h)	Pumping / Turb / Off	Ave. Flow (m³/h)	Pumping / Turb / Off	Ave. Flow (m³/h)
Jan	34.7	-12.0	22.7	Pump	-25.7	Pump	-16.6	Pump	-22.7
Feb	33.9	-12.8	21.1	Pump	-24.3	Pump	-14.7	Pump	-21.1
Mar	33.9	-13.6	20.3	Pump	-23.7	Pump	-13.5	Pump	-20.3
Apr	38.6	-44.4	-5.7	Pump	-0.1	Turbine	11.3	Turbine	3.7
May	38.6	-51.5	-12.8	Off	0.0	Turbine	38.3	Turbine	12.8
Jun	33.1	-55.4	-22.3	Turbine	10.9	Turbine	45.0	Turbine	22.3
Jul	33.1	-60.2	-27.0	Turbine	18.0	Turbine	45.0	Turbine	27.0
Aug	31.5	-55.4	-23.9	Turbine	13.3	Turbine	45.0	Turbine	23.9
Sep	31.5	-44.4	-12.8	Turbine	1.2	Turbine	36.1	Turbine	12.8
Oct	30.0	-30.2	-0.2	Off	0.0	Turbine	0.9	Turbine	0.3
Nov	30.8	-12.0	18.7	Pump	-19.3	Pump	-11.4	Pump	-16.7
Dec	34.7	-11.3	23.4	Pump	-26.3	Pump	-17.8	Pump	-23.4
Mth Min.	30.0	-11.3	-27.0	Pump	-26.3	Pump	-35.6	Pump	-35.6
Yearly Ave.	33.7	-33.6	0.1	Pump	-6.2	Turbine	12.4	Pump	0.0
Mth Max.	38.6	-60.2	23.4	Turbine	45.0	Turbine	45.0	Turbine	45.0
Day Low		-8.4							
Day Peak		-90.2							
Yearly Volume (m³)	295,337	-295,337	0	-36,329		36,329		0	

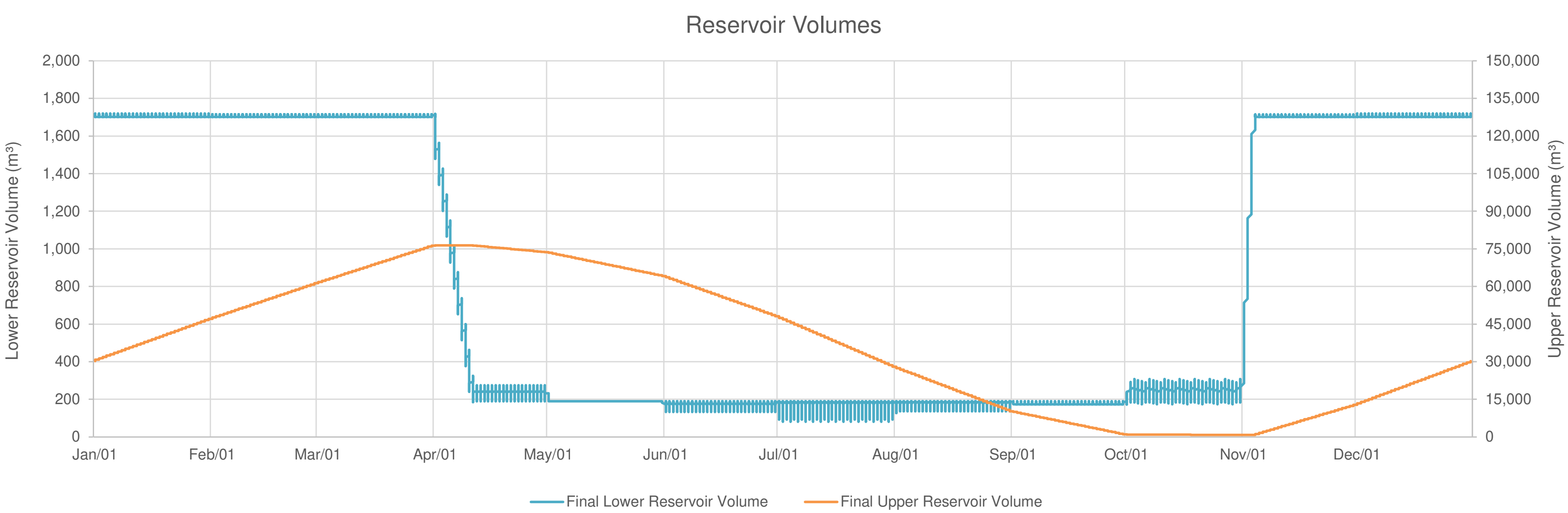


John Day Renewable - Pump Storage Hydro

Yearly Supply and Demand Balance Scenario, 45 m³/hr Pump-Turbine Capacity

Time Series Graphs





John Day Renewable - Pump Storage Hydro

Yearly Supply and Demand Balance Scenario, 45 m³/hr Pump-Turbine Capacity

Conveyance System Hydraulics

Penstock Losses

Friction	Section	Length (m)	Diameter (m)	Velocity (m/s)	Rough (mm)	Factor	Headloss (m)	Percent
	HDPE Pipe	2000	0.203	0.39	0.03	0.0212	1.58	38.9%
	Steel Pipe	2800	0.203	0.39	0.15	0.0232	2.44	59.8%

Transitions		Coefficient	Velocity (m/s)	Headloss (m)	
	Trashrack	1.00	0.40	0.01	0.2%
	Intake - Penstock Transition	0.00	0.39	0.00	0.0%
	HDPE Pipe - Steel Pipe Transition		0.39	0.00	0.0%
			0.39	0.00	
			0.00	0.00	

Bends	Section	No.	Coefficient	Total Coef.	Velocity (m/s)	Headloss (m)	
	HDPE Pipe	20	0.15	3.0	0.39	0.02	0.6%
	Steel Pipe	28	0.10	2.8	0.39	0.02	0.5%
	0	0	0.10	0.0	0.00	0.00	0.0%
	0	0	0.10	0.0	0.00	0.00	0.0%
					Total Headloss:	4.07 m	100%
					Penstock Headloss Coefficient:	0.0020 m/(m³/hr)2	

Tailrace Losses

Friction	Section	Length (m)	Diameter (m)	Velocity (m/s)	Rough (mm)	Factor	Headloss (m)	Percent
	Steel Pipe	0	0.203	0.39	0.15	0.0232	0.00	

Transitions		Coefficient	Velocity (m/s)	Headloss (m)
	Trashrack	0.00	0.40	0.00
	Intake - Penstock Transition	0.00	0.39	0.00
		0.00	0.39	0.00

Bends	Section	No.	Coefficient	Total Coef.	Velocity (m/s)	Headloss (m)
	Steel Pipe	0	0.10	0.0	0.39	0.00
	0	0	0.10	0.0	0.00	0.00
					Total Headloss:	0.00 m
					Tailrace Headloss Coefficient:	0.0000 m/(m³/hr)2

Turbine and Transmission Line Data and Calculations

Transmission Line

Input Data		
Line Voltage	0.480	kV
Conductor Name	2/0	
Wire Size	133.0	kcmil
Resistance (per phase)	0.3250	Ω/km
Length	0.3	km
Plant Capacity	42.97	kW
Power Factor	0.90	cos ϕ

Calculations		
Current per Phase	57.4	A
Resistance per Phase	0.10	Ω
Loss per Phase	0.32	kW
Total Loss	0.96	kW
Percent of Plant Capacity	2.2%	
Loss Factor	0.000522	

Conductor Resistance Table

Name	Size kcmil	Resistance Ω/km	Ampacity 90°C (A)
Partridge	266.8	0.2136	
Tulip	336.4	0.1693	
Cosmos	477.0	0.1194	
Orchid	636.0	0.0896	
2/0	133.0	0.3250	
3/0	166.1	0.2230	
4/0	210.4	0.1970	
Kcmil 250	250.0	0.1388	
Kcmil 350	350.0	0.0990	
Kcmil 500	500.0	0.0694	
Kcmil 750	750.0	0.0463	
Kcmil 100(	1000.0	0.0347	

Turbine Efficiency

Turbine	Min Q	Min E	Peak Q	Peak E	Max E
Horz Split as Pump	20%	27.0%	95%	58.0%	58.0%
Horz Split as Turbine	20%	27.0%	95%	76.0%	55.0%
Vert. Turb. as Pump	40%	55.0%	95%	76.0%	76.0%
Vert. Turb as Turbine	40%	58.0%	95%	73.0%	73.0%

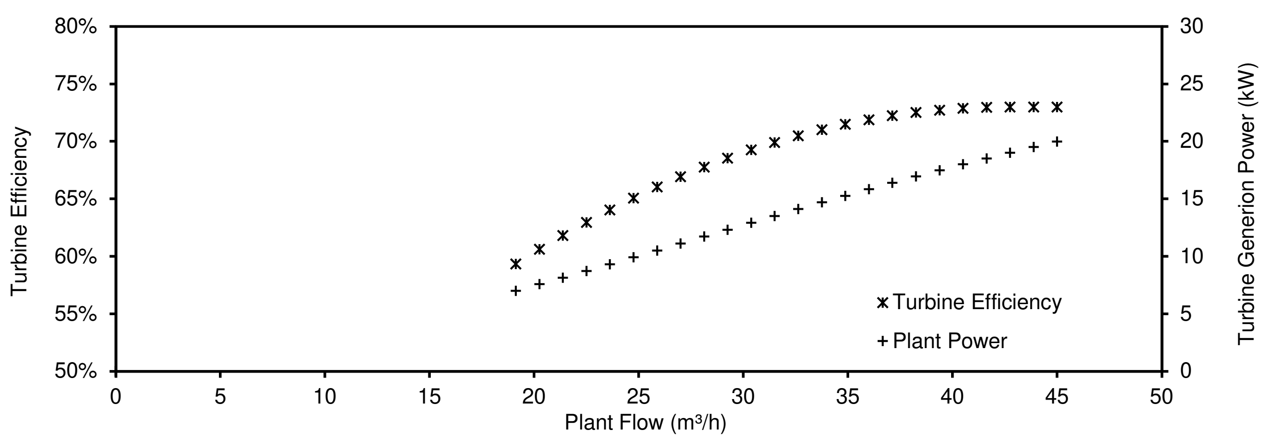
Generator Efficiency

Synchron Generator	95.0%

John Day Renewable - Pump Storage Hydro
Yearly Supply and Demand Balance Scenario, 45 m³/hr Pump-Turbine Capacity

Turbine Performance Characteristics

Percent Capacity	Plant Flow m³/h	Head Loss m	Net Head m	Jet / Run On	Turbine Efficiency	Generator Efficiency	Generator Power kW	Electrical Efficiency	Plant Power kW	Line Loss kW	Point of Sale kW
100%	45.00	-4.07	239.77	1	73.0%	95.0%	20.39	98.0%	19.98	0.209	19.77
97.5%	43.88	-3.87	239.97	1	73.0%	95.0%	19.90	98.0%	19.50	0.199	19.30
95.0%	42.75	-3.68	240.16	1	73.0%	95.0%	19.40	98.0%	19.01	0.189	18.83
92.5%	41.63	-3.48	240.36	1	73.0%	95.0%	18.90	98.0%	18.52	0.179	18.34
90.0%	40.50	-3.30	240.54	1	72.9%	95.0%	18.38	98.0%	18.01	0.169	17.84
87.5%	39.38	-3.12	240.72	1	72.7%	95.0%	17.84	98.0%	17.49	0.160	17.33
85.0%	38.25	-2.94	240.90	1	72.5%	95.0%	17.29	98.0%	16.95	0.150	16.80
82.5%	37.13	-2.77	241.07	1	72.2%	95.0%	16.73	98.0%	16.40	0.141	16.26
80.0%	36.00	-2.61	241.23	1	71.9%	95.0%	16.16	98.0%	15.84	0.131	15.71
77.5%	34.88	-2.45	241.39	1	71.5%	95.0%	15.58	98.0%	15.27	0.122	15.15
75.0%	33.75	-2.29	241.55	1	71.0%	95.0%	14.99	98.0%	14.69	0.113	14.58
72.5%	32.63	-2.14	241.70	1	70.5%	95.0%	14.39	98.0%	14.10	0.104	14.00
70.0%	31.50	-2.00	241.84	1	69.9%	95.0%	13.79	98.0%	13.51	0.095	13.41
67.5%	30.38	-1.86	241.98	1	69.3%	95.0%	13.18	98.0%	12.91	0.087	12.83
65.0%	29.25	-1.72	242.12	1	68.5%	95.0%	12.57	98.0%	12.31	0.079	12.23
62.5%	28.13	-1.59	242.25	1	67.8%	95.0%	11.95	98.0%	11.71	0.072	11.64
60.0%	27.00	-1.47	242.37	1	66.9%	95.0%	11.34	98.0%	11.11	0.065	11.05
57.5%	25.88	-1.35	242.49	1	66.0%	95.0%	10.72	98.0%	10.51	0.058	10.45
55.0%	24.75	-1.23	242.61	1	65.1%	95.0%	10.11	98.0%	9.91	0.051	9.86
52.5%	23.63	-1.12	242.72	1	64.0%	95.0%	9.51	98.0%	9.32	0.045	9.27
50.0%	22.50	-1.02	242.82	1	63.0%	95.0%	8.90	98.0%	8.73	0.040	8.69
47.5%	21.38	-0.92	242.92	1	61.8%	95.0%	8.31	98.0%	8.14	0.035	8.11
45.0%	20.25	-0.82	243.02	1	60.6%	95.0%	7.72	98.0%	7.57	0.030	7.54
42.5%	19.13	-0.74	243.10	1	59.3%	95.0%	7.14	98.0%	7.00	0.026	6.97
40.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
37.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
35.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
32.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
30.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
27.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
25.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
22.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
20.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
17.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
15.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
12.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
10.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
7.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
5.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
2.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
0.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00

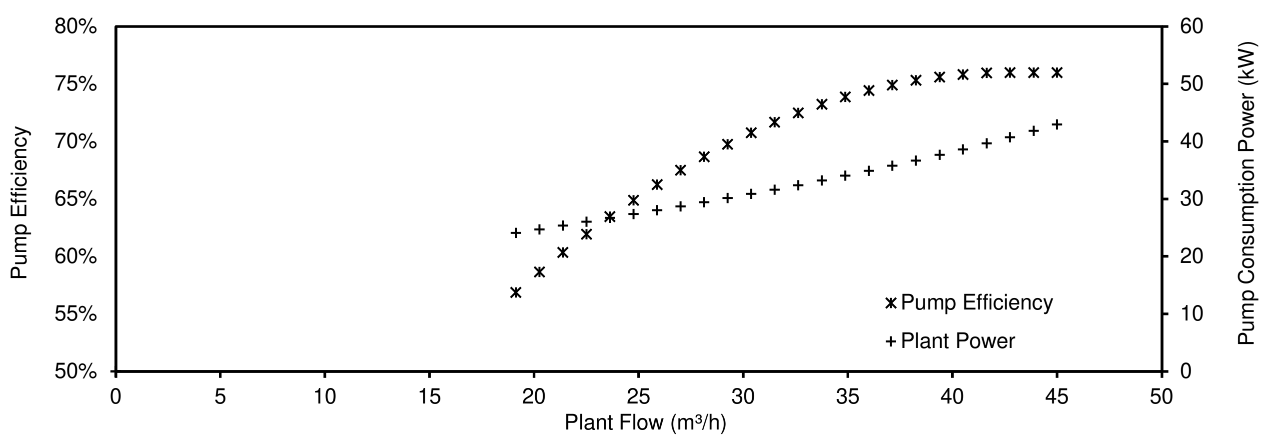


John Day Renewable - Pump Storage Hydro

Yearly Supply and Demand Balance Scenario, 45 m³/hr Pump-Turbine Capacity

Pump Performance Characteristics

Percent Capacity	Plant Flow m³/h	Head Loss m	Net Head m	Jet / Run On	Pump Efficiency	Generator Efficiency	Generator Power kW	Electrical Efficiency	Plant Power kW	Line Loss kW	Point of Sale kW
100%	45.00	4.07	247.91	1	76.0%	95.0%	42.11	98.0%	42.97	0.964	42.00
97.5%	43.88	3.87	247.71	1	76.0%	95.0%	41.02	98.0%	41.86	0.915	40.94
95.0%	42.75	3.68	247.52	1	76.0%	95.0%	39.94	98.0%	40.75	0.868	39.88
92.5%	41.63	3.48	247.32	1	76.0%	95.0%	38.88	98.0%	39.67	0.822	38.85
90.0%	40.50	3.30	247.14	1	75.8%	95.0%	37.86	98.0%	38.64	0.780	37.86
87.5%	39.38	3.12	246.96	1	75.6%	95.0%	36.89	98.0%	37.64	0.740	36.90
85.0%	38.25	2.94	246.78	1	75.3%	95.0%	35.96	98.0%	36.69	0.703	35.99
82.5%	37.13	2.77	246.61	1	74.9%	95.0%	35.06	98.0%	35.77	0.669	35.10
80.0%	36.00	2.61	246.45	1	74.4%	95.0%	34.19	98.0%	34.89	0.636	34.25
77.5%	34.88	2.45	246.29	1	73.9%	95.0%	33.35	98.0%	34.03	0.605	33.43
75.0%	33.75	2.29	246.13	1	73.2%	95.0%	32.54	98.0%	33.21	0.576	32.63
72.5%	32.63	2.14	245.98	1	72.5%	95.0%	31.76	98.0%	32.41	0.549	31.86
70.0%	31.50	2.00	245.84	1	71.7%	95.0%	31.00	98.0%	31.63	0.523	31.11
67.5%	30.38	1.86	245.70	1	70.8%	95.0%	30.26	98.0%	30.87	0.498	30.38
65.0%	29.25	1.72	245.56	1	69.8%	95.0%	29.54	98.0%	30.14	0.475	29.67
62.5%	28.13	1.59	245.43	1	68.7%	95.0%	28.83	98.0%	29.42	0.452	28.97
60.0%	27.00	1.47	245.31	1	67.5%	95.0%	28.15	98.0%	28.72	0.431	28.29
57.5%	25.88	1.35	245.19	1	66.2%	95.0%	27.47	98.0%	28.03	0.411	27.62
55.0%	24.75	1.23	245.07	1	64.9%	95.0%	26.81	98.0%	27.36	0.391	26.97
52.5%	23.63	1.12	244.96	1	63.5%	95.0%	26.16	98.0%	26.69	0.372	26.32
50.0%	22.50	1.02	244.86	1	61.9%	95.0%	25.51	98.0%	26.03	0.354	25.68
47.5%	21.38	0.92	244.76	1	60.3%	95.0%	24.87	98.0%	25.38	0.337	25.04
45.0%	20.25	0.82	244.66	1	58.6%	95.0%	24.23	98.0%	24.73	0.319	24.41
42.5%	19.13	0.74	244.58	1	56.9%	95.0%	23.59	98.0%	24.08	0.303	23.77
40.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
37.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
35.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
32.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
30.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
27.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
25.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
22.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
20.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
17.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
15.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
12.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
10.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
7.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
5.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
2.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
0.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00



John Day Renewable - Pump Storage Hydro

Daily Supply and Demand Balance Scenario, 45 m³/hr Pump-Turbine Capacity

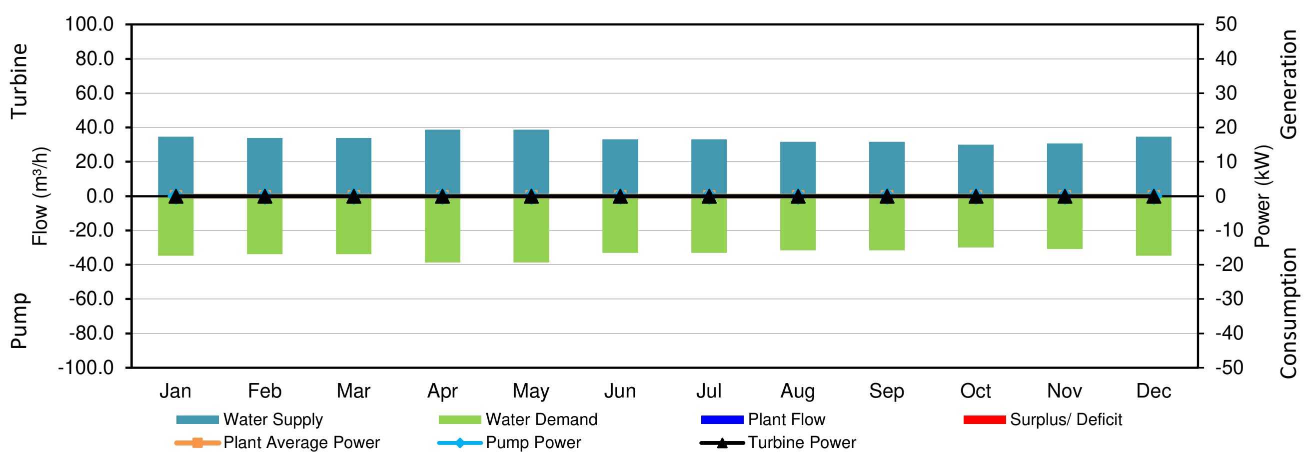
Power and Energy Simulation Summary

	Turbine	Pump	Ave. Plant	
Max Plant Capacity:	0.0	0.0	0.0	kW
Average Annual Energy:	0	0	0	kWh
Yearly Capacity Factor:	0%	0%	0%	
Generator Efficiency:	95.0%			
Plant Electrical Efficiency:	98.0%			
Downtime Losses:	2%			
Maximum Flow:	45.0	45.0	m³/h	
Minimum Flow:	18.0	18.0	m³/h	
Max Capacity:	20.0	-43.0	kW	
Interconnection Voltage:	0.480 kV			
Interconnection Line Length:	0.3 km			
Interconnection Loss at Capacity:	2.2%			

Normal Upper Reservoir El.:	1189 m
Turbine / Pump El.:	945 m
Lower Reservoir El.:	945 m
Gross Head:	244 m
Headloss at Maximum Flow:	4.1 m
Headloss Percentage:	1.7%
Total Penstock Length:	4800 m
Total Tailrace Conduit Length:	0 m
Penstock Diameter:	0.203 m or 8"
Penstock Velocity:	0.39 m/s
Upper Reservoir Max Capacity:	N/A m³
Upper Reservoir Max Volume Change:	0 m³
Upper Reservoir Start / Finish Vol. Change:	0 m³
Lower Reservoir Max Capacity:	1,893 m³
Lower Reservoir Pump/Tur. Dead Band:	190 m³
Lower Reservoir Max Volume Change:	309 m³
Lower Reservoir Start / Finish Vol. Change:	0 m³

	Turbine		Pump	
Selected Turbine:	Vert. Turb as Turbine		Vert. Turb. as Pump	
	Flow	Efficiency	Flow	Efficiency
Minimum	40%	58.0%	40%	55.0%
Peak	95%	73.0%	95%	76.0%
Maximum	100%	73.0%	100%	76.0%

	Water Supply	Water Demand	Plant Flow (m³/h)	Surplus/ Deficit (m³/h)	Turbine Power (kW)	Turbine Capacity Factor	Pump Power (kW)	Pump Capacity Factor	Energy Turbine (kWh)	Energy Pump (kWh)	Energy Total (kWh)
Max	38.6	-15.0	0.00	0.00	0.00	0%	0.00	0%	0	0	0
Avg	33.7	-33.7	0.00	0.00	#DIV/0!	0%	#DIV/0!	0%	0	0	0
Min	30.0	-77.3	0.00	0.00	0.00	0%	0.00	0%	0	0	0
Jan	34.7	-34.7	0.0	0.0	0.0	0%	0.0	0%	0	0	0
Feb	33.9	-33.9	0.0	0.0	0.0	0%	0.0	0%	0	0	0
Mar	33.9	-33.9	0.0	0.0	0.0	0%	0.0	0%	0	0	0
Apr	38.6	-38.6	0.0	0.0	0.0	0%	0.0	0%	0	0	0
May	38.6	-38.6	0.0	0.0	0.0	0%	0.0	0%	0	0	0
Jun	33.1	-33.1	0.0	0.0	0.0	0%	0.0	0%	0	0	0
Jul	33.1	-33.1	0.0	0.0	0.0	0%	0.0	0%	0	0	0
Aug	31.5	-31.5	0.0	0.0	0.0	0%	0.0	0%	0	0	0
Sep	31.5	-31.5	0.0	0.0	0.0	0%	0.0	0%	0	0	0
Oct	30.0	-30.0	0.0	0.0	0.0	0%	0.0	0%	0	0	0
Nov	30.8	-30.8	0.0	0.0	0.0	0%	0.0	0%	0	0	0
Dec	34.7	-34.7	0.0	0.0	0.0	0%	0.0	0%	0	0	0



Rev	Description	Date	ENG	CHK
A	Draft Issued for Review	3-May-24	MM	RS

John Day Renewable - Pump Storage Hydro

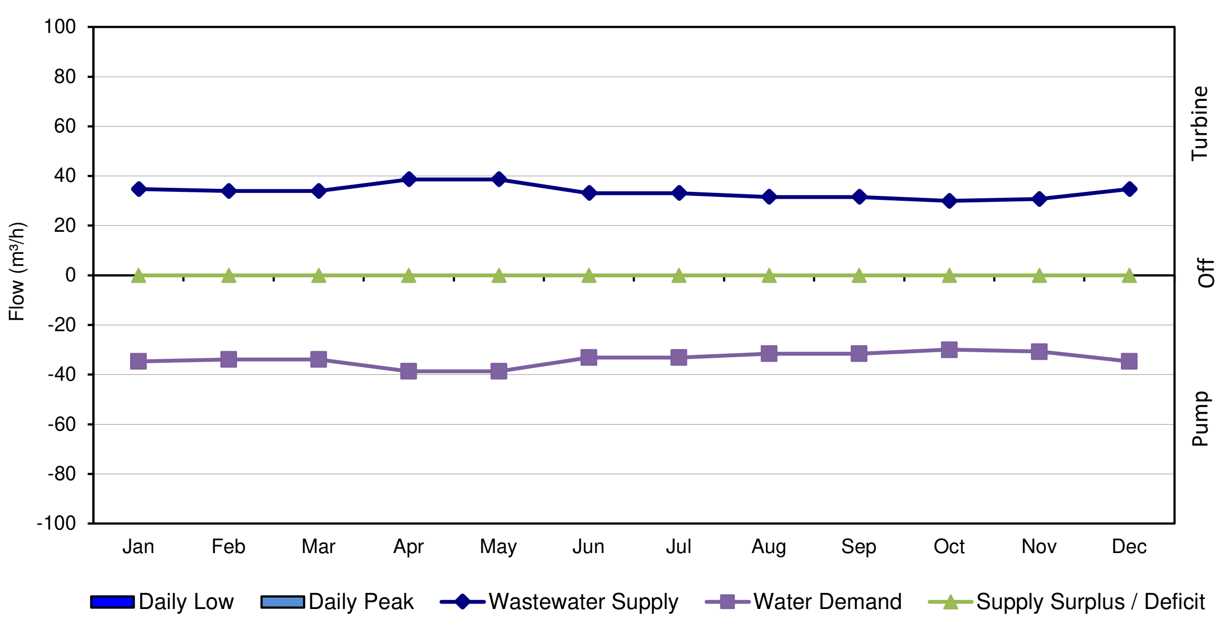
Daily Supply and Demand Balance Scenario, 45 m³/hr Pump-Turbine Capacity

Power and Energy Scenarios

	Daily Low	Daily Peak
Start Hour	16	8
End Hour	8	16
Duration (hr)	16	8
Water Demand Var. From Avg.	0.50	2.00

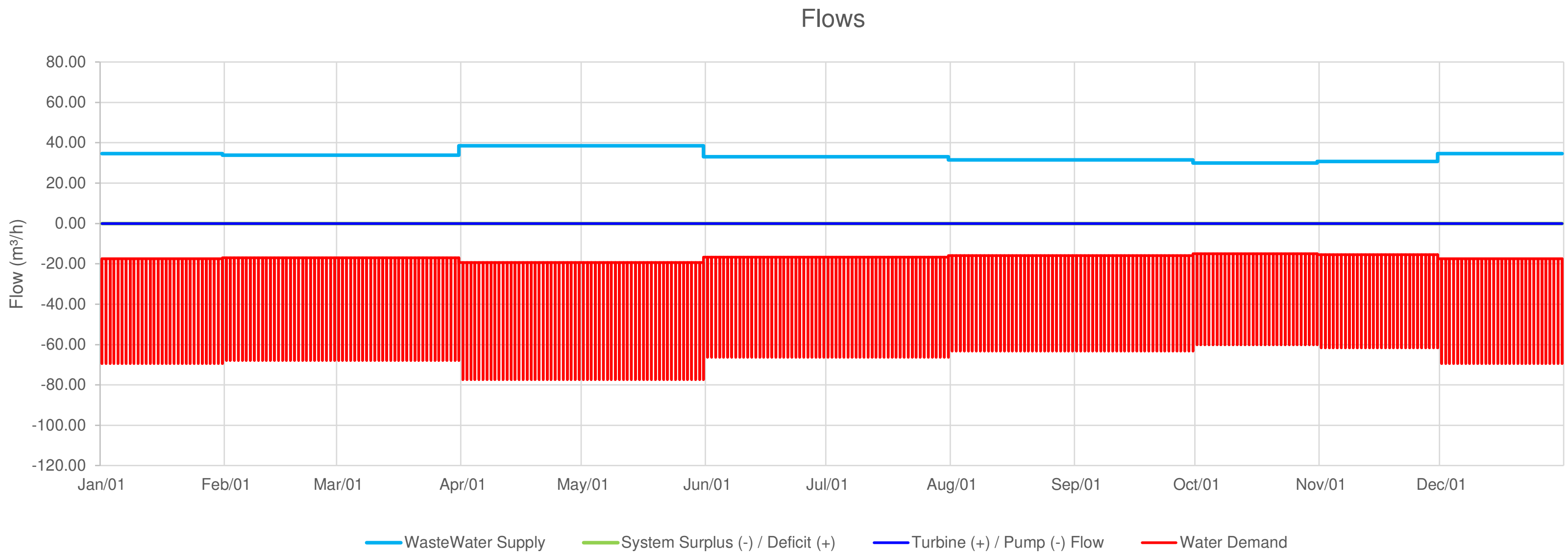
Yearly Volume Summary (m³)		
Water Supply	295,337	100%
Water Demand	-295,337	100%
Surplus/ Deficit	0	0%
Turbine	0	0%
Pump	0	0%
Pump / Turbine Var.	0	0%

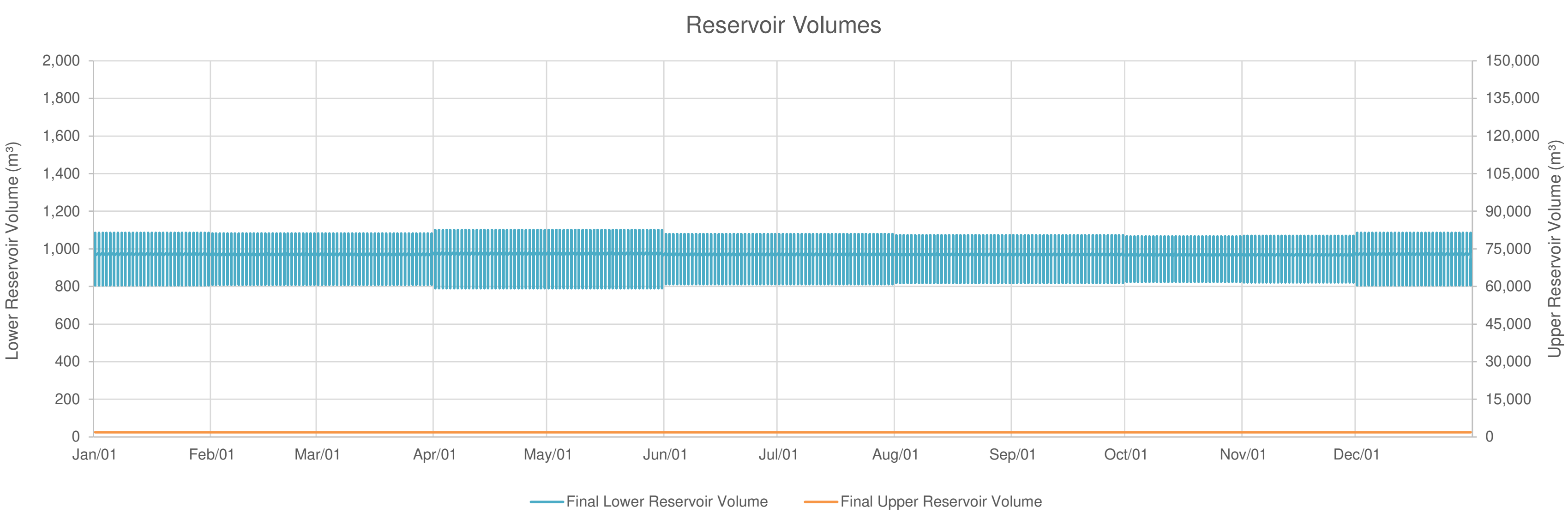
Month	Daily Average			Daily Low		Daily Peak		Daily Ave	
	Wastewater Supply (m³/h)	Water Demand (m³/h)	Supply Surplus / Deficit (m³/h)	Pumping / Turb / Off	Ave. Flow (m³/h)	Pumping / Turb / Off	Ave. Flow (m³/h)	Pumping / Turb / Off	Ave. Flow (m³/h)
Jan	34.7	-34.7	0.0	Off	0.0	Off	0.0	Off	0.0
Feb	33.9	-33.9	0.0	Off	0.0	Off	0.0	Off	0.0
Mar	33.9	-33.9	0.0	Off	0.0	Off	0.0	Off	0.0
Apr	38.6	-38.6	0.0	Off	0.0	Off	0.0	Off	0.0
May	38.6	-38.6	0.0	Off	0.0	Off	0.0	Off	0.0
Jun	33.1	-33.1	0.0	Off	0.0	Off	0.0	Off	0.0
Jul	33.1	-33.1	0.0	Off	0.0	Off	0.0	Off	0.0
Aug	31.5	-31.5	0.0	Off	0.0	Off	0.0	Off	0.0
Sep	31.5	-31.5	0.0	Off	0.0	Off	0.0	Off	0.0
Oct	30.0	-30.0	0.0	Off	0.0	Off	0.0	Off	0.0
Nov	30.8	-30.8	0.0	Off	0.0	Off	0.0	Off	0.0
Dec	34.7	-34.7	0.0	Off	0.0	Off	0.0	Off	0.0
Mth Min.	30.0	-30.0	0.0	Off	0.0	Off	0.0	Off	0.0
Yearly Ave.	33.7	-33.7	0.0	Off	0.0	Off	0.0	Off	0.0
Mth Max.	38.6	-38.6	0.0	Off	0.0	Off	0.0	Off	0.0
Day Low		-15.0							
Day Peak		-77.3							
Yearly Volume (m³)	295,337	-295,337	0	0		0		0	



John Day Renewable - Pump Storage Hydro
Daily Supply and Demand Balance Scenario, 45 m³/hr Pump-Turbine Capacity

Time Series Graphs





John Day Renewable - Pump Storage Hydro
Daily Supply and Demand Balance Scenario, 45 m³/hr Pump-Turbine Capacity

Conveyance System Hydraulics

Penstock Losses

Friction	Section	Length (m)	Diameter (m)	Velocity (m/s)	Rough (mm)	Factor	Headloss (m)	Percent
	HDPE Pipe	2000	0.203	0.39	0.03	0.0212	1.58	38.9%
	Steel Pipe	2800	0.203	0.39	0.15	0.0232	2.44	59.8%

Transitions		Coefficient	Velocity (m/s)	Headloss (m)	
	Trashrack	1.00	0.40	0.01	0.2%
	Intake - Penstock Transition	0.00	0.39	0.00	0.0%
	HDPE Pipe - Steel Pipe Transition		0.39	0.00	0.0%
			0.39	0.00	
			0.00	0.00	

Bends	Section	No.	Coefficient	Total Coef.	Velocity (m/s)	Headloss (m)	
	HDPE Pipe	20	0.15	3.0	0.39	0.02	0.6%
	Steel Pipe	28	0.10	2.8	0.39	0.02	0.5%
	0	0	0.10	0.0	0.00	0.00	0.0%
	0	0	0.10	0.0	0.00	0.00	0.0%

Total Headloss: 4.07 m 100%

Penstock Headloss Coefficient: 0.0020 m/(m³/hr)2

Tailrace Losses

Friction	Section	Length (m)	Diameter (m)	Velocity (m/s)	Rough (mm)	Factor	Headloss (m)	Percent
	Steel Pipe	0	0.203	0.39	0.15	0.0232	0.00	

Transitions		Coefficient	Velocity (m/s)	Headloss (m)
	Trashrack	0.00	0.40	0.00
	Intake - Penstock Transition	0.00	0.39	0.00
		0.00	0.39	0.00

Bends	Section	No.	Coefficient	Total Coef.	Velocity (m/s)	Headloss (m)
	Steel Pipe	0	0.10	0.0	0.39	0.00
	0	0	0.10	0.0	0.00	0.00

Total Headloss: 0.00 m

Tailrace Headloss Coefficient: 0.0000 m/(m³/hr)2

John Day Renewable - Pump Storage Hydro
Daily Supply and Demand Balance Scenario, 45 m³/hr Pump-Turbine Capacity

Turbine and Transmission Line Data and Calculations

Transmission Line

Input Data		
Line Voltage	0.480	kV
Conductor Name	2/0	
Wire Size	133.0	kcmil
Resistance (per phase)	0.3250	Ω/km
Length	0.3	km
Plant Capacity	42.97	kW
Power Factor	0.90	cos ϕ

Calculations		
Current per Phase	57.4	A
Resistance per Phase	0.10	Ω
Loss per Phase	0.32	kW
Total Loss	0.96	kW
Percent of Plant Capacity	2.2%	
Loss Factor	0.000522	

Conductor Resistance Table

Name	Size kcmil	Resistance Ω/km	Ampacity 90°C (A)
Partridge	266.8	0.2136	
Tulip	336.4	0.1693	
Cosmos	477.0	0.1194	
Orchid	636.0	0.0896	
2/0	133.0	0.3250	
3/0	166.1	0.2230	
4/0	210.4	0.1970	
Kcmil 250	250.0	0.1388	
Kcmil 350	350.0	0.0990	
Kcmil 500	500.0	0.0694	
Kcmil 750	750.0	0.0463	
Kcmil 100(	1000.0	0.0347	

Turbine Efficiency

Turbine	Min Q	Min E	Peak Q	Peak E	Max E
Horz Split as Pump	20%	27.0%	95%	58.0%	58.0%
Horz Split as Turbine	20%	27.0%	95%	76.0%	55.0%
Vert. Turb. as Pump	40%	55.0%	95%	76.0%	76.0%
Vert. Turb as Turbine	40%	58.0%	95%	73.0%	73.0%

Generator Efficiency

Synchron Generator	95.0%

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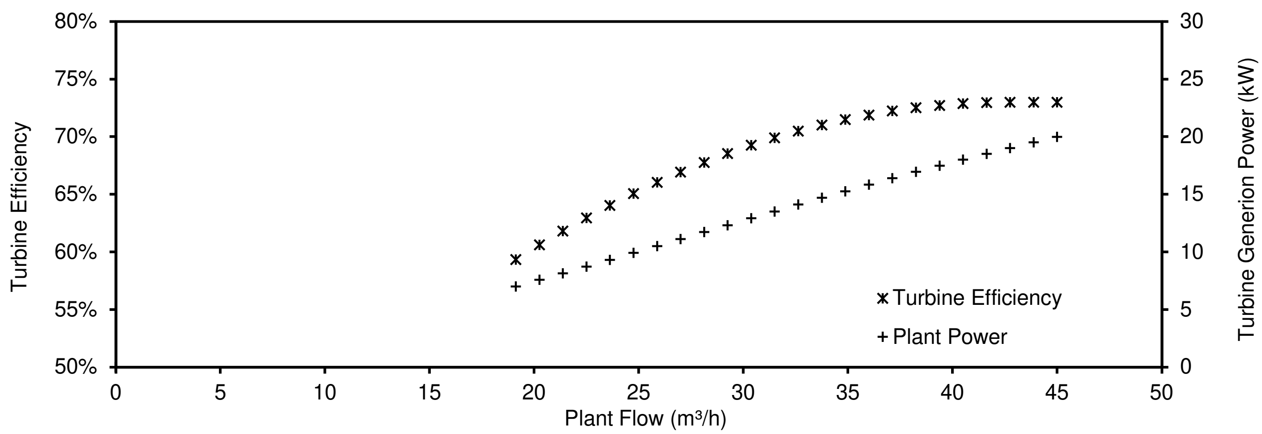
Turbine Performance Characteristics

Percent Capacity	Plant Flow m³/h	Head Loss m	Net Head m	Jet / Run On	Turbine Efficiency	Generator Efficiency	Generator Power kW	Electrical Efficiency	Plant Power kW	Line Loss kW	Point of Sale kW
100%	45.00	-4.07	239.77	1	73.0%	95.0%	20.39	98.0%	19.98	0.209	19.77
97.5%	43.88	-3.87	239.97	1	73.0%	95.0%	19.90	98.0%	19.50	0.199	19.30
95.0%	42.75	-3.68	240.16	1	73.0%	95.0%	19.40	98.0%	19.01	0.189	18.83
92.5%	41.63	-3.48	240.36	1	73.0%	95.0%	18.90	98.0%	18.52	0.179	18.34
90.0%	40.50	-3.30	240.54	1	72.9%	95.0%	18.38	98.0%	18.01	0.169	17.84
87.5%	39.38	-3.12	240.72	1	72.7%	95.0%	17.84	98.0%	17.49	0.160	17.33
85.0%	38.25	-2.94	240.90	1	72.5%	95.0%	17.29	98.0%	16.95	0.150	16.80
82.5%	37.13	-2.77	241.07	1	72.2%	95.0%	16.73	98.0%	16.40	0.141	16.26
80.0%	36.00	-2.61	241.23	1	71.9%	95.0%	16.16	98.0%	15.84	0.131	15.71
77.5%	34.88	-2.45	241.39	1	71.5%	95.0%	15.58	98.0%	15.27	0.122	15.15
75.0%	33.75	-2.29	241.55	1	71.0%	95.0%	14.99	98.0%	14.69	0.113	14.58
72.5%	32.63	-2.14	241.70	1	70.5%	95.0%	14.39	98.0%	14.10	0.104	14.00
70.0%	31.50	-2.00	241.84	1	69.9%	95.0%	13.79	98.0%	13.51	0.095	13.41
67.5%	30.38	-1.86	241.98	1	69.3%	95.0%	13.18	98.0%	12.91	0.087	12.83
65.0%	29.25	-1.72	242.12	1	68.5%	95.0%	12.57	98.0%	12.31	0.079	12.23
62.5%	28.13	-1.59	242.25	1	67.8%	95.0%	11.95	98.0%	11.71	0.072	11.64
60.0%	27.00	-1.47	242.37	1	66.9%	95.0%	11.34	98.0%	11.11	0.065	11.05
57.5%	25.88	-1.35	242.49	1	66.0%	95.0%	10.72	98.0%	10.51	0.058	10.45
55.0%	24.75	-1.23	242.61	1	65.1%	95.0%	10.11	98.0%	9.91	0.051	9.86
52.5%	23.63	-1.12	242.72	1	64.0%	95.0%	9.51	98.0%	9.32	0.045	9.27
50.0%	22.50	-1.02	242.82	1	63.0%	95.0%	8.90	98.0%	8.73	0.040	8.69
47.5%	21.38	-0.92	242.92	1	61.8%	95.0%	8.31	98.0%	8.14	0.035	8.11
45.0%	20.25	-0.82	243.02	1	60.6%	95.0%	7.72	98.0%	7.57	0.030	7.54
42.5%	19.13	-0.74	243.10	1	59.3%	95.0%	7.14	98.0%	7.00	0.026	6.97
40.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
37.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
35.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
32.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
30.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
27.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
25.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
22.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
20.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
17.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
15.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
12.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
10.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
7.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
5.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
2.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
0.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00



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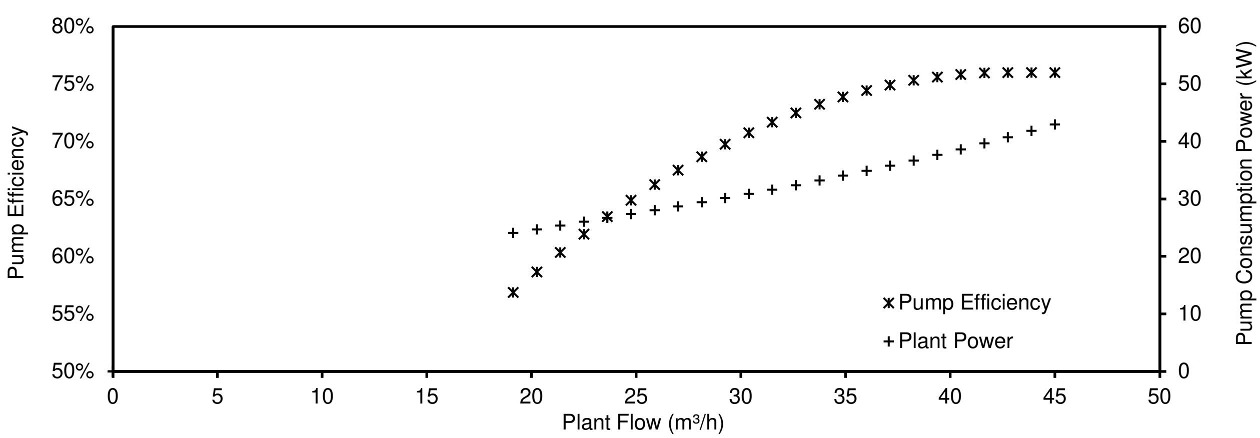
Daily Supply and Demand Balance Scenario, 45 m³/hr Pump-Turbine Capacity

Pump Performance Characteristics

Percent Capacity	Plant Flow m³/h	Head Loss m	Net Head m	Jet / Run On	Pump Efficiency	Generator Efficiency	Generator Power kW	Electrical Efficiency	Plant Power kW	Line Loss kW	Point of Sale kW
100%	45.00	4.07	247.91	1	76.0%	95.0%	42.11	98.0%	42.97	0.964	42.00
97.5%	43.88	3.87	247.71	1	76.0%	95.0%	41.02	98.0%	41.86	0.915	40.94
95.0%	42.75	3.68	247.52	1	76.0%	95.0%	39.94	98.0%	40.75	0.868	39.88
92.5%	41.63	3.48	247.32	1	76.0%	95.0%	38.88	98.0%	39.67	0.822	38.85
90.0%	40.50	3.30	247.14	1	75.8%	95.0%	37.86	98.0%	38.64	0.780	37.86
87.5%	39.38	3.12	246.96	1	75.6%	95.0%	36.89	98.0%	37.64	0.740	36.90
85.0%	38.25	2.94	246.78	1	75.3%	95.0%	35.96	98.0%	36.69	0.703	35.99
82.5%	37.13	2.77	246.61	1	74.9%	95.0%	35.06	98.0%	35.77	0.669	35.10
80.0%	36.00	2.61	246.45	1	74.4%	95.0%	34.19	98.0%	34.89	0.636	34.25
77.5%	34.88	2.45	246.29	1	73.9%	95.0%	33.35	98.0%	34.03	0.605	33.43
75.0%	33.75	2.29	246.13	1	73.2%	95.0%	32.54	98.0%	33.21	0.576	32.63
72.5%	32.63	2.14	245.98	1	72.5%	95.0%	31.76	98.0%	32.41	0.549	31.86
70.0%	31.50	2.00	245.84	1	71.7%	95.0%	31.00	98.0%	31.63	0.523	31.11
67.5%	30.38	1.86	245.70	1	70.8%	95.0%	30.26	98.0%	30.87	0.498	30.38
65.0%	29.25	1.72	245.56	1	69.8%	95.0%	29.54	98.0%	30.14	0.475	29.67
62.5%	28.13	1.59	245.43	1	68.7%	95.0%	28.83	98.0%	29.42	0.452	28.97
60.0%	27.00	1.47	245.31	1	67.5%	95.0%	28.15	98.0%	28.72	0.431	28.29
57.5%	25.88	1.35	245.19	1	66.2%	95.0%	27.47	98.0%	28.03	0.411	27.62
55.0%	24.75	1.23	245.07	1	64.9%	95.0%	26.81	98.0%	27.36	0.391	26.97
52.5%	23.63	1.12	244.96	1	63.5%	95.0%	26.16	98.0%	26.69	0.372	26.32
50.0%	22.50	1.02	244.86	1	61.9%	95.0%	25.51	98.0%	26.03	0.354	25.68
47.5%	21.38	0.92	244.76	1	60.3%	95.0%	24.87	98.0%	25.38	0.337	25.04
45.0%	20.25	0.82	244.66	1	58.6%	95.0%	24.23	98.0%	24.73	0.319	24.41
42.5%	19.13	0.74	244.58	1	56.9%	95.0%	23.59	98.0%	24.08	0.303	23.77
40.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
37.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
35.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
32.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
30.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
27.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
25.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
22.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
20.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
17.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
15.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
12.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
10.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
7.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
5.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
2.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
0.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00



John Day Renewable - Pump Storage Hydro

High Demand (All Reused) Scenario, 45 m³/hr Pump-Turbine Capacity

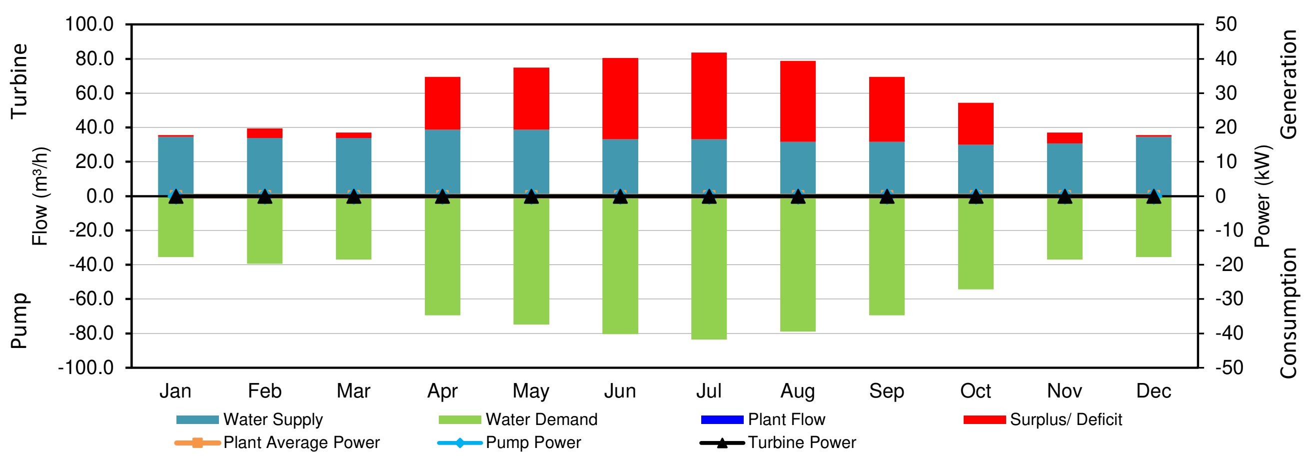
Power and Energy Simulation Summary

	Turbine	Pump	Ave. Plant	
Max Plant Capacity:	0.0	0.0	0.0	kW
Average Annual Energy:	0	0	0	kWh
Yearly Capacity Factor:	0%	0%	0%	
Generator Efficiency:	95.0%			
Plant Electrical Efficiency:	98.0%			
Downtime Losses:	2%			
Maximum Flow:	45.0	45.0	m³/h	
Minimum Flow:	18.0	18.0	m³/h	
Max Capacity:	20.0	-43.0	kW	
Interconnection Voltage:	0.480 kV			
Interconnection Line Length:	0.3 km			
Interconnection Loss at Capacity:	2.2%			

	Value	Unit
Normal Upper Reservoir El.:	1189	m
Turbine / Pump El.:	945	m
Lower Reservoir El.:	945	m
Gross Head:	244	m
Headloss at Maximum Flow:	4.1	m
Headloss Percentage:	1.7%	
Total Penstock Length:	4800	m
Total Tailrace Conduit Length:	0	m
Penstock Diameter:	0.203	m or 8"
Penstock Velocity:	0.39	m/s
Upper Reservoir Max Capacity:	N/A	m³
Upper Reservoir Max Volume Change:	0	m³
Upper Reservoir Start / Finish Vol. Change:	0	m³
Lower Reservoir Max Capacity:	1,893	m³
Lower Reservoir Pump/Tur. Dead Band:	190	m³
Lower Reservoir Max Volume Change:	44	m³
Lower Reservoir Start / Finish Vol. Change:	0	m³

Selected Turbine:	Turbine: Vert. Turb as Turbine		Pump: Vert. Turb. as Pump	
	Flow	Efficiency	Flow	Efficiency
Minimum	40%	58.0%	40%	55.0%
Peak	95%	73.0%	95%	76.0%
Maximum	100%	73.0%	100%	76.0%

	Water Supply	Water Demand	Plant Flow (m³/h)	Surplus/ Deficit (m³/h)	Turbine Power (kW)	Turbine Capacity Factor	Pump Power (kW)	Pump Capacity Factor	Energy Turbine (kWh)	Energy Pump (kWh)	Energy Total (kWh)
Max	38.6	-31.9	0.00	67.19	0.00	0%	0.00	0%	0	0	0
Avg	33.7	-58.0	0.00	24.34	#DIV/0!	0%	#DIV/0!	0%	0	0	0
Min	30.0	-100.3	0.00	0.00	0.00	0%	0.00	0%	0	0	0
Jan	34.7	-35.5	0.0	0.8	0.0	0%	0.0	0%	0	0	0
Feb	33.9	-39.4	0.0	5.5	0.0	0%	0.0	0%	0	0	0
Mar	33.9	-37.1	0.0	3.2	0.0	0%	0.0	0%	0	0	0
Apr	38.6	-69.4	0.0	30.8	0.0	0%	0.0	0%	0	0	0
May	38.6	-74.9	0.0	36.3	0.0	0%	0.0	0%	0	0	0
Jun	33.1	-80.4	0.0	47.3	0.0	0%	0.0	0%	0	0	0
Jul	33.1	-83.6	0.0	50.5	0.0	0%	0.0	0%	0	0	0
Aug	31.5	-78.9	0.0	47.3	0.0	0%	0.0	0%	0	0	0
Sep	31.5	-69.4	0.0	37.9	0.0	0%	0.0	0%	0	0	0
Oct	30.0	-54.4	0.0	24.4	0.0	0%	0.0	0%	0	0	0
Nov	30.8	-37.1	0.0	6.3	0.0	0%	0.0	0%	0	0	0
Dec	34.7	-35.5	0.0	0.8	0.0	0%	0.0	0%	0	0	0



Rev	Description	Date	ENG	CHK
A	Draft Issued for Review	3-May-24	MM	RS

John Day Renewable - Pump Storage Hydro

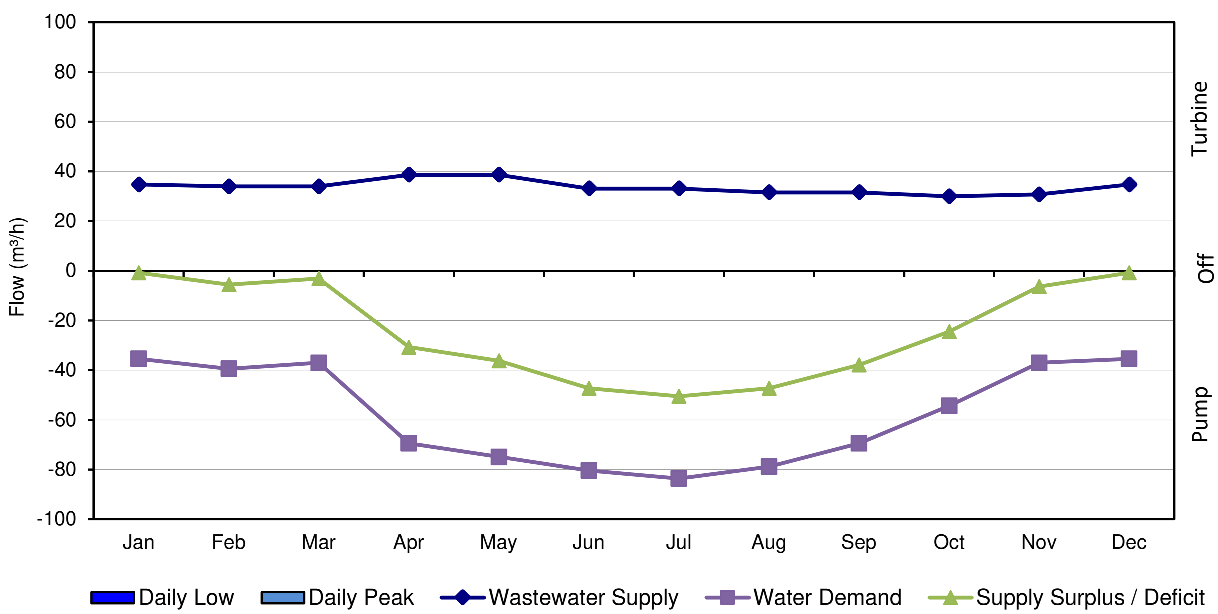
High Demand (All Reused) Scenario, 45 m³/hr Pump-Turbine Capacity

Power and Energy Scenarios

	Daily Low	Daily Peak
Start Hour	16	8
End Hour	8	16
Duration (hr)	16	8
Water Demand Var. From Avg.	0.90	1.20

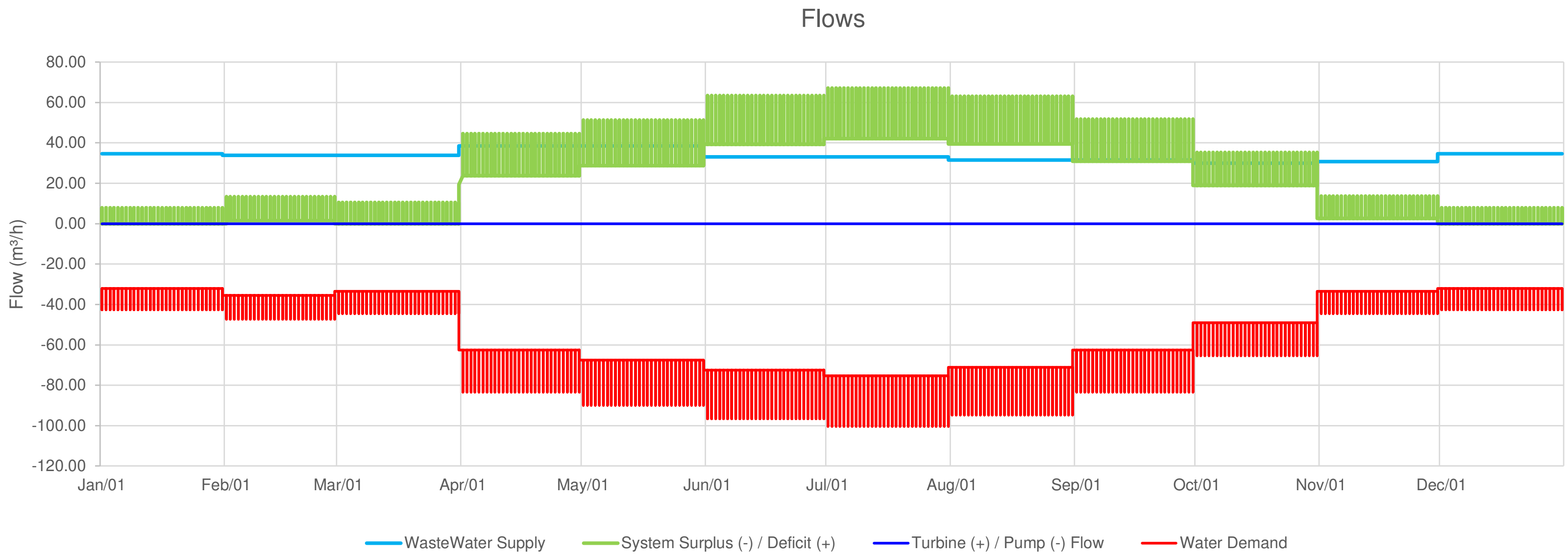
Yearly Volume Summary (m³)		
Water Supply	295,337	100%
Water Demand	-508,512	172%
Surplus/ Deficit	-213,175	72%
Turbine	0	0%
Pump	0	0%
Pump / Turbine Var.	-213,175	72%

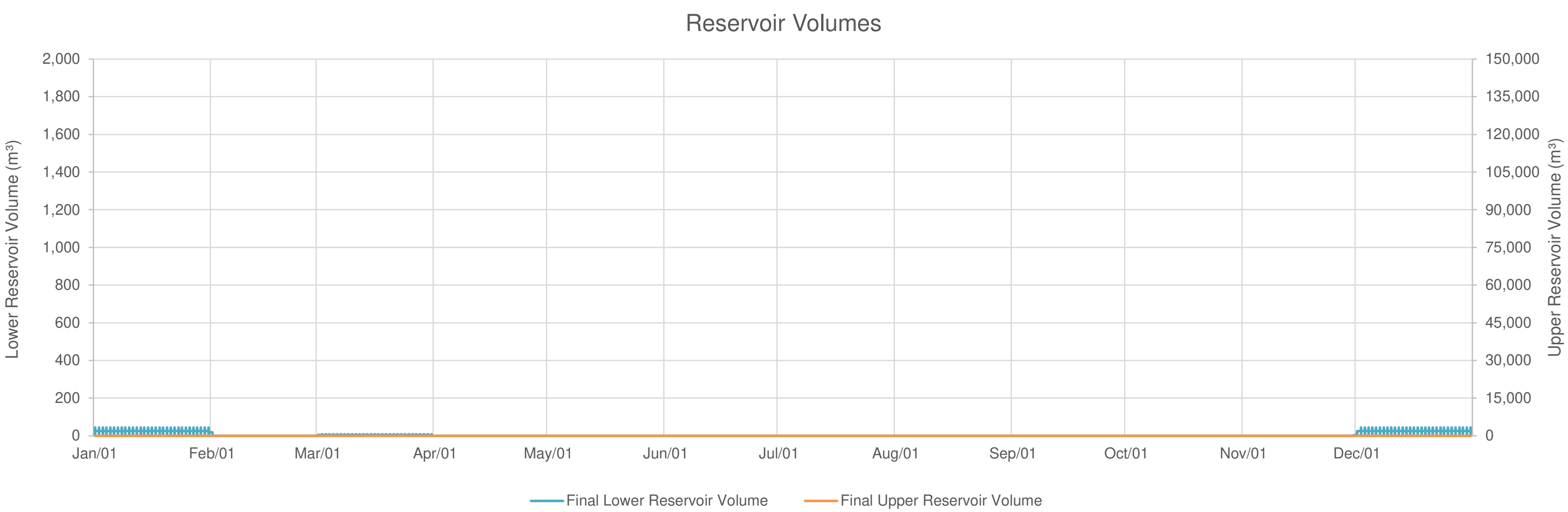
Month	Daily Average			Daily Low		Daily Peak		Daily Ave	
	Wastewater Supply (m³/h)	Water Demand (m³/h)	Supply Surplus / Deficit (m³/h)	Pumping / Turb / Off	Ave. Flow (m³/h)	Pumping / Turb / Off	Ave. Flow (m³/h)	Pumping / Turb / Off	Ave. Flow (m³/h)
Jan	34.7	-35.5	-0.8	Off	0.0	Off	0.0	Off	0.0
Feb	33.9	-39.4	-5.5	Off	0.0	Off	0.0	Off	0.0
Mar	33.9	-37.1	-3.2	Off	0.0	Off	0.0	Off	0.0
Apr	38.6	-69.4	-30.8	Off	0.0	Off	0.0	Off	0.0
May	38.6	-74.9	-36.3	Off	0.0	Off	0.0	Off	0.0
Jun	33.1	-80.4	-47.3	Off	0.0	Off	0.0	Off	0.0
Jul	33.1	-83.6	-50.5	Off	0.0	Off	0.0	Off	0.0
Aug	31.5	-78.9	-47.3	Off	0.0	Off	0.0	Off	0.0
Sep	31.5	-69.4	-37.9	Off	0.0	Off	0.0	Off	0.0
Oct	30.0	-54.4	-24.4	Off	0.0	Off	0.0	Off	0.0
Nov	30.8	-37.1	-6.3	Off	0.0	Off	0.0	Off	0.0
Dec	34.7	-35.5	-0.8	Off	0.0	Off	0.0	Off	0.0
Mth Min.	30.0	-35.5	-50.5	Off	0.0	Off	0.0	Off	0.0
Yearly Ave.	33.7	-58.0	-24.3	Off	0.0	Off	0.0	Off	0.0
Mth Max.	38.6	-83.6	-0.8	Off	0.0	Off	0.0	Off	0.0
Day Low		-31.9							
Day Peak		-100.3							
Yearly Volume (m³)	295,337	-508,512	-213,175	0		0		0	



John Day Renewable - Pump Storage Hydro
High Demand (All Reused) Scenario, 45 m³/hr Pump-Turbine Capacity

Time Series Graphs





John Day Renewable - Pump Storage Hydro
High Demand (All Reused) Scenario, 45 m³/hr Pump-Turbine Capacity

Conveyance System Hydraulics

Penstock Losses

Friction	Section	Length (m)	Diameter (m)	Velocity (m/s)	Rough (mm)	Factor	Headloss (m)	Percent
	HDPE Pipe	2000	0.203	0.39	0.03	0.0212	1.58	38.9%
	Steel Pipe	2800	0.203	0.39	0.15	0.0232	2.44	59.8%

Transitions		Coefficient	Velocity (m/s)	Headloss (m)	
	Trashrack	1.00	0.40	0.01	0.2%
	Intake - Penstock Transition	0.00	0.39	0.00	0.0%
	HDPE Pipe - Steel Pipe Transition		0.39	0.00	0.0%
			0.39	0.00	
			0.00	0.00	

Bends	Section	No.	Coefficient	Total Coef.	Velocity (m/s)	Headloss (m)	
	HDPE Pipe	20	0.15	3.0	0.39	0.02	0.6%
	Steel Pipe	28	0.10	2.8	0.39	0.02	0.5%
	0	0	0.10	0.0	0.00	0.00	0.0%
	0	0	0.10	0.0	0.00	0.00	0.0%

Total Headloss: 4.07 m 100%

Penstock Headloss Coefficient: 0.0020 m/(m³/hr)2

Tailrace Losses

Friction	Section	Length (m)	Diameter (m)	Velocity (m/s)	Rough (mm)	Factor	Headloss (m)	Percent
	Steel Pipe	0	0.203	0.39	0.15	0.0232	0.00	

Transitions		Coefficient	Velocity (m/s)	Headloss (m)
	Trashrack	0.00	0.40	0.00
	Intake - Penstock Transition	0.00	0.39	0.00
		0.00	0.39	0.00

Bends	Section	No.	Coefficient	Total Coef.	Velocity (m/s)	Headloss (m)
	Steel Pipe	0	0.10	0.0	0.39	0.00
	0	0	0.10	0.0	0.00	0.00

Total Headloss: 0.00 m

Tailrace Headloss Coefficient: 0.0000 m/(m³/hr)2

John Day Renewable - Pump Storage Hydro
High Demand (All Reused) Scenario, 45 m³/hr Pump-Turbine Capacity

Turbine and Transmission Line Data and Calculations

Transmission Line

Input Data		
Line Voltage	0.480	kV
Conductor Name	2/0	
Wire Size	133.0	kcmil
Resistance (per phase)	0.3250	Ω/km
Length	0.3	km
Plant Capacity	42.97	kW
Power Factor	0.90	cos ϕ

Calculations		
Current per Phase	57.4	A
Resistance per Phase	0.10	Ω
Loss per Phase	0.32	kW
Total Loss	0.96	kW
Percent of Plant Capacity	2.2%	
Loss Factor	0.000522	

Conductor Resistance Table

Name	Size kcmil	Resistance Ω/km	Ampacity 90°C (A)
Partridge	266.8	0.2136	
Tulip	336.4	0.1693	
Cosmos	477.0	0.1194	
Orchid	636.0	0.0896	
2/0	133.0	0.3250	
3/0	166.1	0.2230	
4/0	210.4	0.1970	
Kcmil 250	250.0	0.1388	
Kcmil 350	350.0	0.0990	
Kcmil 500	500.0	0.0694	
Kcmil 750	750.0	0.0463	
Kcmil 100(	1000.0	0.0347	

Turbine Efficiency

Turbine	Min Q	Min E	Peak Q	Peak E	Max E
Horz Split as Pump	20%	27.0%	95%	58.0%	58.0%
Horz Split as Turbine	20%	27.0%	95%	76.0%	55.0%
Vert. Turb. as Pump	40%	55.0%	95%	76.0%	76.0%
Vert. Turb as Turbine	40%	58.0%	95%	73.0%	73.0%

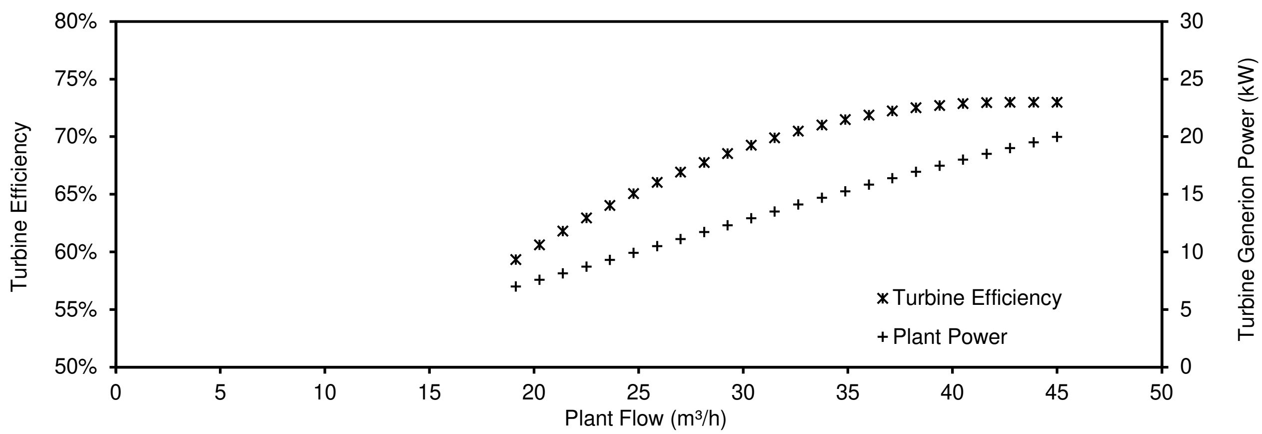
Generator Efficiency

Synchron Generator 95.0%

John Day Renewable - Pump Storage Hydro
High Demand (All Reused) Scenario, 45 m³/hr Pump-Turbine Capacity

Turbine Performance Characteristics

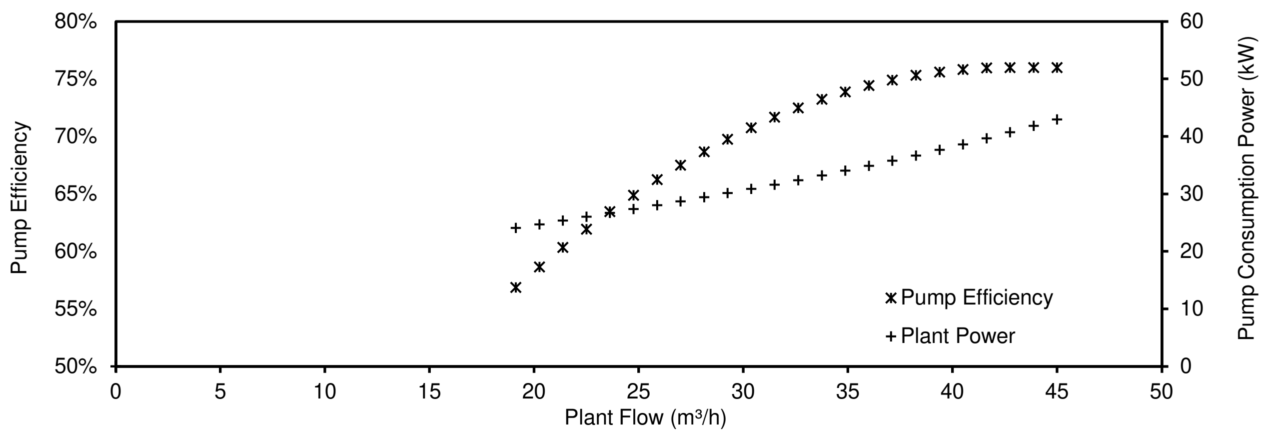
Percent Capacity	Plant Flow m³/h	Head Loss m	Net Head m	Jet / Run On	Turbine Efficiency	Generator Efficiency	Generator Power kW	Electrical Efficiency	Plant Power kW	Line Loss kW	Point of Sale kW
100%	45.00	-4.07	239.77	1	73.0%	95.0%	20.39	98.0%	19.98	0.209	19.77
97.5%	43.88	-3.87	239.97	1	73.0%	95.0%	19.90	98.0%	19.50	0.199	19.30
95.0%	42.75	-3.68	240.16	1	73.0%	95.0%	19.40	98.0%	19.01	0.189	18.83
92.5%	41.63	-3.48	240.36	1	73.0%	95.0%	18.90	98.0%	18.52	0.179	18.34
90.0%	40.50	-3.30	240.54	1	72.9%	95.0%	18.38	98.0%	18.01	0.169	17.84
87.5%	39.38	-3.12	240.72	1	72.7%	95.0%	17.84	98.0%	17.49	0.160	17.33
85.0%	38.25	-2.94	240.90	1	72.5%	95.0%	17.29	98.0%	16.95	0.150	16.80
82.5%	37.13	-2.77	241.07	1	72.2%	95.0%	16.73	98.0%	16.40	0.141	16.26
80.0%	36.00	-2.61	241.23	1	71.9%	95.0%	16.16	98.0%	15.84	0.131	15.71
77.5%	34.88	-2.45	241.39	1	71.5%	95.0%	15.58	98.0%	15.27	0.122	15.15
75.0%	33.75	-2.29	241.55	1	71.0%	95.0%	14.99	98.0%	14.69	0.113	14.58
72.5%	32.63	-2.14	241.70	1	70.5%	95.0%	14.39	98.0%	14.10	0.104	14.00
70.0%	31.50	-2.00	241.84	1	69.9%	95.0%	13.79	98.0%	13.51	0.095	13.41
67.5%	30.38	-1.86	241.98	1	69.3%	95.0%	13.18	98.0%	12.91	0.087	12.83
65.0%	29.25	-1.72	242.12	1	68.5%	95.0%	12.57	98.0%	12.31	0.079	12.23
62.5%	28.13	-1.59	242.25	1	67.8%	95.0%	11.95	98.0%	11.71	0.072	11.64
60.0%	27.00	-1.47	242.37	1	66.9%	95.0%	11.34	98.0%	11.11	0.065	11.05
57.5%	25.88	-1.35	242.49	1	66.0%	95.0%	10.72	98.0%	10.51	0.058	10.45
55.0%	24.75	-1.23	242.61	1	65.1%	95.0%	10.11	98.0%	9.91	0.051	9.86
52.5%	23.63	-1.12	242.72	1	64.0%	95.0%	9.51	98.0%	9.32	0.045	9.27
50.0%	22.50	-1.02	242.82	1	63.0%	95.0%	8.90	98.0%	8.73	0.040	8.69
47.5%	21.38	-0.92	242.92	1	61.8%	95.0%	8.31	98.0%	8.14	0.035	8.11
45.0%	20.25	-0.82	243.02	1	60.6%	95.0%	7.72	98.0%	7.57	0.030	7.54
42.5%	19.13	-0.74	243.10	1	59.3%	95.0%	7.14	98.0%	7.00	0.026	6.97
40.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
37.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
35.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
32.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
30.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
27.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
25.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
22.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
20.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
17.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
15.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
12.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
10.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
7.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
5.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
2.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
0.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00



John Day Renewable - Pump Storage Hydro
High Demand (All Reused) Scenario, 45 m³/hr Pump-Turbine Capacity

Pump Performance Characteristics

Percent Capacity	Plant Flow m^3/h	Head Loss m	Net Head m	Jet / Run On	Pump Efficiency	Generator Efficiency	Generator Power kW	Electrical Efficiency	Plant Power kW	Line Loss kW	Point of Sale kW
100%	45.00	4.07	247.91	1	76.0%	95.0%	42.11	98.0%	42.97	0.964	42.00
97.5%	43.88	3.87	247.71	1	76.0%	95.0%	41.02	98.0%	41.86	0.915	40.94
95.0%	42.75	3.68	247.52	1	76.0%	95.0%	39.94	98.0%	40.75	0.868	39.88
92.5%	41.63	3.48	247.32	1	76.0%	95.0%	38.88	98.0%	39.67	0.822	38.85
90.0%	40.50	3.30	247.14	1	75.8%	95.0%	37.86	98.0%	38.64	0.780	37.86
87.5%	39.38	3.12	246.96	1	75.6%	95.0%	36.89	98.0%	37.64	0.740	36.90
85.0%	38.25	2.94	246.78	1	75.3%	95.0%	35.96	98.0%	36.69	0.703	35.99
82.5%	37.13	2.77	246.61	1	74.9%	95.0%	35.06	98.0%	35.77	0.669	35.10
80.0%	36.00	2.61	246.45	1	74.4%	95.0%	34.19	98.0%	34.89	0.636	34.25
77.5%	34.88	2.45	246.29	1	73.9%	95.0%	33.35	98.0%	34.03	0.605	33.43
75.0%	33.75	2.29	246.13	1	73.2%	95.0%	32.54	98.0%	33.21	0.576	32.63
72.5%	32.63	2.14	245.98	1	72.5%	95.0%	31.76	98.0%	32.41	0.549	31.86
70.0%	31.50	2.00	245.84	1	71.7%	95.0%	31.00	98.0%	31.63	0.523	31.11
67.5%	30.38	1.86	245.70	1	70.8%	95.0%	30.26	98.0%	30.87	0.498	30.38
65.0%	29.25	1.72	245.56	1	69.8%	95.0%	29.54	98.0%	30.14	0.475	29.67
62.5%	28.13	1.59	245.43	1	68.7%	95.0%	28.83	98.0%	29.42	0.452	28.97
60.0%	27.00	1.47	245.31	1	67.5%	95.0%	28.15	98.0%	28.72	0.431	28.29
57.5%	25.88	1.35	245.19	1	66.2%	95.0%	27.47	98.0%	28.03	0.411	27.62
55.0%	24.75	1.23	245.07	1	64.9%	95.0%	26.81	98.0%	27.36	0.391	26.97
52.5%	23.63	1.12	244.96	1	63.5%	95.0%	26.16	98.0%	26.69	0.372	26.32
50.0%	22.50	1.02	244.86	1	61.9%	95.0%	25.51	98.0%	26.03	0.354	25.68
47.5%	21.38	0.92	244.76	1	60.3%	95.0%	24.87	98.0%	25.38	0.337	25.04
45.0%	20.25	0.82	244.66	1	58.6%	95.0%	24.23	98.0%	24.73	0.319	24.41
42.5%	19.13	0.74	244.58	1	56.9%	95.0%	23.59	98.0%	24.08	0.303	23.77
40.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
37.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
35.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
32.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
30.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
27.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
25.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
22.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
20.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
17.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
15.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
12.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
10.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
7.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
5.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
2.5%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00
0.0%	0.00	0.00	243.84	0	0.0%	95.0%	0.00	0.0%	0.00	0.000	0.00



CALCULATION

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PROJECT	**John Day Renewable Energy Study**		
SUBJECT	**Preliminary Pump Storage Hydro (PSH) Penstock / Pipe Design - 200 GPM**		
CALC NO.		**FILE**	**1075-033-3.3.4**
SUPERSEDES NO.		**SHEETS ATTACHED**	

CALCULATION DESCRIPTION

Scope

Penstock / pipe preliminary type and size selection based on static and surge pressures.

References

Dwg	Rev	Date	Title
FIG 1		03/2024	Overall Site Plan

Assumptions

- Assumed maximum surge at 50% of Gross Head for pump used as Turbine with proper control / surge prevention measures.
- A53 B steel was used for preliminary steel pipe selection.
- No corrosion allowance is included in the pipe thickness.
- Preliminary pipe wall thickness based on hydrostatic and surge pressures only.
- Number of bends estimated based on preliminary penstock route.

Conclusion / Recommendations

- Suggest use of 8" (203 mm) pipe to minimize friction losses at 2.8 m (~1.1%).
- Suggest HDPE pipe (DR 32.5 and DR 21) for the upper low pressure section to reduce costs.
- Suggest Steel pipe (Schedule 5 and Schedule 10) for high pressure section PSH facility. Welded
- Final design of pipe to be completed at detailed design and to take into consideration pump / turbine operation and control design and installation cost.

REVISION	DESCRIPTION	PREP BY	DATE	CHKD BY	DATE
A	Issue For Review (Internal)	MM	4/10/2024	RS	4/10/2024

PROJECT	John Day Renewable Energy Study	BY	MM
SUBJECT	PRELIMINARY PENSTOCK SELECTION	DATE	10-Apr-24
	Pump Storage Hydro 200 GPM	FILE	1075-033-3.3.4
	Selection Summary	PAGE	1 of 1

Plant Capacity At Max Flow:	27	kW	Max Plant Flow:	0.013	m^3/s	200	gpm
Gross Head:	244	m	Velocity Based On Nominal Diameter:	0.39	m/s		
Turbine & Generator Efficiency:	90	%	Headloss At Max Plant Flow:	3.0	m		
Total Penstock Length:	4838	m	Max Design Surge:	50	% at Station:	4+825	
Penstock Average Slope (H/L):	5.0	%		122	m at Station:		
Penstock Nominal Diameter:	203	mm					

Penstock Selection

	Station		Slope	True Length	Max Pressure Head			Penstock			
	From	To			Static	Surge	Total	Type	Nom. Diam.	Wall THK	Max Head
	(m)	(m)	(%)	(m)	(m)	(m)	(m)		(mm)	(mm/Class/DR	(m)
1	0+000	0+400	-2%	400	-8	10	2	HDPE	203	DR 32.5	70
2	0+400	0+800	7%	401	21	20	41	HDPE	203	DR 32.5	70
3	0+800	1+200	3%	400	32	30	62	HDPE	203	DR 32.5	70
4	1+200	1+600	1%	400	34	40	74	HDPE	203	DR 21	113
5	1+600	2+000	0%	400	32	51	83	HDPE	203	DR 21	113
6	2+000	2+400	2%	400	39	61	99	Steel - A53 B	203	SCH. 5	285
7	2+400	2+800	1%	400	44	71	115	Steel - A53 B	203	SCH. 5	285
8	2+800	3+200	11%	402	86	81	167	Steel - A53 B	203	SCH. 5	285
9	3+200	3+600	10%	402	127	91	218	Steel - A53 B	203	SCH. 5	285
10	3+600	4+000	11%	403	172	101	273	Steel - A53 B	203	SCH. 10	387
11	4+000	4+400	11%	402	215	111	326	Steel - A53 B	203	SCH. 10	387
12	4+400	4+800	11%	402	260	121	381	Steel - A53 B	203	SCH. 10	388
13	4+800	4+825	10%	25	262	122	384	Steel - A53 B	203	SCH. 10	389
14											
15											

Penstock Bend Estimation

	Station		Penstock			Bend			Comments
	From	To	Type	Nom. Diam.	Wall THK	Angle	Radius[1]	Quantity	
	(m)	(m)		(mm)	(mm/Class)	(deg)	(mm)		
1	0+000	0+400	HDPE	203	DR 32.5	15	508	4	All quantities were approximated based on the penstock length. Assumed 1 bend per 100m of penstock.
2	0+400	0+800	HDPE	203	DR 32.5	15	508	4	
3	0+800	1+200	HDPE	203	DR 32.5	15	508	4	
4	1+200	1+600	HDPE	203	DR 21	15	508	4	
5	1+600	2+000	HDPE	203	DR 21	15	508	4	
6	2+000	2+400	Steel - A53 B	203	SCH. 5	15	508	4	
7	2+400	2+800	Steel - A53 B	203	SCH. 5	15	508	4	
8	2+800	3+200	Steel - A53 B	203	SCH. 5	15	508	4	
9	3+200	3+600	Steel - A53 B	203	SCH. 5	15	508	4	
10	3+600	4+000	Steel - A53 B	203	SCH. 10	15	508	4	
11	4+000	4+400	Steel - A53 B	203	SCH. 10	15	508	4	
12	4+400	4+800	Steel - A53 B	203	SCH. 10	15	508	4	
13	4+800	4+825	Steel - A53 B	203	SCH. 10	15	508	1	
14									
15									
16									
17									
18									
19									
20									
							Total Elbows:	49	

Notes

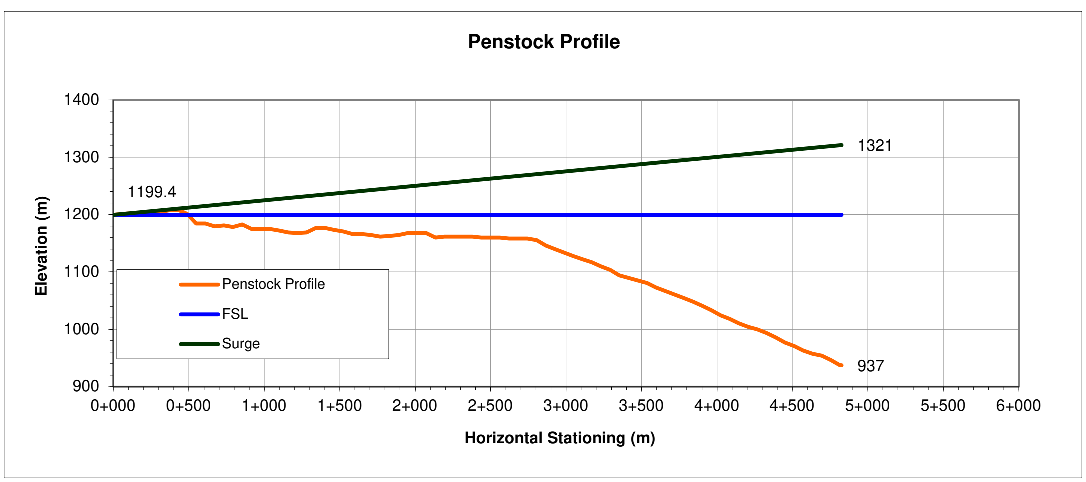
1 - Bend Radius: 2.5 x Diameter

	PROJECT	John Day Renewable Energy Study	BY	MM
	SUBJECT	PRELIMINARY PENSTOCK SELECTION	DATE	10-Apr-24
		Pump Storage Hydro 200 GPM	FILE	1075-033-3.3.4
		Penstock Profile and Static Head	PAGE	1 of 1

Headpond FSL Elevation: 1199.4 m
Intake Static Head: 0.0 m

Total Penstock Length: 4839 m
Gross Head: 262 m
Average Slope: 5%

	Station	Elevation	Total	To Next Station			Comments
		MSL	Static Head	Slope	True Length	Vertical	
	(m)	(m)	(m)	(%)	(m)	(m)	
1	0+000	1199.4	0	-1%	200	-2	
2	0+200	1201.0	-2	-3%	200	-7	
3	0+400	1207.9	-8	12%	201	24	
4	0+600	1184.1	15	3%	200	6	
5	0+800	1178.6	21	2%	200	4	
6	1+000	1175.0	24	4%	200	7	
7	1+200	1167.9	32	-4%	200	-9	
8	1+400	1176.5	23	5%	200	11	
9	1+600	1165.9	34	2%	200	4	
10	1+800	1162.1	37	-3%	200	-5	
11	2+000	1167.4	32	3%	200	6	
12	2+200	1161.3	38	0%	200	1	
13	2+400	1160.7	39	1%	200	2	
14	2+600	1158.8	41	2%	200	3	
15	2+800	1155.4	44	11%	201	23	
16	3+000	1132.6	67	10%	201	19	
17	3+200	1113.3	86	11%	201	23	
18	3+400	1090.7	109	9%	201	18	
19	3+600	1072.6	127	10%	201	20	
20	3+800	1052.6	147	12%	202	25	
21	4+000	1027.6	172	11%	201	23	
22	4+200	1004.9	194	10%	201	21	
23	4+400	984.4	215	12%	201	24	
24	4+600	960.4	239	10%	201	21	
25	4+800	939.6	260	10%	25	2	
26	4+825	937.3	262				
27							
28							
29							
30							



Canadian Projects Limited	PROJECT	John Day Renewable Energy Study	BY	MM
	SUBJECT	PRELIMINARY PENSTOCK SELECTION	DATE	10-Apr-24
		Pump Storage Hydro 200 GPM	FILE	1075-033-3.3.4
		Penstock Headlosses	PAGE	1 of 2

Plant Capacity:	27	kW
Gross Head	244	m
Penstock Nominal Diameter:	203	mm
Total Penstock Length:	4838	m
Max Plant Flow:	0.01262	m^3/s
Velocity Based On Nom. Diam.:	0.39	m/s

Head-Race Canal Loss:	0.0	m
Tunnel Head Loss:	0.0	m
Penstock Head Loss:	3.0	m
Bend Head Loss:	0.0	m
Transition Head Loss:	0.0	m
Trashrack Head Loss:	0.000	m
Total Head loss At Max Plant Flow:	**3.0**	m
Percentage of Gross Head:	1	%
Head Loss By 100 m Of Penstock/Tunnel/Canal:	0.1	m

Penstock Losses

	Station		True Length	Penstock			Head Loss				
	From (m)	**To** (m)	(m)	**Type**	**Nom. Diam.** (mm)	**Wall THK** (mm)	**Pipe I.D.** (mm)	**Velocity** (m/s)	**Roughness** (mm)	**Factor f**	**Headloss** (m)
1	0+000	0+400	400	HDPE	203	6.2	197	0.41	0.03	0.013	0.2
2	0+400	0+800	401	HDPE	203	6.2	197	0.41	0.03	0.013	0.2
3	0+800	1+200	400	HDPE	203	6.2	197	0.41	0.03	0.013	0.2
4	1+200	1+600	400	HDPE	203	9.7	194	0.43	0.03	0.013	0.3
5	1+600	2+000	400	HDPE	203	9.7	194	0.43	0.03	0.013	0.3
6	2+000	2+400	400	Steel - A53 B	203	2.8	200	0.40	0.15	0.018	0.3
7	2+400	2+800	400	Steel - A53 B	203	2.8	200	0.40	0.15	0.018	0.3
8	2+800	3+200	402	Steel - A53 B	203	2.8	200	0.40	0.15	0.018	0.3
9	3+200	3+600	402	Steel - A53 B	203	2.8	200	0.40	0.15	0.018	0.3
10	3+600	4+000	403	Steel - A53 B	203	3.8	199	0.40	0.15	0.018	0.3
11	4+000	4+400	402	Steel - A53 B	203	3.8	199	0.40	0.15	0.018	0.3
12	4+400	4+800	402	Steel - A53 B	203	3.8	203	0.39			
13	4+800	4+825	25	Steel - A53 B	203	3.8	203	0.39			
14											
15											

Penstock Bend Losses

	Station		Penstock			Bend		Head Losses			
	From (m)	**To** (m)	**Type**	**Nom. Diam.** (mm)	**Wall THK** (mm)	**Angle** (deg)	**Quantity**	**I.D.** (m)	**Velocity** (m/s)	**Factor K_b**	**Headloss** (m)
1	0+000	0+400	HDPE	203	6.2	15	4	197	0.41	0.04	0.00
2	0+400	0+800	HDPE	203	6.2	15	4	197	0.41	0.04	0.00
3	0+800	1+200	HDPE	203	6.2	15	4	197	0.41	0.04	0.00
4	1+200	1+600	HDPE	203	9.7	15	4	194	0.43	0.04	0.00
5	1+600	2+000	HDPE	203	9.7	15	4	194	0.43	0.04	0.00
6	2+000	2+400	Steel - A53 B	203	2.8	15	4	200	0.40	0.04	0.00
7	2+400	2+800	Steel - A53 B	203	2.8	15	4	200	0.40	0.04	0.00
8	2+800	3+200	Steel - A53 B	203	2.8	15	4	200	0.40	0.04	0.00
9	3+200	3+600	Steel - A53 B	203	2.8	15	4	200	0.40	0.04	0.00
10	3+600	4+000	Steel - A53 B	203	3.8	15	4	199	0.40	0.04	0.00
11	4+000	4+400	Steel - A53 B	203	3.8	15	4	199	0.40	0.04	0.00
12	4+400	4+800	Steel - A53 B	203	3.8	15	4	199	0.40	0.04	0.00
13	4+800	4+825	Steel - A53 B	203	3.8	15	1	199	0.40	0.04	0.00
14											
15											
16											
17											
18											
19											
20											

Plant Capacity:	27	kW	Head-Race Canal Loss:	0.0	m
Penstock Main Diameter:	203	mm	Tunnel Head Loss:	0.0	m
Max Plant Flow:	0.01262	m^3/s	Transition Head Loss:	0.0	m
Average Velocity:	0.39	m/s	Trashrack Head Loss:	0.00	m
			Total Other Head loss At Max Plant Flow:	**0.00**	m
Head-Race Canal Length:	0	m			
Total Tunnel Length:	0	m			

Head-Race Canal Losses

	Station		Length	Canal							
	From	To		Type	Side Slope	Width	Depth	Velocity	Manning's	Hydraulic	Headloss
	(m)	(m)	(m)			(mm)	(mm)	(m/s)	Roughness	Radius (m)	(m)
1	0+000	0+000	0	Gvl & Riprap	1/1	8000	6000	0.00	0.033	0.000	0.0
2											
3											
4											
5											

Tunnel Losses

	Station		Slope	Length	Tunnel						
	From	To			Type	Width/diam	Height	Velocity	Roughness	Factor f	Headloss
	(m)	(m)	(%)	(m)		(mm)	(mm)	(m/s)	(mm)		(m)
1											
2											
3											
4											
5											

Transition Losses

	Station	From		To		Head Lost			Comments
		Width/diam	Velocity	Width/diam	Velocity	Width Ratio	Factor K	Headloss	
	(m)	(mm)	(m/s)	(mm)	(m/s)			(m)	
1	0+000	10000000	0.00	203	0.39	0.00	0.50	0.00	Headpond-Intake
2									
3									
4									
5									

Trash Rack Losses

Intake Channel Width:	0.50	m	Trashrack Angle From Vertical:	30	degree
Intake Channel Water Height:	0.50	m	Trashrack Bar Thickness:	6.4	mm
Average Intake Velocity:	0.05	m/s	Trashrack Bar Spacing:	30.0	mm
Head Loss:	0.16	mm	Factor K:	2.4	Square Bars

Notes

1 - Roughness: Hydropower engineering Handbook, J.S. Gulliver, 1991, page 5.45

Canadian Projects Limited			
PROJECT	John Day Renewable Energy Study	BY	MM
SUBJECT	PRELIMINARY PENSTOCK SELECTION	DATE	10-Apr-24
	Pump Storage Hydro 200 GPM	FILE	1075-033-3.3.4
	High Density Polyethylene (HDPE) Pipe Maximum Head	PAGE	1 of 1

Maximum Allowable Static and Total Head (Static + Surge)

	DR	32.5	26	21	17	11	9
Rated Static Water Pressure[1]	**(psi)**	50	64	80	100	160	200
Max Surge Pressure[2]	**(psi)**	100	128	160	200	320	400
Rated Static Head	**(ft)**	116	148	185	231	370	462
	(m)	35	45	56	70	113	141
Max Surge Head	**(ft)**	231	296	370	462	739	924
(Static + Surge)	**(m)**	70	90	113	141	225	282

Notes:

1 - The rated working pressure is based on the Hydrostatic Design Stress (HDS).
- The HDS is calculated by applying a design factor of 0.5 to the Hydrostatic Design Basis (HDB), which represent the Long-Term Hydrostatic Strength (LTHS) of the pipe (50 years).
- HDPE pipe made from materials qualified as PE 3408 have a HDS of 800 psi (HDB of 1 600 psi).
- At a temperature of 73.4˚C, the design stress should not increase more than 3% over 50 years of continuous service.

2 - The Maximum Surge Pressure is based on the Hydrostatic Design Basis (HDB) at 1 600 psi.
- The instantaneous surge pressure should not last more than 60 seconds.
- At a stress of 1 465 psi (91.5 % of the HDB), the surge pressure is allowed for 1 hour.
- At a stress of 1 070 psi (66.9 % of the HDB), the surge pressure is allowed for 1 000 hours.
- Surge pressure can be reasonably repeated but should not be a regular cycling pressure.

Reference:

KWH Pipe, High Density Polyethylene Pipe Sclairpipe, Systems Design, 2007
KWH Pipe, High Density Polyethylene Pipe Sclairpipe, Construction, 1990

Nominal Size		O.D.	I.D.(mm) - % of Area From Nominal Size												Bending Radius[1]
			Dimension Ratio (DR)												
in	mm	in	32.5		26		21		17		11		9		(m)
7	178	181	169	90%	166	87%	163	84%	158	79%	146	67%	138	60%	9
8	203	219	205	102%	201	98%	197	94%	192	89%	177	76%	167	68%	10
10	254	273	255	101%	251	98%	245	93%	239	89%	220	75%	209	68%	13
12	305	324	303	99%	297	95%	291	91%	283	86%	261	73%	248	66%	15
13	330	340	318	93%	312	89%	305	85%	297	81%	274	69%	260	62%	17
14	356	356	332	87%	327	84%	320	81%	311	76%	287	65%	272	58%	18
16	406	406	380	88%	373	84%	365	81%	356	77%	328	65%	311	59%	20
18	457	457	427	87%	420	84%	411	81%	400	77%	369	65%	350	59%	23
20	508	508	475	87%	467	85%	457	81%	445	77%	410	65%	388	58%	25
22	559	559	525	88%	513	84%	502	81%	489	77%	451	65%	427	58%	28
24	610	610	570	87%	560	84%	548	81%	534	77%	492	65%	466	58%	31
26	660	660	617	87%	607	85%	594	81%	578	77%	533	65%	505	59%	33
28	711	711	665	87%	653	84%	639	81%	623	77%	574	65%	544	59%	36
30	762	762	712	87%	700	84%	685	81%	667	77%	615	65%	582	58%	38
32	813	802	750	85%	737	82%	721	79%	702	75%	648	64%	613	57%	41
36	914	914	855	88%	840	84%	822	81%	800	77%	738	65%	-		46
40	1016	1003	937	85%	921	82%	901	79%	877	75%	-		-		51
42	1067	1067	997	87%	980	84%	959	81%	934	77%	-		-		53
48	1219	1203	1125	85%	1105	82%	1082	79%	1053	75%	-		-		61
54	1372	1372	1282	87%	1260	84%	1233	81%	1201	77%	-		-		69
55	1397	1405	1313	88%	1290	85%	1263	82%	1229	77%	-		-		70
63	1600	1606	1501	88%	1475	85%	1443	81%	-		-		-		80

Notes

1 - Multiplier for mimimum permanent bending radius: 50 x pipe diameter for pressure pipe

Canadian Projects Limited			
PROJECT	John Day Renewable Energy Study	BY	MM
SUBJECT	PRELIMINARY PENSTOCK SELECTION	DATE	10-Apr-24
	Pump Storage Hydro 200 GPM	FILE	1075-033-3.3.4
	Steel Pipe Maximum Head - Less Than 14in (ASME B36.10)	PAGE	1 of 1

Material and Resistance Factors

Steel Grade:	**A53 Grade B**
Yield Strength Criterion:	**0.66**
Ultimate Strength Criterion:	**0.33**

Design Factors

Weld Joint Reduction Factor[1], E:	0.9	
Corrosion Allowance, C:	0.00	mm
Manufacturing Tolerance[2]:	10.0	%

Material Strength	Yield	241	MPa
	Ultimate	414	MPa
Allowable Stress	Yield	159	MPa
	Ultimate	137	MPa
Allowable Design Stress[3], S		**137**	MPa

Steel Grade	**Min Fy** (ksi)	(MPa)	**Min Fu** (ksi)	(MPa)	**Fu/Fy**	**Comments**
A53 Grade A	30	207	48	331	1.60	
A53 Grade B	35	241	60	414	1.71	
API 5L Grade X42	42	290	60	414	1.43	
API 5L Grade X52	52	359	66	455	1.27	
API 5L Grade X60	60	414	75	517	1.25	
API 5L Grade X70	70	483	82	565	1.17	
Concept Values	30	207	60	414	2.00	

Pipe Wall Thickness

ANSI Nominal Pipe Diameter (in)	(mm)	Minimum Wall Thickness Criteria: Pacific Gas & Electric (in)	(mm)	US Bureau of Reclamation (in)	(mm)	5	10	20	30	40	STD	60	80	XH	100	120	140	160	XXH
1	**25**	1/32	0.1	1/16	1.3	2	3			3	3		5	5				6	9
2	**51**	1/32	0.2	1/16	1.4	2	3			4	4		6	6				9	11
3	**76**	1/32	0.3	1/16	1.5	2	3			5	5		8	8				11	15
4	**102**	1/32	0.4	1/16	1.5	2	3			6	6	7	9	9		11		13	17
5	**127**	1/32	0.4	1/16	1.6	3	3			7	7		10	10		13		16	19
6	**152**	1/32	0.5	3/32	1.7	3	3			7	7		11	11		14		18	22
7	**178**	1/32	0.6	3/32	1.7						8			13					22
8	**203**	1/32	0.7	3/32	1.8	3	4	6	7	8	8	10	13	13	15	18	21	23	22
9	**229**	1/32	0.8	3/32	1.8						9			13					
10	**254**	1/16	0.9	3/32	1.9	3	4	6	8	9	9	13	15	13	18	21	25	29	
11	**279**	1/16	1.0	3/32	2.0						10			13					
12	**305**	1/16	1.1	3/32	2.0	4	5	6	8	10	10	14	17	13	21	25	29	33	

Maximum Allowable Total Head (Static + Surge) in Meters

ANSI Nominal Pipe Diameter (in)	(mm)	Outside Diameter (in)	(mm)	5	10	20	30	40	STD	60	80	XH	100	120	140	160	XXH
1	**25**	1.315	33.4	1114	1869	0	0	2280	2280	0	3069	3069	0	0	0	4286	6137
2	**51**	2.375	60.3	617	1035	0	0	1462	1462	0	2069	2069	0	0	0	3265	4139
3	**76**	3.500	88.9	535	773	0	0	1391	1391	0	1932	1932	0	0	0	2821	3865
4	**102**	4.500	114.3	416	601	0	0	1187	1187	1408	1688	1688	0	2194	0	2660	3377
5	**127**	5.563	141.3	442	543	0	0	1046	1046	0	1520	1520	0	2026	0	2533	3039
6	**152**	6.625	168.3	371	456	0	0	953	953	0	1470	1470	0	1912	0	2447	2940
7	**178**	7.625	193.7	0	0	0	0	0	890	0	0	1478	0	0	0	0	2587
8	**203**	8.625	219.1	285	387	653	724	842	842	1061	1307	1307	1553	1879	2122	2368	2287
9	**229**	9.625	244.5	0	0	0	0	0	801	0	0	1171	0	0	0	0	0
10	**254**	10.750	273.1	281	346	524	644	765	765	1049	1246	1049	1508	1770	2097	2359	0
11	**279**	11.750	298.5	0	0	0	0	0	719	0	0	959	0	0	0	0	0
12	**305**	12.750	323.9	292	318	442	583	718	663	994	1216	884	1492	1768	1989	2320	0

Pipe Inside Diameter

ANSI Nominal Pipe Diameter (in)	(mm)	Outside Diameter (in)	(mm)	5	10	20	30	40	STD	60	80	XH	100	120	140	160	XXH
1	**25**	1.315	33.4	30	28	0	0	27	27	0	24	24	0	0	0	21	15
2	**51**	2.375	60.3	57	55	0	0	53	53	0	49	49	0	0	0	43	38
3	**76**	3.500	88.9	85	83	0	0	78	78	0	74	74	0	0	0	67	58
4	**102**	4.500	114.3	110	108	0	0	102	102	100	97	97	0	92	0	87	80
5	**127**	5.563	141.3	136	134	0	0	128	128	0	122	122	0	116	0	110	103
6	**152**	6.625	168.3	163	161	0	0	154	154	0	146	146	0	140	0	132	124
7	**178**	7.625	193.7	0	0	0	0	0	178	0	0	168	0	0	0	0	149
8	**203**	8.625	219.1	214	212	206	205	203	203	198	194	194	189	183	178	173	175
9	**229**	9.625	244.5	0	0	0	0	0	227	0	0	219	0	0	0	0	0
10	**254**	10.750	273.1	266	265	260	257	255	255	248	243	248	237	230	222	216	0
11	**279**	11.750	298.5	0	0	0	0	0	279	0	0	273	0	0	0	0	0
12	**305**	12.750	323.9	315	315	311	307	303	305	295	289	298	281	273	267	257	0

Notes:

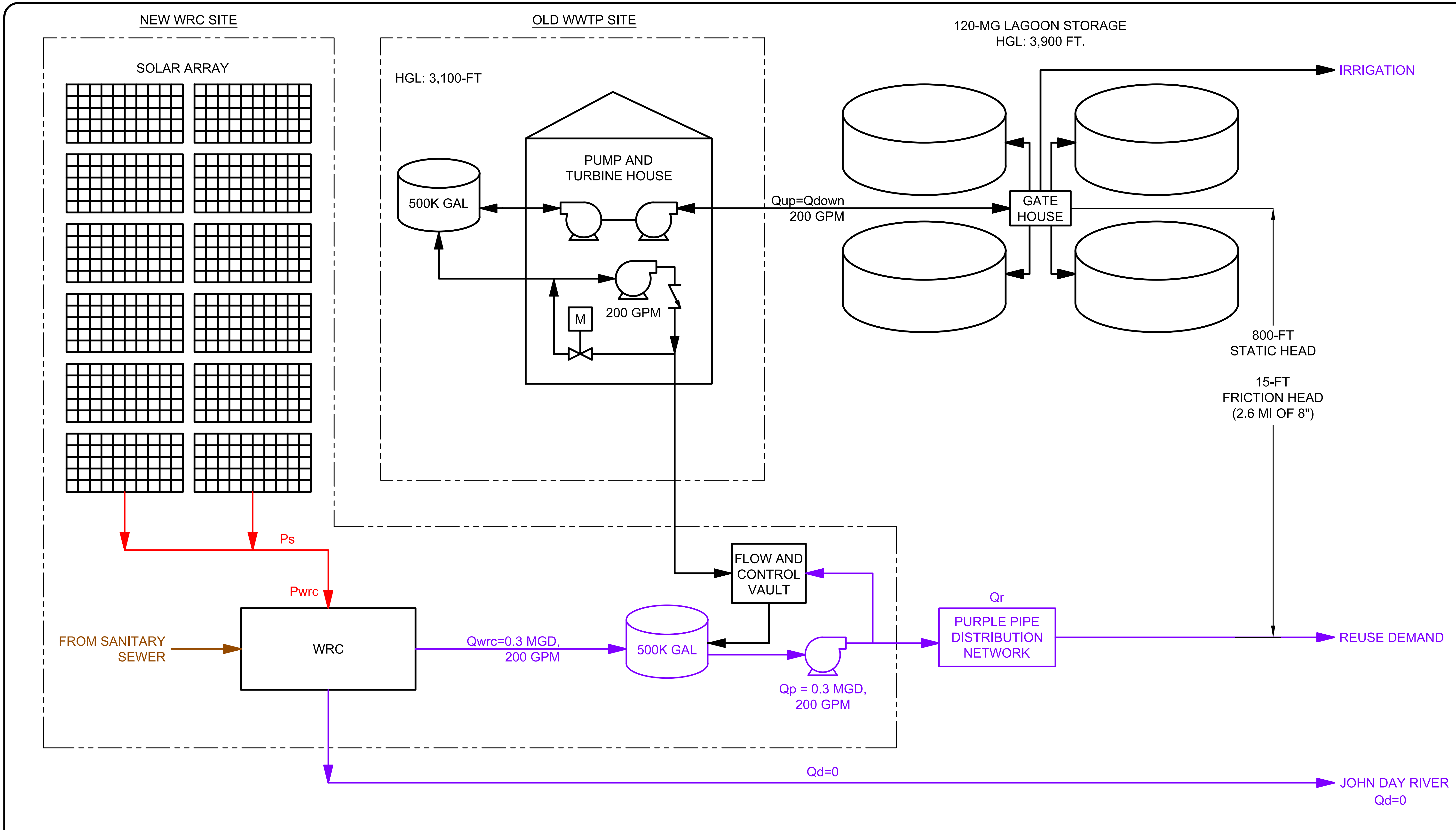
1 - ASCE No. 79, Table 3-3, pg. 69: 0.9 for 100% RT butt joints,

2 - AWWA C200 2.2.3 (Or API 5L, to confirm)

3 - Smallest of Yield or Ultimate Allowable Stress

Appendix C

Figures



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PORTLAND, OR 97224
TEL (503) 684-9097

CITY OF JOHN DAY, OREGON

JOHN DAY RENEWABLE ENERGY STUDY

PROCESS FLOW DIAGRAM

PROJ: 200-654565-24007
DATE: 03/2024
DESN: JF

FIGURE
FIG 1

Bar Measures 1 inch

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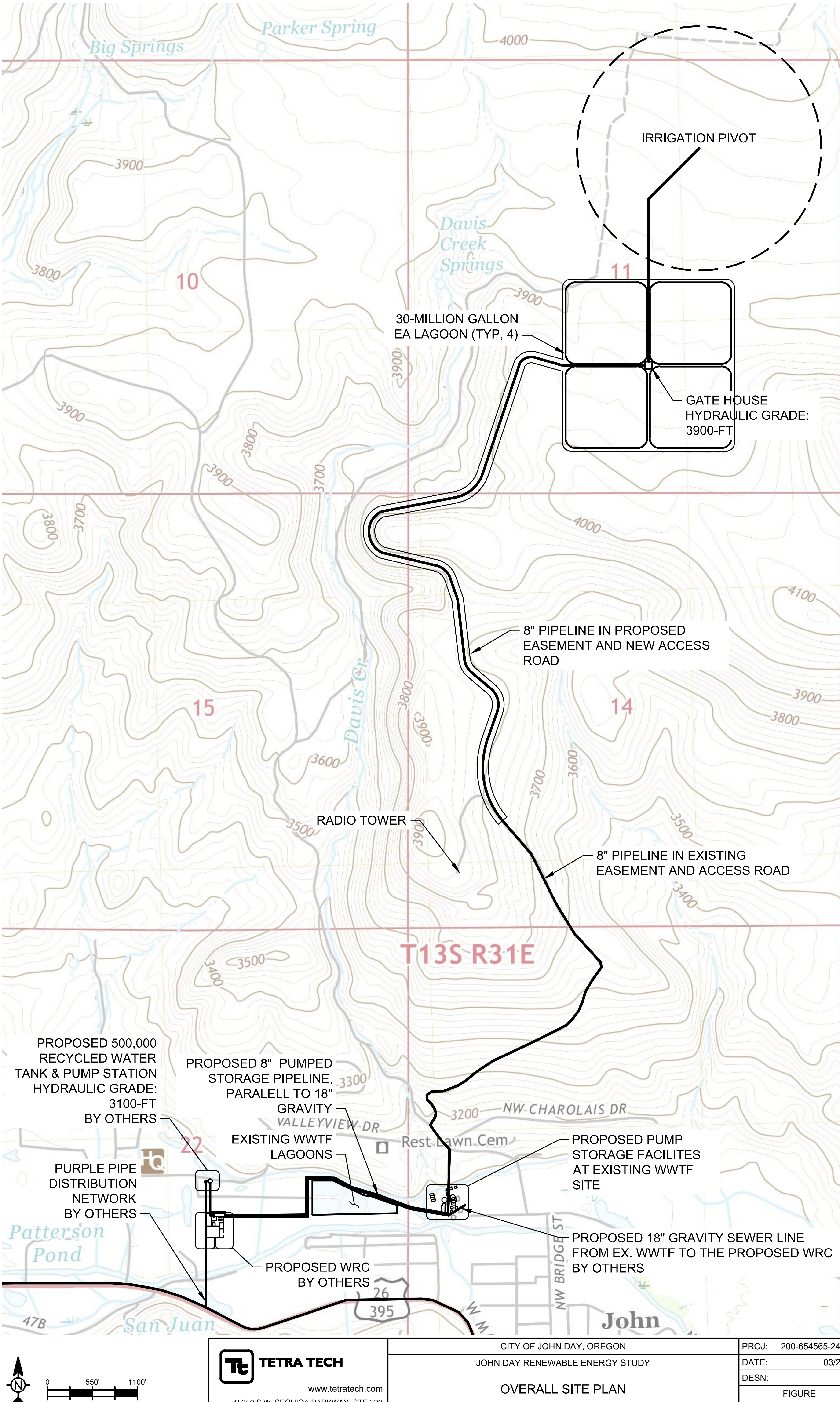

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OVERALL SITE PLAN

PROJ: 200-654565-24007
DATE: 03/2024
DESN: JF

FIGURE
FIG 2

Bar Measures 1 inch

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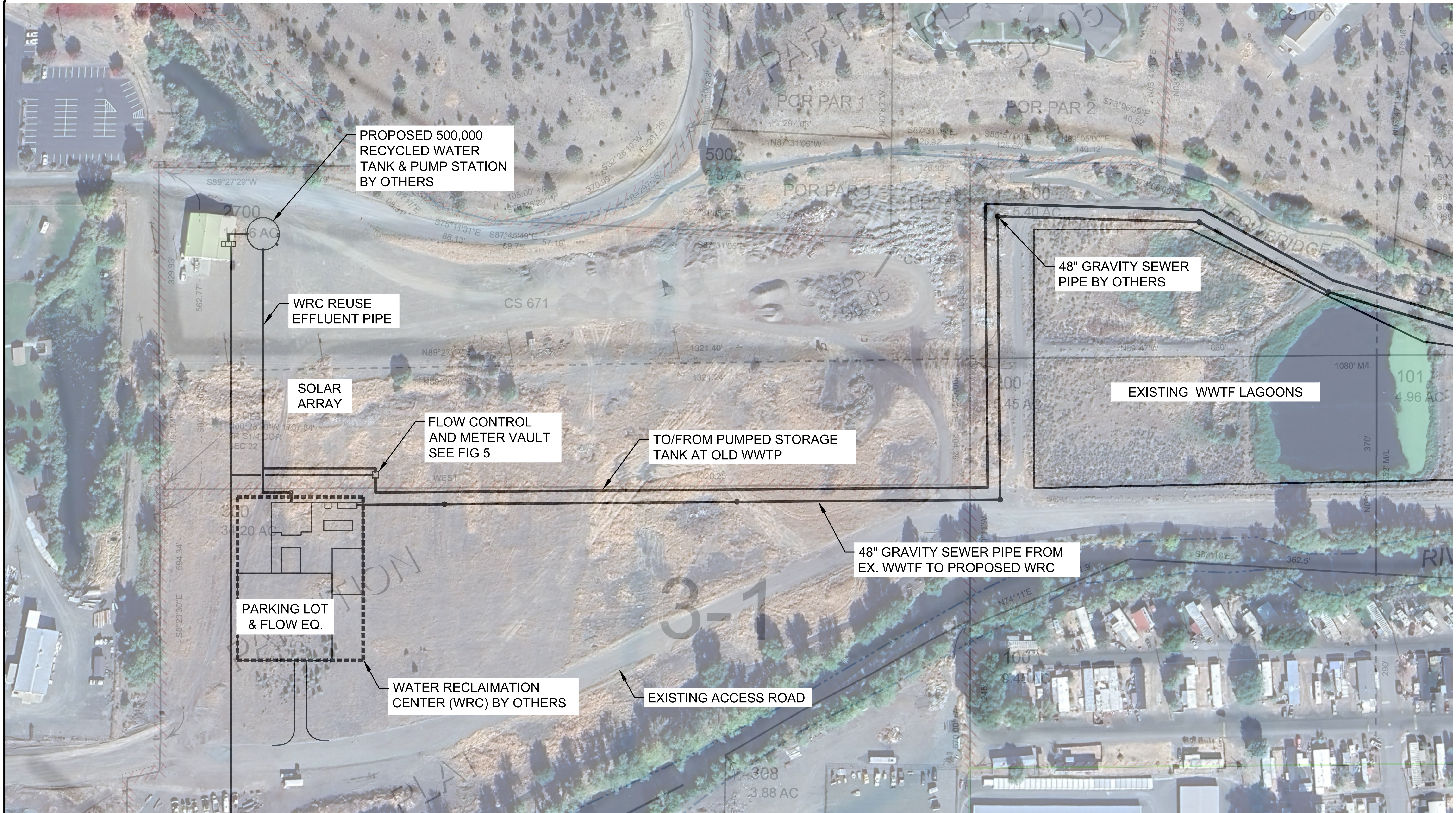

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PROPOSED WASTEWATER TREATMENT PLANT

PROJ:	200-654565-24007
DATE:	03/2024
DESN:	JF
FIGURE	FIG 3

Bar Measures 1 inch

4/19/2024 4:31:26 PM - C:\USERS\JESSE.FIELDS\ONEDRIVE - TETRA TECH, INC\JOHN DAY\CAD\SHEETFILES\FIG 3_.DWG - FIELDS, JESSE

4/19/2024 4:31:55 PM - C:\USERS\JESSE.FIELDS\ONEDRIVE - TETRA TECH, INC\JOHN DAY\CAD\SHEETFILES\FIG 4.DWG - FIELDS, JESSE

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CITY OF JOHN DAY, OREGON
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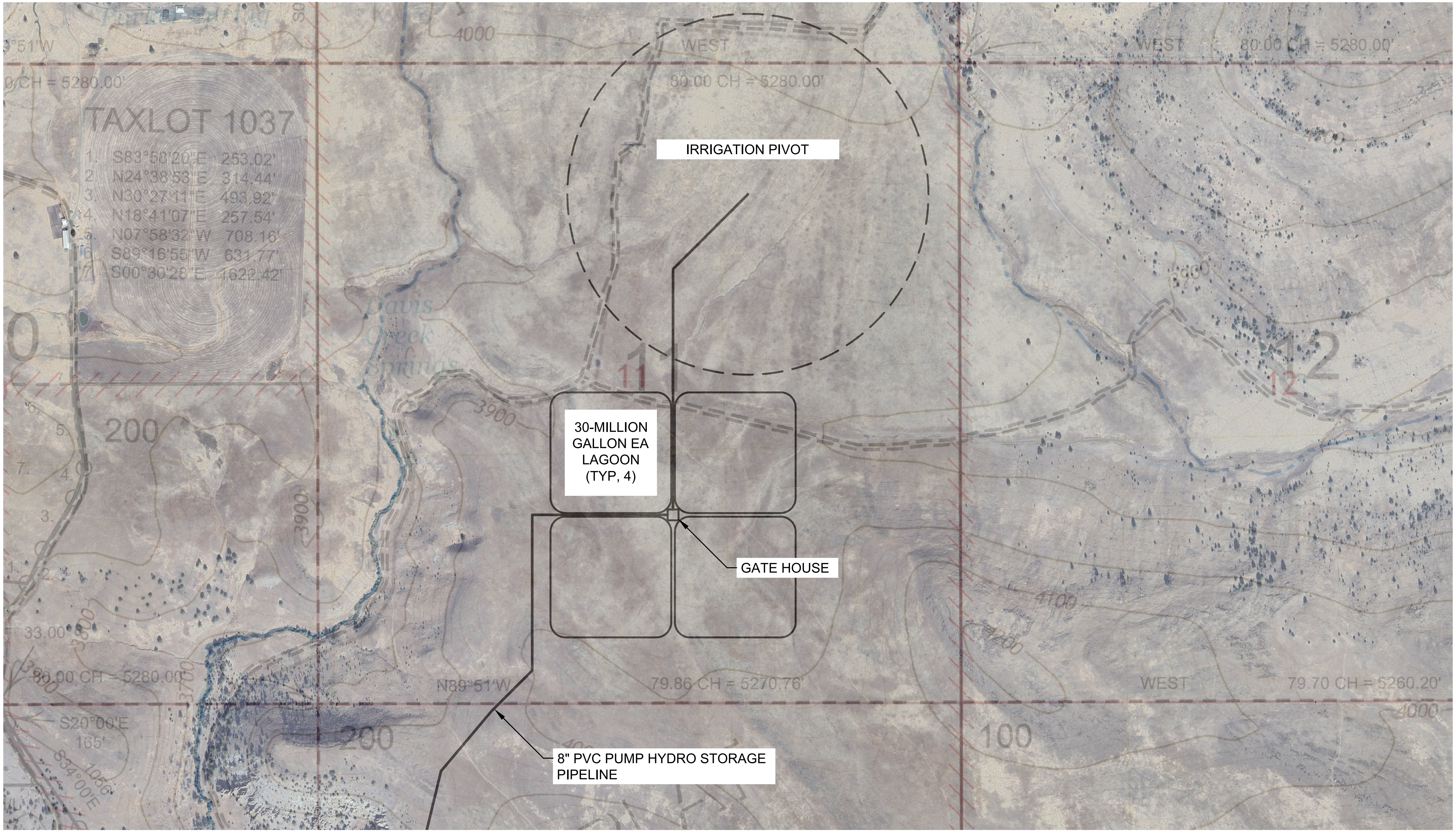
EXISTING WASTEWATER TREATMENT PLANT

PROJ:	200-654565-24007
DATE:	03/2024
DESN:	JF

FIGURE
FIG 4

Bar Measures 1 inch



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JOHN DAY RENEWABLE ENERGY STUDY

PROPOSED STORAGE AND IRRIGATION SITE

PROJ:	200-654565-24007
DATE:	03/2024
DESN:	JF
FIGURE	FIG 5

Bar Measures 1 inch

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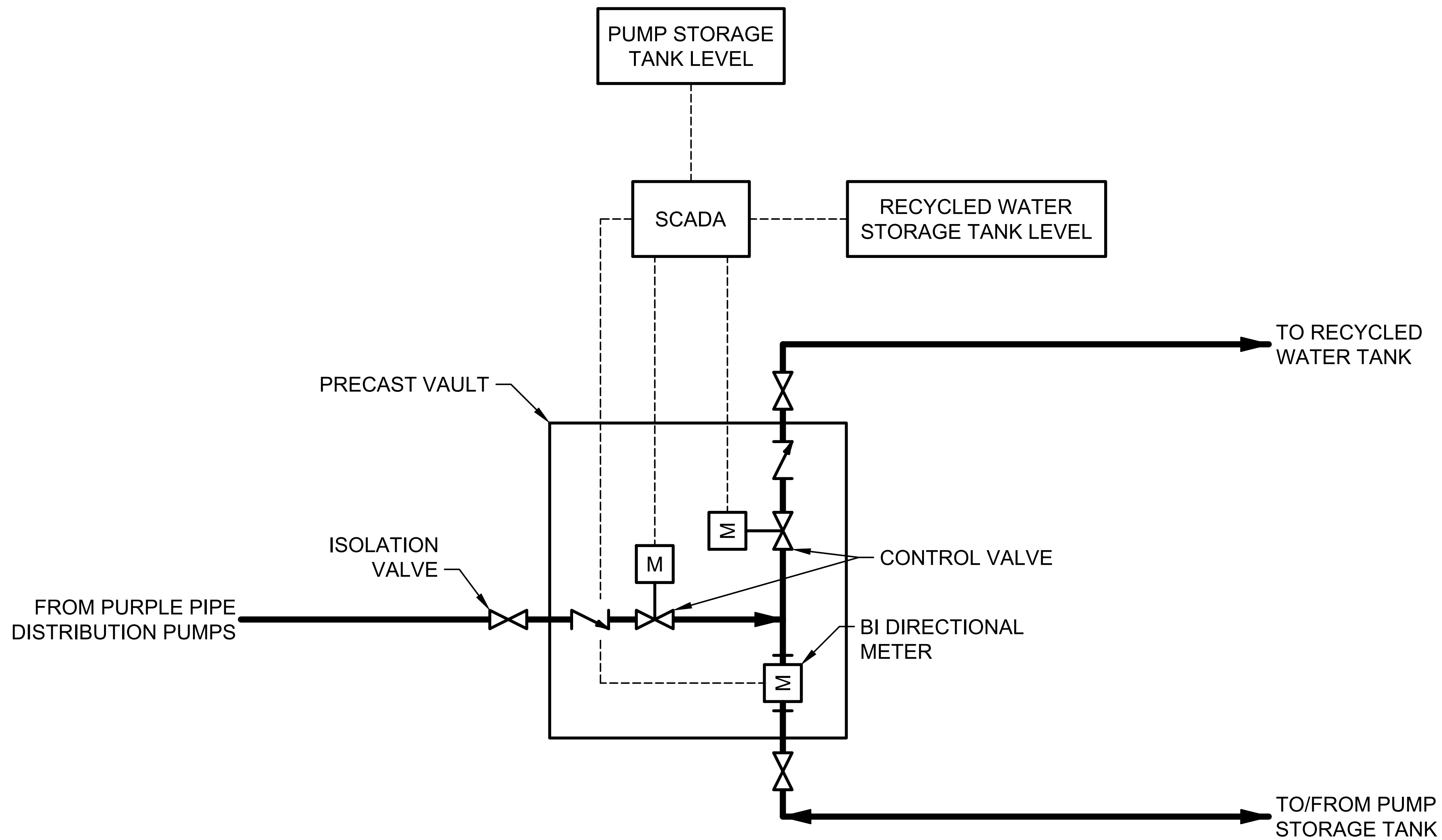

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CITY OF JOHN DAY, OREGON

JOHN DAY RENEWABLE ENERGY STUDY

CONCEPTUAL FLOW CONTROL AND METER VAULT

PROJ: 200-654565-24007
DATE: 03/2024
DESN: JF

FIGURE
FIG 6

Bar Measures 1 inch

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Appendix D

Cost Estimate – Pump Hydro

TETRA TECH

Date: **May 13, 2024**
Project: **John Day Renewable Energy**
Subject: **Opinion of Probable Construction Cost - Pumped Storage System**
AACE Estimate Class: Class 5
Low Accuracy: -20% to -50%
High Accuracy: +30% to +100%

Item Description	Qty	Unit	Unit Cost	Cost	Notes
Pipe/Connections					
8" HDPE pipe	14,500	LF	$ 150	$ 2,175,000	RSMeans adjusted up
8" Steel pipe	6,000	LF	$ 200	$ 1,200,000	RSMeans adjusted up
Asphalt surface restoration	900	SQ YD	$ 50	$ 45,000	SWAG Jesse
Ditch crossing	1	LS	$ 50,000	$ 50,000	SWAG Jesse
Flow Control and Meter Vault	1	LS	$ 100,000	$ 100,000	SWAG Jesse
			Subtotal:	$ 3,570,000	
Pump and Turbine Facility					
Pump and Turbine Building	900	SQ FT	$ 300	$ 270,000	SWAG Jesse
Booster Pumps/Turbine Generator	2	EA	$ 300,000	$ 600,000	Vertical turbine quote 200gpm @ 850ft
Piping & Mechanical	1	LS	$ 200,000	$ 200,000	SWAG Jesse
Regenerative Drive	2	EA	$ 10,000	$ 20,000	KEB Distributer Estimate
Pump and Turbine Electrical, Instrumentation, and Controls	1	LS	$ 163,500	$ 163,500	15% of sum of Booster Pumps/Turbine Generator, Regenerative Drive, and piping & mechanical
500,000 gallon steel tank	1	EA	$ 300,000	$ 300,000	Calculated in "Tank $ Calcs"
Site Civil	1	LS	$ 200,000	$ 200,000	
			Subtotal:	$ 1,753,500	
Lagoon Storage					
Lagoon - Cut & fill earthwork	1,600,000	CY	$ 10.00	$ 16,000,000	Excavating common earth 1' to 4' deep, 3/4 CY excavator - $ 166,667 per acre
Lagoon - HDPE Liner	4,300,000	SQ FT	$ 2.00	$ 8,600,000	HPDE 60 mil liner - $2.92/ SQ FT RSMeans (Total O&P), adjusted down for economy of scale
Lagoon - Fence	9,000	LF	$ 50.00	$ 450,000	SWAG Jesse
Access Roads - Crushed rock	28,000	SQ YD	$ 20.00	$ 560,000	Crushed stone base, compacted, to 8" deep - $13.96/SY RSMeans (Total O&P) adjusted up
Access Roads - Geotextiles	28,000	SQ YD	$ 1.00	$ 28,000	Geotextile fabric, woven - $1.25/SY RSMeans (Total O&P)
Lagoon - Clearing and grubbing	100	ACRES	$ 300	$ 30,000	Medium brush to 4" diameter - $316.39/acre RSMeans (Total O&P)
Gate house	300	SQ FT	$ 250	$ 75,000	SWAG, assuming CMU walls
Gate House Electrical, Instrumentation, and Controls	1	LS	$ 40,875	$ 40,875	25% of Pump and Turbine Electrical, Instrumentation, and Controls
			Subtotal:	$ 25,783,875	
			Subtotal:	$ 31,107,375	
Erosion Sediment Control		0.5%		$ 155,537	
Mobilization		10%		$ 3,110,738	
			Subtotal:	$ 34,373,649	
Estimating Contingency		20%		$ 6,874,730	
			Hard Costs Subtotal (Rounded):	$ 41,250,000	
Engineering and Construction Support		7%		$ 2,887,500	
Permitting		1%		$ 412,500	
			Total Estimated Project Cost (Rounded):	$ 45,000,000	
	Low Estimated Total Project Cost:		**-25%**	**$ 34,000,000**	
	High Estimated Total Project Cost:		**50%**	**$ 68,000,000**	

MONITORING WELL DRILLING, INSTALLATION, AND DEVELOPMENT AGREEMENT

This Monitoring Well Drilling, Installation, and Development (this "Agreement") is dated effective June __, 2024 (the "Effective Date") between City of John Day ("City"), an Oregon municipal corporation, whose address is 450 East Main Street, John Day, Oregon 97845, and Yellow Jacket Drilling Services, LLC ("Contractor"), an Arizona limited liability company, whose principal place of business is located at 3922 East University Drive, Phoenix, Arizona, 85034.

RECITALS:

A. Contractor is a licensed Oregon water and monitoring well constructor in the business of well drilling, installation, and development on a contract basis. Contractor's Oregon Water and Monitoring Well Constructor's License number is 10576 and telephone number is 503-285-2461.

B. City desires to drill, install, and develop five (5) monitoring wells (the "Project") as required by City's water pollution control facility permit groundwater monitoring program. City and Contractor desire to enter into this Agreement pursuant to which Contractor will undertake and perform certain well drilling, installation, and development services to complete the Project.

C. The Project is funded with federal grant funds from the Oregon Community Development Block Grant ("CDBG") program administered by the Oregon Business Development Department ("OBDD"). City's receipt of the CDBG grant funds is subject to the terms and conditions of that State of Oregon CDBG Grant Program Contract dated on or about __________ between City and OBDD (the "Grant Agreement").

AGREEMENT:

NOW, THEREFORE, for and in consideration of the parties' mutual obligations under this Agreement, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto hereby agree as follows:

1. WELL DRILLING, INSTALLATION, AND DEVELOPMENT SERVICES; COMPENSATION

1.1 Description of Services. Subject to the terms and conditions contained in this Agreement, Contractor will perform and complete the following well drilling, installation, and development services for and on behalf of City concerning or related to the Project (collectively, the "Services"): (a) the well drilling, installation, and development services as further described on the Technical Specifications drafted by CwM-H20, LLC and attached hereto as Schedule 1.1; and (b) all necessary or appropriate services customarily provided by Contractor in connection with its performance of the services set forth in this Agreement. Contractor will (w) consult with and advise City on all matters concerning the Services reasonably requested by City, (x) communicate all matters and information concerning the Services to City's city manager and report directly to the city manager, (y) devote such time and attention to the performance of the Services as City and Contractor deem necessary or appropriate, and (z) perform the Services to the best of Contractor's ability.

1.2 Schedule of Services. Timely and proper completion of the Services is of the essence to this Agreement. Contractor will commence performance of the Services promptly after City issues Contractor written notice to proceed. Contractor will prosecute completion of the Services diligently and continuously. The Services will be Completed (as defined below) no later than _______ ___, 2024 (the "Completion Date"). For purposes of this Agreement, the term "Completion" or "Completed" means when City determines, in its sole discretion, that the Services is complete in accordance with this Agreement.

1.3 Compensation. Subject to the terms and conditions contained in this Agreement, in consideration of Contractor's timely completion of the Services in accordance with this Agreement, City will pay Contractor the amounts identified on the attached Exhibit A (the "Contractors Bid"). Total compensation payable by City to Contractor under this Agreement for performance of the Services will not exceed $51,900.00 without first obtaining City's prior written consent. Upon completion of the Services, Contractor will submit an invoice to City concerning the Services (the "Invoice"). City will pay the amount due under the Invoice within thirty (30) days after City has reviewed and approved the Services. City's payment will be accepted by Contractor as full compensation for completing the Services. No compensation will be paid by City for any portion of the Services not completed in accordance with this Agreement. City will not provide any benefits to Contractor, and Contractor will be solely responsible for obtaining Contractor's own benefits, including, without limitation, insurance, medical reimbursement, and retirement plans. City will not reimburse Contractor for any expenses incurred by Contractor to complete the Services. Notwithstanding anything contained in this Agreement to the contrary, City's performance of its obligations under this Agreement is conditioned on Contractor's performance of its obligations under this Agreement, including, without limitation, those Contractor obligations described under Section 1.1, 1.2, and Section 2.

2. CONTRACTOR DUTIES, RESPONSIBILITIES, RELATIONSHIP, REPRESENTATIONS, AND WARRANTIES

In addition to any other Contractor representation, warranty, and/or covenant contained in this Agreement, Contractor represents, warrants, and covenants to City the following:

2.1 General Duties. Contractor will perform and complete the following at Contractor's cost and expense: (a) furnish all labor, materials, equipment, tools, supplies, and services necessary or appropriate to complete the Services; (b) perform the Services in a good and workmanlike manner to meet the highest standards prevalent in the monitoring well drilling industry; (c) obtain and pay for all licenses, inspections, and permits required by any private and/or public authority in connection with the Services; (d) properly manage and dispose of all waste, trash, and debris, including, without limitation, sediment, motor oil, and grease, in accordance with all applicable laws and regulations; (e) be responsible to City for the acts and omissions of Contractor and/or Contractor's Representatives (as defined below); (f) not cause and/or permit any hazardous substances to be spilled, leaked, disposed of, and/or otherwise released in, on, under, and/or about the Project sites and/or any surrounding areas; and (g) obtain and maintain all licenses, permits, certificates, registrations, and other governmental authorizations required to conduct Contractor's business and perform the Services. Contractor will maintain proper licensure with the Oregon Water Resources Department and maintain proper insurance and bonding as required under this Agreement. For purposes of this Agreement, the term "Contractor's Representative(s)" means each present and future Contractor officer, employee, representative, subcontractor, and/or agent. Contractor will pay when due all charges for labor and materials incurred by Contractor used in completion of the Services and will be responsible for keeping the Project sites free of all liens and/or other claims related to the Services.

2.2 Independent Contractor; No Agency Relationship; Independent Investigation. Contractor is an independent contractor and not an employee of City. Contractor will be free from direction and control over the means and manner of performing the Services, subject only to the right of City to specify the desired results. City will not withhold any taxes from any payments made to Contractor, and Contractor will be solely responsible for paying all taxes arising out of or resulting from performance of the Services, including, without limitation, income, social security, workers' compensation, and employment insurance taxes. This Agreement does not create an agency relationship between City and Contractor and does not establish a joint venture or partnership between City and Contractor. Contractor does not have the authority to bind City or represent to any person that Contractor is an agent of City. Contractor has visited, reviewed, and evaluated the Project sites (and all surrounding areas) and is satisfied with the nature and condition of the Project sites (and all surrounding areas) and the general and local conditions, including, without limitation, those bearing upon building materials, disposal, availability of labor, uncertainties of weather, and any other conditions concerning the Project sites (and all surrounding areas) and/or the Services, and warrants that the consideration for the Services is reasonable in light of such conditions.

2.3 Limited Warranty. Contractor guarantees and warrants the Services against all deficiencies and/or defects in materials, equipment, and workmanship for a period of one (1) year, commencing from the date

City determines the Services is Completed. If City discovers a deficiency and/or defect in the Services, Contractor will commence repair or correction of the deficiency or defect within forty-eight (48) hours after City's written notice. Contractor will complete all warranty work diligently and expeditiously until completion (and without cost and/or interruption to City). If Contractor fails to promptly complete the warranty work, City may employ a third party to complete the warranty work. All costs and expenses incurred by City to complete the warranty work will be reimbursed by Contractor immediately on City's written demand. Contractor warrants and guarantees all repair work for one (1) year, commencing on the date the warranty work is completed to City's satisfaction. Contractor's warranty provided under this Section 2.3 is in addition to, and not in limitation of, all other representations, warranties, guarantees, and remedies provided under this Agreement.

2.4 Compliance With Laws. Contractor will comply and perform the Services subject to and in accordance with the Laws. For purposes of this Agreement, the term "Law(s)" means all applicable federal, state, and local laws, regulations, restrictions, orders, codes, rules, and/or ordinances related to or concerning, whether directly or indirectly, Contractor, the Grant Agreement, this Agreement, and/or the Services, including, without limitation, (a) ORS 279B.220, 279B.225, 279B.230, and 279B.235, which statutes are incorporated herein by reference, (b) those federal contract provisions and clauses contained in the attached Exhibit B, and (c) all applicable City ordinances, resolutions, policies, regulations, orders, restrictions, and guidelines, all as now in force and/or which may hereafter be amended, modified, enacted, or promulgated.

2.5 Compliance with Tax Laws. Contractor represents and warrants that it has complied with the tax laws of the State of Oregon (and all applicable political subdivisions of the State of Oregon), including, without limitation, those tax laws described in ORS 305.380(4) (individually and collectively, the "Tax Laws"). Contractor will comply with the Tax Laws during the term of this Agreement. By signing this Agreement, Contractor certifies, under penalty of perjury, that Contractor is, to the best of Contractor's knowledge, not in violation of any Tax Laws.

2.6 Records. Contractor will maintain complete and accurate records concerning all Services performed, the number of hours each person spent to perform the Services, and all documents produced under this Agreement for a period of five (5) years after the termination of this Agreement. Contractor's records will be maintained in accordance with sound accounting practices. Contractor's records concerning the Services, including, without limitation, Contractor's time and billing records, will be made available to City for inspection, copying, and/or audit immediately upon City's request.

3. INSURANCE AND INDEMNIFICATION

3.1 Insurance. Contractor will maintain public liability and property damage insurance against death or injury to persons and physical loss or damage to property, which insurance will include perils of fire, theft, vandalism, Acts of God, and malicious mischief; the insurance will include coverage for contractual liability and "products-completed operations" that will apply for a period of two (2) years from the date the Services is determined Completed. The insurance required under the immediately preceding sentence will be in the form of general liability and property damage insurance (occurrence version) and protect against all claims arising out of Contractor's activities on, or any condition of, the Project with limits of no less than $1,000,000.00 per occurrence, $2,000,000.00 in the aggregate. Contractor will obtain and maintain the following insurance: (a) commercial automobile insurance with limits of no less than $500,000.00 combined single limit or split limits of $250,000.00 per person, $500,000.00 per occurrence and $250,000.00 property damage, for all automobiles used in the prosecution of the Services; and (b) workers' compensation insurance in form and amount sufficient to satisfy the requirements of applicable Oregon law. Each liability insurance policy will be in form and content satisfactory to City and will contain a severability of interest clause. By separate endorsement, each liability insurance policy will name City and City's Representatives as additional insureds. Contractor's insurance will be primary, and any insurance carried by City will be excess and noncontributing. Contractor will provide evidence of the insurance coverage (including applicable endorsements) required to be maintained by Contractor under this Section 3.1 prior to commencement of the Services and upon City's demand. All policies of insurance Contractor is required to carry under this Agreement will provide that the insurer waives the right of subrogation against City. For purposes of this Agreement, the term "City's Representative(s)" means each present and future City officer, official, employee, representative, and/or agent.

3.2 Indemnification. Contractor releases and will defend, indemnify, and hold City and City's Representatives harmless for, from, and against all claims, actions, proceedings, damages, liabilities, judgments, penalties, fines, costs, and expenses of every kind, whether known or unknown, including, without limitation, attorney fees and costs, resulting from or arising out of the Services and/or Contractor's breach and/or failure to perform any representation, warranty, covenant, and/or obligation contained in this Agreement. Contractor's indemnification obligations provided in this Section 3.2 will survive the termination of this Agreement.

4. TERMINATION AND DAMAGES

4.1 Termination for Cause. Notwithstanding anything contained in this Agreement to the contrary, City may terminate this Agreement immediately upon notice to Contractor upon the happening of any of the following events: (a) Contractor fails to timely prosecute the Services continuously with sufficient laborers and equipment to ensure its completion by the Completion Date; (b) Contractor fails to complete the Services in accordance with this Agreement; (c) Contractor fails to pay its obligations as and when they become due; (d) Contractor breaches and/or otherwise fails to perform any Contractor representation, warranty, covenant, and/or obligation contained in this Agreement; (e) Contractor engages in any form of dishonesty or conduct that reflects adversely on City's reputation or operations; (f) Contractor fails to comply with any applicable law related to Contractor's independent contractor relationship with City; (g) problems occur in connection with Contractor's performance of the Services; and/or (h) Contractor gives City cause to doubt Contractor's ability to timely, fully, and properly complete the Services (or any other obligation hereunder). Any of the foregoing act(s) or omission(s) will constitute a default by Contractor under this Agreement. City may terminate this Agreement immediately on written notice to Contractor if City determines in its sole discretion that Contractor is in default under this Agreement as provided under this Section 4.1.

4.2 Termination for Convenience. City may terminate this Agreement in whole or in part whenever City determines that termination of this Agreement is in the best interest of the public. Such termination may be without cause and without prejudice to any other right and/or remedy of City. City will provide Contractor with seven (7) days' prior written notice of a termination for convenience. Upon receipt of a written notice of termination, except as explicitly directed by City, Contractor must immediately discontinue performing the Services.

4.3 Remedies; Damages. If City terminates this Agreement under this Section 4, City may take over prosecution of all or any portion of the Services and may complete it with its own forces or otherwise, or use such other measures as in City's sole discretion are necessary or appropriate to prevent delay or damages. Completion of the Services, or any portion thereof, will not constitute a forfeiture of City's right to recover damages from Contractor for Contractor's delay or failure to complete the Services. Upon City's termination of this Agreement, City will reimburse Contractor for any unpaid labor and materials and for Contractor's reasonable overhead and profit earned through the date of termination for Services Contractor has completed (to City's satisfaction) through the date of termination. Under no circumstances will Contractor be entitled to lost profits or revenue or other economic loss arising out of or resulting from City's termination action. City will not be obligated to reimburse or pay Contractor for any continuing contractual commitments to others or for penalties or damages arising from the cancellation of such contractual commitments. City's decision to terminate this Agreement will not constitute City's sole remedy; rather, City will have all remedies available to City under this Agreement, at law and/or in equity.

5. MISCELLANEOUS

5.1 Attorney Fees; Dispute Resolution. If any arbitration or litigation is instituted to interpret, enforce, and/or rescind this Agreement, including, without limitation, any proceeding brought under the United States Bankruptcy Code, the prevailing party on a claim will be entitled to recover with respect to the claim, in addition to any other relief awarded, the prevailing party's reasonable attorney fees and other fees, costs, and expenses of every kind, including, without limitation, costs and disbursements specified in ORCP 68 A(2), incurred in connection with the arbitration, the litigation, any appeal or petition for review, the collection of any award, or the enforcement of any order, in amounts as determined by the arbitrator or court. If any claim, dispute, or controversy arising out of or related to this Agreement occurs (a "Dispute"), City and Contractor will exert their reasonable efforts to seek a fair and prompt negotiated resolution of the Dispute and will meet at least once to discuss and seek a resolution of the Dispute. If the Dispute is not resolved by negotiated resolution, either party may initiate a suit, action, arbitration, or other proceeding to interpret, enforce, and/or rescind this Agreement.

5.2 Time of Essence; Notices. Time is of the essence with respect to all dates and time periods in this Agreement. All notices or other communications required or permitted by this Agreement must be in writing, must be delivered to the parties at the addresses set forth above, or any other address that a party may designate by notice to the other party, and are considered delivered upon actual receipt if delivered personally, by fax or email transmission (with electronic confirmation of delivery), or by a nationally recognized overnight delivery service, or at the end of the third business day after the date of deposit if deposited in the United States mail, postage pre-paid, certified, return receipt requested.

5.3 Amendment; Waiver; Severability; Governing Law. This Agreement may be amended only by a written document signed by both parties. No waiver will be binding on a party unless it is in writing and signed by the party making the waiver. A party's waiver of a breach of a provision of this Agreement will not be a waiver of any other provision or a waiver of a subsequent breach of the same provision. If a provision of this Agreement is determined to be unenforceable in any respect, the enforceability of the provision in any other respect and of the remaining provisions of this Agreement will not be impaired. This Agreement is governed by the laws of the State of Oregon, without giving effect to any conflict-of-law principle that would result in the laws of any other jurisdiction governing this Agreement. Any action or proceeding arising out of this Agreement will be litigated in courts located in Grant County, Oregon. Each party consents and submits to the jurisdiction of any local, state, or federal court located in Grant County, Oregon.

5.4 Further Assurances; Termination; Survival. The parties will sign all other documents and take any other actions reasonably necessary to further effect and evidence this Agreement. The termination of this Agreement, regardless of how it occurs, will not relieve a party of obligations that have accrued before the termination. All provisions of this Agreement that would reasonably be expected to survive the termination of this Agreement will do so, including, without limitation, the indemnification obligations under Section 3.2 and the warranty obligations under Section 2.3. Any exhibits, schedules, and other attachments referenced in this Agreement are part of this Agreement.

5.5 Entire Agreement; Interpretation; Discretion. This Agreement contains the entire understanding of the parties regarding the subject matter of this Agreement and supersedes all prior and contemporaneous negotiations and agreements, whether written or oral, between the parties with respect to the subject matter of this Agreement. All pronouns contained herein and any variations thereof will be deemed to refer to the masculine, feminine, or neutral, singular or plural, as the identity of the parties may require. The singular includes the plural and the plural includes the singular. The word "or" is not exclusive. The words "include," "includes," and "including" are not limiting. The titles, captions, or headings of the sections herein are inserted for convenience of reference only and are not intended to be a part of or to affect the meaning or interpretation of this Agreement. For purposes of this Agreement, the term "person" means any natural person, corporation, limited liability company, partnership, joint venture, firm, association, trust, unincorporated organization, government or governmental agency or political subdivision, or any other entity. When City is exercising any consent, approval, determination, and/or similar discretionary action under this Agreement, the standard will be City's sole discretion.

[signature page follows]

IN WITNESS WHEREOF, the undersigned have caused this Agreement to be executed and effective for all purposes as of the Effective Date.

CITY: City of John Day, an Oregon municipal corporation	CONTRACTOR: Yellow Jacket Drilling Services, LLC an Arizona limited liability company
________________________________ By: Melissa Bethel, City Manager	________________________________ By: {NAME}, {TITLE}

Schedule 1.1
Technical Specifications

[attached]

Exhibit A
Contractor's Bid

[attached]

Exhibit B
Oregon Community Development Block Grant
Required Federal Contract Clauses

Use for Non-Construction Contracts Where the Grant Award Exceeds $100,000

1. Source of Funds

''Work under this contract will be funded in its entirety with federal grant funds from the Oregon Community Development Block Grant program."

2. Conflict of Interest

No employee, agent, consultant, officer, elected official or appointed official of the city or county grant recipient or any of its sub-recipients (sub-grantees) receiving CDBG funds who exercise or have exercised any functions or responsibilities with respect to CDBG activities who are in a position to participate in a decision making process or gain inside information with regard to such activities, may obtain a financial interest or benefit from the activity or have an interest or benefit from the activity or have an interest in any contract, subcontract or agreement with respect thereto, or the proceeds there under, either for themselves or those with whom that have family or business ties, during their tenure or for one year thereafter, in accordance with 24 CFR Part 570.489(h).

3. Minority, Women and Emerging Small Business

Before the final payment to Contractor is made, Contractor shall submit the attached "Minority, Women and Emerging Small Business Activity Report."

4. Prohibition on the Use of Federal Funds for Lobbying

As evidenced by execution of this contract, Contractor certifies, to the best of their knowledge and belief that:

CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief, that:

A. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan or cooperative agreement.

B. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

C. The undersigned shall require that the language of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, sub grants, and

D. Contracts under grants, loans, and cooperative agreements) and that all sub recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into *this* transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

____
Signature

____
Title/Firm

____
Date

CITY OF JOHN DAY

REQUEST FOR COUNCIL ACTION

<table>
<tr><td colspan="4">DATE ACTION REQUESTED: June 11, 2024</td></tr>
<tr><td>Ordinance ☐</td><td>Resolution ☐</td><td>Motion X</td><td>Information</td></tr>
<tr><td colspan="2">Date Prepared: June 4, 2024</td><td colspan="2">Dept.: City Manager's Office</td></tr>
<tr><td colspan="2">SUBJECT: Recommendation of Award of the Rate Study Contract to Donovan Enterprises, Inc.</td><td colspan="2">Contact Person for this Item: Melissa Bethel, City Manager, bethelm@grantcounty-or.gov, (541) 575-0028</td></tr>
</table>

SUBJECT: Recommendation of Award of the Rate Study Contract to Donovan Enterprises, Inc.

BACKGROUND: The City of John Day published a Request for Proposals for "Wastewater and Water Utility Rate Model and System Development Charges Methodology Update," on May 1, 2024 in the *Blue Mountain Eagle,* which closed on May 30, 2024. The Scoring Committee (Public Works Director Casey Meyers, City Manager Melissa Bethal, and Grant Administrator Nicholas Dudocte) met on May 31, 2024 to rank and review the three proposals provided for Rate Study consulting services to the City of John Day.

The three proposals were received from:

- GEL Oregon, Inc. - $31,403
- Donovan Enterprises, Inc. - $35,425
- FCS Group - $84,060

GEL was the lowest proposed price, but also the lowest scoring proposal. Their proposal was the most generic and provided no unique analysis or information on the City of John Day's situation. Apart from the cover letter, very little in the proposal is tailored to local situation. GEL proposed a billing rate of $250/hr for consulting time and a total of 110 hours of professional services (not including travel).

FCS Group scored second-highest, but was also over double the cost of the other two proposals. While FCS Group is a highly qualified professional firm with an entire team of experts, their proposal was also fairly generic and not tailored to the needs of the City of John Day. FCS has extensive experience with rate studies and methodologies, but the City's issues are not overly complex. FCS Groups proposed rates were $305, $235, and $200/hr for its primary professional service provider with a total of 326 hours budgeted for the project.

CITY OF
JOHN DAY

Donovan Enterprises, Inc. was the highest scoring proposal and the second-lowest price proposal. Donovan put the most effort into understanding and explaining the City of John Day's issues. He provided a number of charts, graphs, and began to do some of the financial analysis. The time needed for this sort of work not only demonstrates Donovan's understanding of the project, but also refines the project approach setting it apart from the other two proposals. Additionally, Donovan's primary rate is $175/hour and dedicating 207 hours to the project. Donovan's proposal not only demonstrates the highest value, but the best project approach and the deepest understanding of the City's issues.

		Consensus Scoring		
Category	**Max**	**GEL**	**Donovan**	**FCS**
Team Member Qualifications	25	12	20	24
Past Projects and References	20	10	19	19
Project Approach	45	15	40	30
Other Factors	10	10	10	10
Total	100	**47**	**89**	**83**

FINANCIAL IMPACT: The work will be paid for through the Community Development Block Grant #18011 grant. The contract will be for $35,425.

COUNCIL ACTION REQUESTED: Concur with the Committee's recommendation, award the contract to Donovan Enterprises, Inc., and direct the City Manager to sign a contract for the RFP scope of work with a Not to Exceed amount of $35,425 pending legal review.

ATTACHMENTS:

#1 - Donovan Enterprises, Inc. proposal
#2- FCS Group proposal
#3- GEL Oregon Inc. proposal

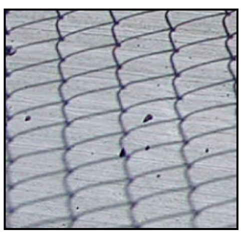
Professional Services Proposal

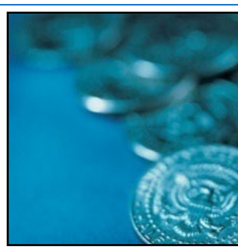
May 30, 2023

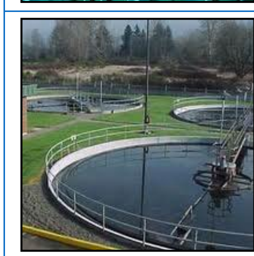
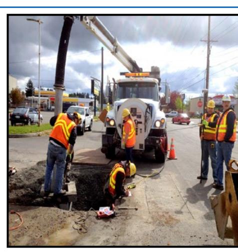
Prepared for

CITY OF
JOHN DAY

Water and Sewer Rates and SDCs Study



Presented by

DONOVAN
enterprises, inc.

9600 SW Oak Street, Suite 335
Tigard, Oregon 97223-6596
☎ 503.517.0671

Vital Information Table

City of John Day - 2024 Water and Sewer Rates and SDCs Study	
Name of firm submitting	Donovan Enterprises, Inc. Federal Tax I.D.: 41-2180168
State of Oregon Emerging Small Business Certification	ESB Tier 1 Certification No.: 6756
Insurances in force	*Professional liability insurance:* Philadelphia Insurance Company; coverage: aggregate limit: $2,000,000, each wrongful act limit: $1,000,000 *Commercial general liability insurance:* American Family Insurance Company; products-completed operations aggregate limit: $2,000,000, liability and medical expenses: $1,000,000 *Commercial liability umbrella policy:* American Family Insurance Company; aggregate limit: $2,000,000
Project manager & officer in charge	Steven J. Donovan
Project manager contact information and professional affiliations	*Office address:* 9600 SW Oak Street, Suite 335, Tigard, Oregon 97223 *Telephone:* 503.517.0671 *Fax:* 503.517.0672 *e-mail:* steve.donovan@donovan-enterprises.com *Professional Affiliations:* • American Public Works Association • American Water Works Association • Water Environment Federation • Institute of Electrical and Electronic Engineers • Oregon Municipal Finance Officers Association • Oregon Association of Clean Water Agencies

DONOVAN
enterprises, inc.

INFRASTRUCTURE FINANCIAL MANAGEMENT
MANAGEMENT CONSULTING
LAND USE PLANNING

May 30, 2024

Ms. Melissa Bethel
City Manager
450 East Main Street
John Day, Oregon 97845

Re: Request for Proposals – Water and Sewer Rates and SDCs Study

Dear Ms. Bethel,

Donovan Enterprises, Inc. (DEI) is pleased to submit this response to your request for proposals to develop a utilities rate and SDCs study. I will be the principal in charge of this engagement. DEI has over thirty years of experience in engineering, utility finance, system development charges (SDC), utility economics, and public policy analysis. We have worked on a number of high-profile projects specifically related to rate and SDC analysis in the Northwest over the past 30 plus years. We are also familiar with you having worked on the LaPine transportation SDCs and Lakeside sewer rates while you were in management at these Oregon communities.

We are extremely excited at the prospect of working on this project. In terms of roles and time commitments for this project, I will be the consultant team project manager and my staff will aid in the technical areas of engineering analysis and statutory compliance. I will focus on the planning, rates, and revenue requirements analysis; and will be looking for opportunities to improve and enhance the work the city has already completed relative to utilities planning. We believe that our best indicator of success is the record of accomplishment we have established with municipal clients. We can point to a consistent record of efficiency, within budget, on-schedule and implemented work products for each of these authorities.

In closing, we are able to commit ourselves to working on this project from beginning to completion and our proposal content and price will be valid for ninety (90) days from our submittal date. We see ourselves as the “hands on” team to assist you in answering key technical and financial questions that will result in a thorough analytical review of the financial health of the City’s water and wastewater utilities. We know cost of service methods and utilities finance. We can hit the ground running and will continue this level of effort through successful completion of the project. The value of this to the city is there will be no learning curve for our team. We believe our record of performance speaks for itself in providing a quality product on time and within budget. We look forward to collaborating with you on this important project. If you have any questions concerning our proposal, please do not hesitate to call.

Very truly yours,

Steven J. Donovan

Principal

Voice: 503.517.0671
Fax: 503.517.0672

Plaza West
Business Center

9600 SW Oak Street,
Suite 335

Tigard, Oregon 97223

Utilities Rate Study

CITY OF
JOHN DAY

Table of Contents

Project Understanding and Approach

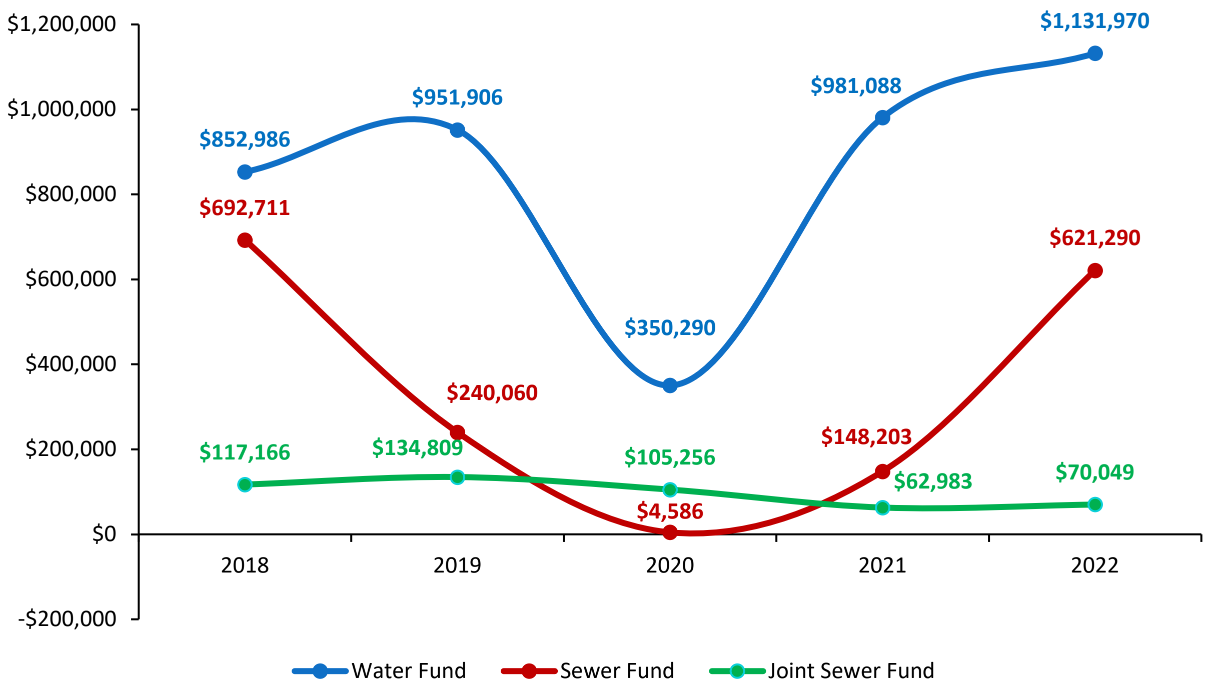
The City of John Day (the city) is the sole provider of water and wastewater services to customers within the urban services boundary of the city. The city also provides wholesale wastewater treatment services for surrounding areas including all of Canyon City. Revenues required to fund the delivery of these services are obtained from monthly user fees which are set by the City Council via their charter authority. Costs to operate, maintain, and improve these systems have increased over time, particularly over the last three years. The City has done a commendable job managing the finances of these utilities and has sufficient reserves to fund future operations. However, over the last few years, the city has been in a holding pattern with respect to improvements to these systems as it fine tunes its master plan implementation strategies, particularly in the case of wastewater. The vintages of the City's master plans are as follows:

- Water:
  - ✓ Water Management and Conservation Plan; September 2015
- Wastewater:
  - ✓ Wastewater Facilities Plan Update; March 2019
  - ✓ Wastewater System Improvements – Preliminary Engineering Report; February 2020
  - ✓ Wastewater System Improvements – Preliminary Engineering Report Addendum #1; March 2022

Now the City is in the process of implementing these plans.

From an accounting and budgeting perspective, the city treats the water and wastewater businesses as "enterprises" as defined by Oregon budget law. Within each enterprise, there is an operating component and a capital component. Operating revenues and expenditures are tracked in the respective operating funds. Capital revenues and expenditures are tracked in the respective capital construction/SDC funds or accounts. Figure 1 shows historical ending fund balances for the water and wastewater utility operating funds (source City Audits).

Figure 1 - Historical Water, Sewer, & Stormwater Utility Fund Balances Budgetary Basis (June 30) – Source: City of John Day Audits



As the data in Figure 1 shows, over fiscal 2021 and 2022, the City has steadily grown its cash reserve positions in the water and sewer operating funds. The cash in the Joint Sewer Fund is low and is dedicated for the shared costs of operating the wastewater treatment plant between John Day and Canyon City. This cash can now be deployed to improve and expand the water and sewer systems.

The single largest demand on cash will be the funding for the relocation and replacement of the city's wastewater treatment plant. Based on our reading of the 2022 Preliminary Engineering Report Addendum #1 the relocation and construction of a new Sequencing Batch Reactor (SBR) wastewater treatment plant is now forecasted to cost $17,487,661 and consists of the following cost categories:

Preliminary engineering, environmental, and permitting	$ 741,326
Sequencing Batch Reactor WW treatment plant	10,347,248
Collection system rerouting to new WW treatment plant site (pipe alt #1)	2,140,834
Site improvements and road access	1,430,118
Project management	40,000
Debt financing	2,788,135
Project cost summary	$17,487,661

The city has been preparing a funding strategy for this project and has participated in the State of Oregon's "One Stop" funding meetings hosted by Business Oregon. Per the 2022 Preliminary Engineering Report Addendum #1 the basic funding assumptions for the project are shown in Table 1.

Table 1 - Preliminary Funding Plan for the Wastewater Treatment Plant Relocation and Reconstruction

WATER RECLAMATION FACILITY PROJECTED FINANCING (PRE-DECISIONAL)

Estimated Project Cost	**$17,487,661**
Local Contribution	
Assistance Requested	**$17,487,661**

Projected Monthly OM&R + Existing DS per EDU	$46.74
Monthly New DS per EDU	$43.89
Projected New Avg Monthly Rate per EDU	**$90.63**

					Financing Terms		
Partner	Program	Total Financing	Grant Amount	Loan Amount	Loan Repayment Term (yrs)	Estimated Interest Rate	Annual Debt Payment
BizOR	CDBG	$235,000	$235,000	$0			$0
BizOR	CDBG	$2,265,000	$2,265,000	$0			$0
BizOR	W/W	$2,500,000	$750,000	$1,750,000	30	1.000%	$67,809
State	Other	$1,500,000	$1,500,000				$0
USDA	RUS	$10,987,661	$0	$10,987,661	40	2.000%	$401,662

Total Financed	**$17,487,661**	Financing Gap	**$0**	Annual Debt Service	**$469,471**

As the data in Table 1 shows, the preliminary funding plan assumes the city will receive $4,750,000 in grants, and loans in the amount of $12,737,661. The loans are to consist of a 30-year 1% Business Oregon loan for $1,750,000 and a USDA Rural Utility Service 40-year 2% loan for $10,987,661. As of today, the interest rate on the USDA loan is inaccurate. We are working on a project in Molalla (SBR WW treatment plant) and the interest rate on their loan is 3%. They are also getting a $5 million USDA grant for their project. As of this date, the city has not secured any funding from the Clean Water State Revolving Loan Fund program administered by the Oregon Department of Environmental Quality. We are very familiar with this program and are aware of opportunities for principal forgiveness on some of their loan packages. We suggest the city connect with the DEQ on this issue.

We should also point out, the optimistic funding assumptions in Table 1 indicate the impact on the monthly sewer rate. As the data shows, the new projected monthly sewer rate would be $90.93 per Equivalent Dwelling Unit (EDU); the current rate is $60 per month per EDU. Even though the city has done substantial planning for the funding of this project, it is likely the total cost of the facility will exceed $20 million when completed in the next few years. The future cost of the project and the funding strategy will have meaningful rate impacts to the City's sewer ratepayers.

Rate Study Methodology

The purpose of the financial plan development and rate analysis is to create a cost of service-based methodology that will accurately determine the costs the City incurs to deliver water and wastewater services at current service levels to customers. In cases where the City chooses to exceed current levels of service, for example, borrowing money for proposed capital improvements, this study will identify the costs to meet these higher levels of service (LOS) and enable policy makers to understand the rate implications of providing services at a level that exceeds current revenues.

There are a number of specific issues the Council would like incorporated into the project. Beyond the cost-of-service analysis (COSA) which will be developed as part of our proposed scope of work, concerns related to rate structures, conservation incentives, and rate equity between customer classes will be specifically addressed. The city is also interested in modeling the adopted capital improvement plans for water and wastewater services. This will most likely require the future issuance of long-term debt (as discussed above). The cost of this capital financing plan can be incorporated into the COSA and included in the account or base elements of the rates under either a pay as you go approach or under a phased repayment program. The options will be developed in close coordination with the city with a focus on mitigating the impacts on customers while assuring that costs are equitably recovered from ratepayers. All of the above must be assessed in terms of the City's existing billing system software to accommodate these rate alternatives which the project team will evaluate as part of this work plan.

Our approach for this study will be incremental, taking each utility and breaking it down into distinct cost centers related to equipment, labor, materials and overhead. This process will result in the cost to provide the City's "current service level." From there, we will work with City staff to calculate the full cost of water and wastewater services at the department and division level. These cost pools will then be used to calculate the full rates that should be charged to recover the total cost of delivering services.

The process to develop this LOS cost schedule will be done in conjunction with the city and will be transparent, defensible, and above all, make sense to the Council and ratepayers. Experience has taught us that we have to pay careful attention to policy considerations in this area. In particular, we will develop cost-of-service models with the flexibility to allow for support of rates from other City sources. Ultimately, the level of general fund support to "buy down" utility revenue requirements are a matter of City Council policy. The models developed through this study will allow a clear understanding of the cost implications resulting from various levels of service.

The outcomes from this study are:

1. A thorough understanding of the true cost to provide water service levels, and
2. What additional services or higher service levels the city is interested in undertaking and what that would translate into regarding a local rate or alternative funding source requirement.

In addition to the rates analysis, a key deliverable of this engagement will be the development and documentation of the Excel-based spreadsheet models. These models will have twenty (20) year forecast horizons and will forecast revenue requirements in addition to the final rates for water and wastewater services. In our rate studies, we always prepare these models and include them as project deliverables.

Scope of Work and Task Plans

Task 1 – Rate Study Kickoff and Data Collection

…We have developed a task plan to meet the City's short-term needs and adequately address long-term policy objectives.…

There are three separate elements of a rate study: revenue requirements, cost of service allocation, and rate design. Our approach uses these steps as basic elements of a study tailored to the City's specific interests and needs. We have highlighted some of the utility management issues that we often address through the rate study process in the task plan outlined below. In the interest of brevity, we will highlight the key tasks, analyses, and considerations that will be essential to a successful study.

Data Collection - This initial project task is essential to timely completion of the engagement. A rate study requires data from various sources, including financial statements (income statement and balance sheet), budgets, asset schedules or inventories, and customer billing data. We have already collected a considerable amount of data in preparation for this engagement, as shown above in our presentation of the estimated cash position of the water and wastewater utilities. We also schedule an initial project kick-off meeting to review available data, clarify unfulfilled data needs, identify key contact persons, and assign responsibilities. Data collection will also include identifying the steps required to obtain the customer statistics for use in the cost-of-service analysis. Finally, as part of our analysis, we will identify standard reports and formats which will improve management review capability and simplify future updates.

As this database takes shape it will be important to keep the process oriented on the objective for this study, which is an accurate, comprehensive, and clearly documented cost basis for each enterprise. To be useful, the project must produce maintenance standards and costs that are mutually understood and ultimately "owned" by the city as the process moves forward before the Council and ratepayers.

Task 2 – Preliminary Model and Revenue Requirements Development

Once the data collection and validation tasks are completed and vetted by the city project manager, the consultant team will develop the water and wastewater revenue requirements models in Microsoft Excel format. We design our models for easy use by City staff and build in flexibility for the inclusion of future services. The models function as the utilities' financial plans. We will develop the financial plan models to allow for evaluation of alternative policies and strategies. The models typically perform several revenue sufficiency tests, such as cash flow, coverage, and earnings, against which the sufficiency of current rates to fund enterprise activities is measured. The revenue requirements analysis determines the amount of revenue needed from rates. This is related to utility cash flow or income requirements, constraints of bond covenants, and specific fiscal policies related to the three utilities. The matter of compliance with bond & loan covenants is particularly important in this case because we anticipate the City will be borrowing money in the future to fund new master plan projects, particularly in the case of wastewater for the new treatment plant. As of June 30, 2022, the enterprise funds have legacy debt outstanding; and the stream of future principal and interest payments on this legacy debt will be incorporated into the models. We also have a situation where the water fund will be receiving future principal and interest payments from the city's General Fund and the Urban Renewal Agency from two interfund loans. As of June 30, 2022, the water fund was owed $230,291 from the General Fund and $587,326 from the Urban Renewal Agency. Complete future payment schedules on the General Fund loan are available. The future payment schedule on the Urban Renewal Agency loan are still pending per the Fiscal 2022 audit.

Itemized below is a listing of the legacy water and sewer debts outstanding as of June 30, 2022, along with the schedules of future payments to maturities (per City Audits):

1. Joint Water and Sewer Fund Loans:

    a. Washington Federal Loan Payable

    The city applied for and received a loan from Washington Federal for sewer system improvements, fire hall improvements, and to refinance other City debt. The loan of $2,182,952 (74% Water Fund and 26% Sewer Fund) will be paid over 10 years, including interest at 3.34%. Interest payments are made semiannually on June 1 and December 1. Principal payments began December 1, 2018, and will continue through December 1, 2027. The Bank reserves the right, at its sole option, to request the unpaid balance to be paid in full on December 1, 2022, or the bank, at its sole option, could reset the rate on December 1, 2022, and allow payments to continue on to the 10-year maturity. If the rate resets, the interest rate will be based on the St Louis Fed 5-year Treasury Constant Maturity Rate, plus 1.75%, multiplied by 0.79. There was accrued interest payable of $3,738 on June 30, 2022. As of June 30, 2022, future payments are as follows:

FY Ended June 30	Principal	Interest	Total Payment	Balance
2023	$ 210,000	$ 47,868	$ 257,868	$ 1,132,952
2024	225,000	45,104	270,104	907,952
2025	225,000	35,159	260,159	682,952
2026	225,000	25,214	250,214	457,952
2027	225,000	15,269	240,269	232,952
2028	232,952	5,148	238,100	-
	$ 1,342,952	$ 173,762	$ 1,516,714	

2. Sewer Fund Loans:

    a. Oregon Business Special Public Works Fund Loan Payable – Gateway Property Acquisition

    The City applied for and received a loan from the Oregon Economic Development Department Special Public Works Fund for the purchase of property for a future sewer plant expansion. Terms of the $519,000 loan are 25 annual payments on December 1 of each year including interest of 3.78 percent through December 1, 2041. Annual payments are $29,217 for the first two years and $31,794 for the remaining 23 years. The loan is secured by net revenues from the City's Wastewater System after payment of operation and maintenance cost of the system, and all real and personal property associated with the Wastewater System are collateral for the loan. The first payment was made on December 1, 2017. There was accrued interest payable of $9,716 on June 30, 2022. As of June 30, 2022, future payments are as follows:

FY Ended June 30	Principal	Interest	Total Payment	Balance
2023	$ 15,138	$ 16,656	$ 31,794	$ 425,489
2024	15,710	16,083	31,793	409,779
2025	16,304	15,490	31,794	393,475
2026	16,920	14,873	31,793	376,555
2027	17,560	14,234	31,794	358,995
2028-2032	98,272	60,696	158,968	260,723
2033-2037	112,920	46,048	158,968	147,803
2038-2042	147,803	11,166	158,969	-
	$ 440,627	$ 195,246	$ 635,873	

b. Oregon Business Special Public Works Fund Loan Payable – Greenhouse

The City applied for and received a loan from the Oregon Economic Development Department Special Public Works Fund for the purchase of property for a future sewer plant expansion. Terms of the $350,000 loan are 25 annual payments on December 1 of each year including interest of 3.43 percent through December 1, 2043. Annual payments are $21,074.90 for the first twenty-four years and $9,720.80 for the final payment. The loan is secured by net revenues from the City's Agribusiness System after payment of operation and maintenance cost of the system, and all personal property associated with the Agribusiness System are collateral for the loan. The first payment will be made on December 1, 2019. During the fiscal year ended June 30, 2021, the asset and associated loan described here were transferred to the Community Development Fund. There was accrued interest payable of $6,331 on June 30, 2022. As of June 30, 2022, future payments are as follows:

FY Ended June 30	Principal	Interest	Total Payment	Balance
2023	$ 10,221	$ 10,854	$ 21,075	$ 306,219
2024	10,572	10,503	21,075	295,647
2025	10,934	10,141	21,075	284,713
2026	11,309	9,766	21,075	273,404
2027	62,638	42,737	105,375	210,766
2028-2032	74,143	31,232	105,375	136,623
2033-2037	87,761	17,613	105,374	48,862
2038-2042	48,862	3,009	51,871	-
	$ 316,440	$ 135,855	$ 452,295	

c. Oregon Business Special Public Works Fund Loan Payable – New Water Reclamation Facility

The City entered into a contract for the funding of a new water reclamation facility with the Oregon Business Development Department. This agreement is for a grant of up to $750,000 and a loan up to $1,750,000. As of the date of the financial statements no amounts had been received on either loan, however, expenses had been charged against this grant and loan during the year and to facilitate proper matching, the amounts were accrued. The loan amount as of June 30, 2022, was $98,070.

To meet the need to implement a rate adjustment to meet requirements, we recommend evaluating the revenue requirements as follows: review of the utility's current fiscal policies and their impact on the revenue requirements to ensure the rate models reflect the financial objectives of the City. We will evaluate the impact of changes in policy, such as capital improvement funding approaches or reserve levels, to determine the impact of changes on revenue requirements. Through the linkage of the analysis to a model of fund balances, rate strategies such as uniform increases, single or multi-year increases, or other strategies can be evaluated on an ongoing basis in terms of compliance with all fiscal constraints.

The specific tasks that will be included in development of the financial plan model will be:

1. Review historical costs and revenues and project revenue under existing rates (this will provide information on the current capacity of rates to support revenue requirements). During this work, we will also identify and develop applicable revenue sufficiency tests. Finally, we will determine projected revenue shortfalls (if any) for the test year and present results to staff.
2. Develop long-term financial model (planning period consistent with adopted capital improvement plan(s) and policies). Based on the work done to establish the historical review of costs and revenues, we will expand the logic to a forecast horizon consistent with other City planning times (currently set at a ten-year forecast horizon). Consistency between the adopted Capital Improvement Plan(s) and the financial plan will be essential. Critical work in this sub task will be:
    a. Project revenue under existing rates and determine overall revenue shortfalls by year for the forecast horizon. Identify annual increases needed to meet annual revenue requirements.
    b. Forecast O&M and capital costs based on the adopted Capital Improvement Plan (CIP). It is clear that the CIP will result in increases in operations and maintenance expenses. New costs (life cycle) to operate and maintain these the facilities will be identified, vetted, and loaded into the financial plan model.
    c. Evaluate capital funding alternatives, including bonding strategies. This task will include evaluating fiscal policies related to capital financing, including preferences for debt or equity funding. Also, analyses will be done to evaluate reserve levels for debt or equity funding, reserve levels for contingencies, and replacement of funding (i.e., explicit funding of depreciation). Finally, the feasibility of developing alternative sources of funds, including grants, special low interest loans, special fees, and SDC's will also be integrated into the analysis.
    d. Develop rate increase strategy. In this sub task, we will evaluate rate implementation strategies for effects on utilities financial performance and condition.
    e. Evaluate rate implementation strategies for effects on utility financial performance and condition.
    f. Review revenue requirements findings with staff and the Council.

Upon the completion of the model building work, the consultant team will present the preliminary models to City's project team for review and comment. We suggest the city reserve a specific date and time for a staff workshop. This will allow a thorough briefing on the models' contents and capabilities. Copies of the draft models will be left with the city team to use and beta test. Upon completion of this internal review, the consultant team will adjust the models to bring it in line with City staff requirements.

After incorporating City staff comments into the models, the consultant team will be prepared to make a presentation to the City Council at a work session (or perhaps to a City Council subcommittee). At this meeting, the consultant team will present the preliminary study results and demonstrate the use of the models to the Council. The presentation will also offer the Council a number of funding alternatives and implementation strategies. The agenda and format for the meeting will be prepared by the consultant team and reviewed with the City's project manager.

Task 3 - Detailed Financial Analysis (including policy on current and future indebtedness)

…A cost-of-service analysis generally addresses the basis for recovering revenues from customers according to the demands which they place on the utility…

Cost of Service - The cost-of-service analysis allocates costs to functional categories, classifies customers, defines their service characteristics, and distributes costs to customer classes. It also develops unit costs appropriate for recovering revenue requirements by customer class. An essential element of the cost-of-service analysis and rate review is to define customer service characteristics. This effort relies on the information contained in the customer billing system. The level of detail needed often exceeds that provided in summary reports. For example, to evaluate increasing block water rates, customer usage needs to be compiled by usage level. We pursue this information early in the assignment, recognizing the difficulties that can arise in developing necessary reports or downloading necessary raw data. Specific cost of service tasks includes:

1. Develop functional allocation of costs. For water, this would include customers, fire protection, base usage, and extra capacity (peak demand). Also included at this stage are any special allocations associated with providing service to wholesale customers. This allocation relies primarily on utility planning documents and generally available statistics.
2. Develop customer statistics. The specific structure of the statistics needed will depend on the types of rate structures that the city wishes to consider. We would work with the billing system staff and, if necessary, the billing system programmers to obtain either summary statistics or raw customer data.
3. Distribute costs to customer classes. Develop class revenue requirements based on usage/demand characteristics. Develop functional unit costs.

…The cost-of-service analysis will likely result in different percentage rate increases among the customer classes, which may be more equitable based on the supporting analysis. …

Task 4 – Rate Analysis and Rate Model Development

The rate design effort examines and evaluates alternative rate structures. The analysis compares existing rates with alternative rate design and compares results with the allocated costs by customer class. The rate model can be designed to accommodate various rate alternatives, such as seasonal rates, block rates, and varying customer classifications if appropriate. Due to the nature of restructuring rates, impacts are not limited to customer classes nor necessarily uniform within them. The Excel-based rate model also documents impact of representative customers, as well as customer classes as a whole, in order to provide full information on the range of rate impacts which would result.

…The city may want to consider implementing changes to the rate structure on a calendar year basis rather than fiscal year …

This avoids dramatic change during the summer peak period when customer sensitivity is highest and allows an education program to be implemented during the winter period when impacts will tend to be smaller. Specific tasks would include:

1. Review rate objectives and various alternatives for attaining those objectives with the city. Identify rate structures to be developed and quality of data to support them.
2. Develop rate model and incorporate customer statistics. Integrate revenue requirements and cost of service models to automate the rate development process.
3. Develop and evaluate each rate alternative. Evaluation will be based on equity, sufficiency, and impacts.
4. Review preliminary rate findings with City staff. Refine analyses based on review. If appropriate, develop phased strategies for restructuring rates.

Task 5 – Draft Report, Staff Comments, Final Report, and Presentation to the City Council

As described above, the rate study is a blend of policy directive and technical follow-through. Our study approach emphasizes ongoing interaction and review with staff and the Council to ensure the direction of the study. The documentation task is simply the culmination of that effort. We have found the most effective reporting method to be a policy-level document describing objective, general methods, summary results, considerations, and recommendations. This report, typically 15-20 pages in length including exhibits, provides a document which is both meaningful and useful for decision-makers. Along with this, a detailed printed record of the analyses is also provided.

An equally important element of successfully completing the study is presentation. We will conduct a presentation to the Council and/or other forums as appropriate, or support staff presentations if this is preferred. Additional presentations or workshops can also be incorporated. We have often collaborated with Citizen Advisory Committees, particularly in potentially controversial efforts. Specific tasks include:

1. Present Draft Rates Proposal - As discussed above, when the draft models have been completed and vetted by the city staff team, the consultant team will present the proposals regarding rates to the City Council via work session.
2. Prepare Draft Report - Prepare and submit a draft report for City review and comment. Review the report with the city and determine revisions for the final version. In this step, we will prepare PDF copies of the draft report, and one (1) unbound copy. We will also present the preliminary report to the City Council and Staff at a public meeting.
3. Prepare Final Report - Prepare and submit the final report to the city. The final report submittal will consist of ten (10) bound copies and one unbound copy. These final versions will be given to the staff for distribution to the Council and other interested parties. We will also provide Staff with a disk that will contain the final report in MS Word format and all related Excel spreadsheet models.
4. Present a Resolution for City Council consideration that will adopt the recommended rates.

SDC Methodology Update Scope of Work and Task Plan

This scope of work is based on a three-phase approach toward reviewing and implementing a schedule of SDCs. Phase 1 would consist of a review and assessment of the City's developing Water and Wastewater System Master Plans in order to document both current and future SDC-eligible facilities.

Phase 2 will focus on the process required to move the city toward the implementation of a schedule of SDCs that are consistent with the planned facilities that are currently identified, or under study within the context of the City's adopted water and wastewater master plans. This process will include issues relative to proposed methodologies for both the reimbursement and improvement portions of the SDCs. It is currently assumed that this work will focus on a facility needs analysis planned out for twenty years and will be based on the City's specific response to policy issues affecting how capacity can be allocated, measured, and priced. Phase 3 will be the process of the SDC calculation itself along with documentation of the methodology leading to the specific charge.

In each of these phases, we will work closely with city staff and their master planning consultants to achieve closure. This proposed approach would include two meetings with respective City staff, and presentations to the City Council. We strongly suggest the city consider creating a Citizens Advisory Committee for this project. We have found that by inviting stake holders into the process at the onset, the study inevitability gains credibility with decision makers. We believe that two meetings with an advisory group (that would coincide with the two staff presentation discussed above) would be sufficient to keep stake holders involved and informed, and still keep the study on track for completion by the end of June 2021. The specific tasks required to complete this work are itemized below:

Task 1 – Municipal Code Review, Data Collection, Demand Forecast

The consultant team will secure copies of the current ordinances concerning SDCs. These ordinances will be reviewed for relevancy, accuracy, and functionality. Upon completion of this review, the consultant team will prepare a decision memorandum for Staff review that will evaluate the adequacy of the existing municipal code/ordinance and if appropriate itemize ways to perfect the code for the current state of the law concerning SDCs.

In concert with the code review, we will prepare a data request including the City' financial statements, fixed asset records, facility use data, facilities/master, and/or capital improvement plans. The clear intent is to obtain all capital facility lists, schedules and costs that are either in the Cities' books or contained in planning documents that are part of the current master plans. The consultant team will obtain pertinent staff and consultant reports from other relevant Oregon districts and cities regarding their water SDCs. We will summarize the methodologies considered by these cities and create a menu of options required for this task. The Consultant team will also account for the outcomes of recent Oregon litigation regarding the construction and administration of SDCs.

The next step will be to review the information provided and conduct a status meeting with city staff to review the adequacy of the documentation, means for filling identified deficiencies and the next steps in the SDC development process; and

The final step in task 2 will be to evaluate and update funding assumptions and use (i.e., demand) estimates with emphasis on the cost of planned projects and their consistency with adopted plans and/or CIP's. The demand drivers for water are typically based on growth in equivalent dwelling units (i.e., equivalent residential meters for water).

Task 2 – Financial Analysis, Modeling, and Public Involvement

Based on the information developed through Task 1, we will prepare optional approaches toward SDC calculation, given the future demand forecast that will be derived from the master plans. Upon completion, we will evaluate these approaches relative to specific compliance with the provisions of ORS 223.297 – 223.314 and the definition of the reimbursement and improvement portions of the fee; and establish specific policy statements relative to the preferred approach regarding:

- credits,

- valuation of existing capacity,
- indexing costs based on Engineering News Record (ENR) or CPI data,
- consistency of growth projections with development of future capacity patterns,
- allocation of improvement costs between existing and future system users,
- accounting for SDC receipts,
- sources of customer use statistics for facilities and,
- other planning assumptions affecting the SDC methodology.

If the City chooses to form a SDC Citizens Advisory Committee, we will conduct and participate in one or two community meetings as directed by City Staff.

Task 3 – Draft Report, Staff Comments, Final Report, Presentation to City Council

Upon completion of the analytical task 2, we will prepare an interim summary of the proposed SDC methodology for review by the City, and conduct a work session with City staff including the documentation of the credit policy (a requirement of ORS 223.304), SDC inputs, assumptions, and calculations;

Based on staff comments on the interim summary, we will prepare for public review and present to the ad hoc committee improvement fee and/or reimbursement fee SDC methodologies which include preliminary SDC base rates, credits, exemptions and exceptions, and administrative charges.

Based on feedback from the city staff and the ad hoc SDC committee, make any necessary revisions to the methodology and calculations;

At this point, we will prepare draft revisions to the City's development code to implement the SDCs if necessary, and draft an updated SDC resolution which meets the current requirements of ORS 223.297-223.314; and

The next step will be to prepare a summary-level report documenting the SDC methodology and present this report to the city staff. The City Council briefing would also take place at this phase of the Project.

The final step in task 4 will be to prepare an SDC procedures guide for use by City staff in collecting the SDC and administering the SDC ordinance/resolution. This will include providing training for City staff who will be involved in collection of the SDC and administration of the updated SDC ordinance/resolution.

Work History - Representative Study Descriptions and Client References

Itemized below is a brief listing of very similar projects to the John Day rate study. We have chosen these projects because they are also very current.

Project Information
City of Coquille 2022 Water and Sewer Rate Study. City population 3,925. The city recently completed new water and sewer master plans that recommended substantial investments in both systems. In 2021, the city implemented some 20% sewer rate increases to affect critical repairs and improvements to the wastewater treatment system. The primary purpose of this rate study was to focus on what would be required to fund the critical improvements for the water system. In consultation with the City Council and Staff, we developed a 20-year base case water financial forecast model that funded the 2020 water master plan priority projects. This called for an immediate water rate increase of $12 per month for the average single family residential customer. On February 7, 2022, the City Council adopted the proposed water rate increases for implementation on July 1, 2022. City Project Manager – Forrest Neuerburg, City Manager 851 North Central Boulevard Coquille, OR 97423 (541) 396-2115 x201 fneuerburg@cityofcoquille.org CITY OF COQUILLE
City of Sheridan 2023 Utilities Rate Study. City population 6,122. We have been the City's utilities rates and financial evaluations consultant since 1996. Over that time, we have provided annual rate reviews and ten (10) year financial plans for the City's water, wastewater, and stormwater utilities. This year's study was completed in August, and the rate recommendations and ten-year financial plans were presented to the City Council at their August 15th business meeting. Key components of the 10-year financial plans include the future siting and construction of a new water treatment plant and the funding strategy for construction of a new 20-inch sewer interceptor line that will cross the South Yamhill River in 2023. City Project Manager – Heidi Bell, City Manager 120 Mill Street Sheridan, OR 97378 (503) 843-2347 hbell@cityofsheridanor.com CITY OF SHERIDAN On the Yamhill
City of Molalla 2023 water rates and SDCs update. City population 9,155. This water cost-of-service study was undertaken in concert with the development and completion of the City's 2020 Water Master Plan Update. The SDC component of the study dovetailed with the master plan capital improvement plan (CIP) formulation. The rate study focused on the rate implications of funding the high priority master plan storage and distribution system projects over the next five (5) years. As in the case of Scappoose, the Molalla City Council was particularly interested in implementing conservation-based water rates. In this study, we used statistical analyses to create a recommended three (3) block water rate structure. The City Council will we reviewing the Staff recommended water rate structure at an October 27, 2021, work session. City Project Manager – Dan Huff, City Manager 117 North Molalla Avenue Molalla, Oregon 97038 (503) 759-0224 dhuff@cityofmolalla.com MOLALLA OREGON

***City of Scappoose 2023 water and wastewater rates and SDCs study*.** City population 7,270. This cost-of-service study was started in early 2021 and completed in July. The City Council adopted the recommended water rates and SDCs in May of this year and will visit the wastewater rates and SDCs at a City Council meeting on October 18th. A key component of the water rates was the implementation of conservation-based rates (i.e., inverted block pricing). The wastewater rates are critically important to the city because the city is in the process of reconstructing its wastewater treatment plant at a cost of approximately $20 million with the priority phase 1 costs at $9.2 million over the next two years.

City Project Manager – David Sukau, Public Works Director
33568 East Columbia Avenue
Scappoose, Oregon 97056
(503) 543-7145 extension 4
dsukau@cityofscappoose.org

Personnel

Our approach to constructing this study will emphasize teamwork. This project must be focused, and task oriented to meet the timelines for project completion. Our approach places a premium on structured interaction, strong project leadership, on-going client involvement, quality assurance review, and the exercise of proven management methods. Itemized below, is a brief description of the expertise that the team bring to this engagement.

Project Leadership

Steve's role will be to lead the study development process, coordinate the review and decision process with the City's project manager, review the work products, and quality assurance reviews. Steve will also be the financial modeler for the cost-of-service analysis, and his primary focus will be on updating the demand forecast elements. His extensive rate making experience specific to Oregon municipal organizations will be drawn upon to validate the analysis. He will be available at critical meetings and will be working together on all study issues. Continuity and commitment will be maintained throughout the project.

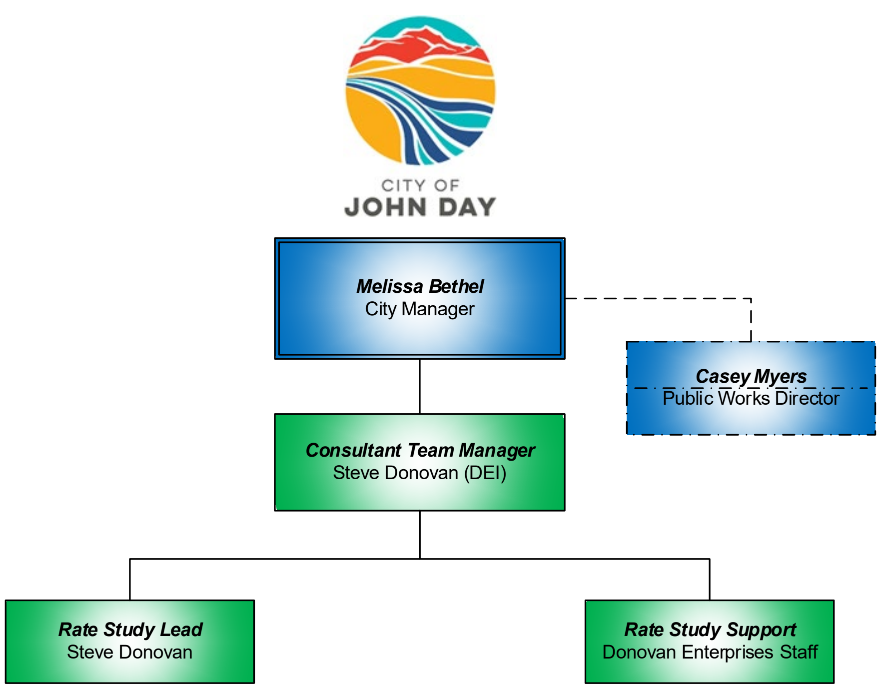
Coordination

The DEI team recognizes the importance of maintaining close communication with City staff throughout the project. Steve possesses strong communication skills that support his technical strengths. Because of the need for close communication and regular client/consultant interaction, we propose to:

- Begin the project with a review workshop that will involve all the City's stakeholders in the project. The purpose of this workshop will be to identify project goals, map communication channels for participants and provide a venue for interested parties to raise issues regarding the project. The output of this step will be a detailed project work plan with special emphasis on how data will be collected.
- Once the detailed work plan is approved by the City's project manager, the consultant team will overlay the team member assignments to each task, their roles within each task, and a time budget for each team member by task.

- Maintain the communication channels with the city throughout the project. This will include the preparation and maintenance of a project schedule to ensure timely submittals of deliverables and completion of the project within the City's anticipated timeline.
- All tasks will be managed by Steve Donovan at his Tigard office. Administration of the project will be done here, including the preparation of monthly invoices (including hours and costs expended on each task by the consultant team with a comparison to the budget).
- We will schedule and attend City department staff meetings and City Council work sessions and/or subcommittee meetings. This work will include the preparation of meeting agendas, meeting minutes and actions items. The city does not have a standing public works Citizen Advisory Committee, but City Staff has indicated they may form a stakeholder group for this project although nothing has been formalized at the time the request for proposals for this project was released. We will work with City staff on this issue as the study progresses. (We encourage City Staff to form such a stakeholder group for this project, and we will elaborate on this issue in a moment).
- Key project direction will be made using issue papers and technical memorandum to identify and review key decision points and alternatives. Decisions will be made at regular meetings with the City's project manager and those directions will be clearly documented to keep all internal stakeholders informed.

Project Team Organization Chart



Professional Resume for Steve Donovan

♦ Over thirty (30) years of experience in engineering, public works programming, economics, and public policy analysis.

♦ Principal author or collaborator on dozens of utilities rate and SDC studies throughout the United States. These skills transfer directly to the scope of services required for John Day.

♦ Experience in the development and adoptions of System Master Plans throughout Oregon

Steve Donovan

Donovan Enterprises, Inc.

President

EDUCATION

B.S., Electrical Engineering, University of Wisconsin, 1977

MBA, University of Wisconsin, 1979

YEARS OF EXPERIENCE

43

PROFESSIONAL AFFILIATIONS

American Public Works Association

American Water Works Association

Water Environment Federation

Institute of Electrical and Electronic Engineers

Oregon Municipal Finance Officers Association

Oregon Association of Clean Water Agencies

REFERENCES

Dan Huff, City of Molalla
dhuff@cityofmolalla.com
(503) 829-6855

Gerald Fisher PE, City of Independence
gfisher@ci.independence.or.us
(503) 829-6855

Greg Geist, Clackamas County
ggeist@clackamas.us
(503) 742-4567

UTILIITES RATE STUDY UPDATES

- Heceta Water PUD 2022
- City of Sutherlin 2020
- City of Creswell 2020
- City of Sisters 2019
- City of Molalla 2022
- City of Sublimity 2019
- City of Independence 2022
- City of Dallas 2018
- City of Silverton 2019
- City of Scappoose 2022
- City of St. Helens 2022

UTILITIES PLANNING & CIP DEVELOPMENT

- City of Creswell 20208
- Clackamas County 2022
- City of Molalla 2022
- City of Astoria 2022
- City of Coos Bay 2022
- City of Sheridan 2021
- City of Silverton 2019
- Marion County 2018
- City of Tillamook 2016
- City of Ashland 2015

Qualifications

Client	Year	Cost of Service Studies	Policy Analysis of Program Delivery	Increased Costs for New Programs or Services	Shifting of Cost Recovery from Customer Classes
City of Astoria – Industrial strength wastewater rates analysis	2022	✓	✓	✓	✓
City of Coos Bay – 2022 WWTP funding options study; Coos Bay, Oregon	Underway	✓	✓	✓	✓
City of Coquille – Utilities rate study	2022	✓	✓	✓	✓
City of Gresham – 2021 Water revenue bond feasibility study	2022	✓	✓	✓	✓
City of Independence – 2022 sewer and transportation SDCs update	Underway	✓	✓	✓	
City of Lebanon – Stormwater Master Plan financial analysis	2021	✓	✓	✓	✓
City of Molalla – SDCs methodology Update for all Municipal Services; Molalla, Oregon	Underway	✓	✓	✓	✓
City of Scappoose – Utilities rates and SDCs study	Underway	✓	✓	✓	✓
City of Sheridan – Utilities rate study	2021	✓	✓	✓	✓
City of St. Helens – Utilities rates and SDCs study	Underway	✓	✓	✓	✓
City of Sublimity – Policy support on SDC credits policy	2021		✓		
City of Willamina – SDC methodology update	2022	✓	✓	✓	✓
City of Wood Village – utilities rates and SDCs study	Underway	✓	✓	✓	✓
Polk County/City of Falls City – Wastewater treatment plan funding feasibility study	2021	✓	✓	✓	✓
Water Environment Services of Clackamas County - Wastewater and stormwater rate studies	Underway	✓	✓		

Timetable/Project Schedule

ID	Task Name	Start	Finish
1	Rate and SDC methodology update study notice to proceed	5/30/2024	5/30/2024
2	Rate Study Task 1: Kickoff and data collection	6/17/2024	6/28/2024
3	Rate Study Task 2: Preliminary model and revenue requirements	6/24/2024	7/26/2024
4	Rate Study Task 3: Detailed financial analysis	6/24/2024	7/31/2024
5	Rate Study Task 4: Rate analysis	7/8/2024	8/30/2024
6	Rate Study Task 5: Final report and presentations to City Council	7/8/2024	11/8/2024
7	SDC Update Task 1: Municipal code review, data collection, demand forecast	6/17/2024	6/28/2024
8	SDC Update Task 2: Detailed financial analysis	6/24/2024	7/31/2024
9	SDC Update Task 3: Final report and presentations to City Council	7/8/2024	11/8/2024
10	Study completion date	11/29/2024	11/29/2024
11	City staff review of draft and final report	7/8/2024	11/29/2024
12	City Council review & approval	12/10/2024	12/10/2024
13	Implement rates and SDC changes (if recommended)	1/1/2025	1/1/2025

Intermediate milestone   Project completion milestone

Proposed Project Budget

Itemized below is the cost proposal for the utilities rate study. The consultant team is proposing a time and materials contract with a "not to exceed" fee that cannot be altered without prior written approval of the City. **Travel costs:** will be billed at the current IRS mileage allowance (i.e., 59 cents per mile).

		$175	$88	Rate & SDC Study Project Totals	
	Task and Subtask Description	Steve Donovan	Staff Support	Hours	Dollars
Water & Wastewater Financial Plan and Rate Study Tasks:					
Task 1 - Data collection and validation					
a	Collect and validate water financial data	4	-	4	700
b	Collect and validate forecast assumptions	4	-	4	700
c	Create and vet cost of service database	4	-	4	700
d	Compare and contrast City data	2	-	2	350
e	Develop preliminary gap analysis	1	-	1	175
Task 2 - Preliminary model and revenue requirements development					
a	Review historical costs and revenues; perform revenue sufficiency tests	8	2	10	1,575
b	Project revenue under existing rates and determine revenue shortfalls	4	2	6	875
c	Forecast O&M and capital costs for the water utility	8	2	10	1,575
d	Evaluate capital funding alternatives, and fiscal policies	8	2	10	1,575
e	Develop rate increase strategy	4	1	5	788
f	Evaluate rate implementation strategies for effect on utility financial performance	8	1	9	1,488
g	Review revenue requirements findings with Staff and the Council	4	1	5	788
Task 3 - Detailed financial analysis					
a	Develop functional allocation of costs	12	2	14	2,275
b	Develop customer statistics	12	1	13	2,188
c	Distribute costs to customer classes	12	1	13	2,188
Task 4 - Rate analysis					
a	Review rate objectives and alternatives	6	1	7	1,138
b	Develop rate model and incorporate customer statistics	8	1	9	1,488
c	Develop and evaluate each rate alternative	2	1	3	438
Task 5 - Draft report, staff comments, final report, & City Council presentation					
a	Present draft rates proposal	4	-	4	700
b	Prepare draft report	8	-	8	1,400
c	Prepare final report	8	-	8	1,400
d	Present rates resolutions to City Council	4	-	4	700
Water & Wastewater SDC Methodology Update:					
Task 1 - Municipal code review, data collection, demand forecast					
a	Collect and validate study input data	4	2	6	875
b	Develop SDC model(s)	4	2	6	875
c	Establish the 2040 demand forecast	4	-	4	700
d	Evaluate SDC implementation strategies & review with City Staff	2	-	2	350
Task 2 - Detailed financial analysis					
a	Develop functional allocation of costs	2	1	3	438
b	Develop customer statistics	4	1	5	788
c	Distribute costs to customer classes	2	1	3	438
d	Develop reimbursement and improvement fees	2	1	3	438
Task 3 - Draft report, final report, presentation to City Council					
a	Prepare draft report	4	2	6	875
b	Finalize project issue papers and technical memoranda	2	2	4	525
c	Prepare final report	4	2	6	875
d	Present final report results to City Council	4	-	4	700
e	Prepare draft SDC Resolutions	2	-	2	350
	Total labor hours	175	32	207	
	Total labor cost	$ 30,625	$ 2,800		$ 33,425
	Graphics, mileage, printing and binding				2,000
	Total not to exceed budget				$ 35,425

If the IRS adjusts the standard mileage allowance during the term of this engagement, the updated value will be used for mileage reimbursement. **Final reports printing and binding:** The cost of producing the final reports and technical memoranda will be billed on actual cost basis (i.e., without markup). **Project materials:** will be billed to the project on an "as needed" basis. No materials will be billed for the project without the prior review and consent of the City's project manager.

Draft Contract

CITY OF JOHN DAY, OREGON
PERSONAL SERVICES CONTRACT

A CONTRACT between THE CITY OF JOHN DAY, OREGON ("City"), and Donovan Enterprises, Inc. ("Provider")

WHEREAS, City and Provider believe it in their mutual interest to enter into a written contract setting out their understandings concerning Provider's provision of utility rate study services to the City for the 2022 water and sewer rate study.

1. Term

The term of this contract shall be from November 13, 2023, until not later than February 28, 2024, unless sooner terminated under the provisions of this contract.

2. Provider's Service

The scope of Provider's services and time of performance under this contract are set forth in Exhibit "A." All provisions and covenants contained in said exhibit are hereby incorporated by reference and shall become a part of this contract as if fully set forth. Any conflict between this contract and Provider's proposal (if any) shall be resolved first in favor of this written contract. Provider will, in the rendering of its services to City, use its best efforts and due diligence and provide such personnel as are necessary to successfully provide the services covered under this contract and Exhibit "A".

3. Provider Identification

Provider shall furnish the City Provider's employer identification number, as designated by the Internal Revenue Service or, if the Internal Revenue Service has designated no employer identification number, Provider's Social Security number.

4. Compensation

City agrees to pay Provider at the times and in the amount(s) set out in and in accordance with Exhibit "A."

5. Project Managers

City's Project Manager is ________________________. Provider's Project Manager is Steve Donovan. Each party shall give the other written notification of any change in their respective Project Manage.

6. Project Information

Provider agrees to share all project information, to fully cooperate with all corporations, firms, contractors, governmental entities, and persons involved in or associated with the project. No information, news, or press releases related to the project shall be made to representatives of newspapers, magazines, television and radio stations, or any other news medium without the prior authorization of City's Project Manager.

7. Duty to Inform

Provider shall give prompt written notice to City's Project Manager if, at any time during the performance of this contract, Provider becomes aware of actual or potential problems, faults or defects in the project, any nonconformity with the contract, or with any federal, state, or local law, rule, or regulation, or has any objection to any decision or order made by City. Any delay or failure on the part of City to provide a written response to Provider shall constitute neither agreement with nor acquiescence in Provider's statement or claim and shall not constitute a waiver of any of City's rights.

8. Provider is Independent Contractor

Provider is an independent contractor for all purposes and shall be entitled to no compensation other than the compensation expressly provided by this contract. Provider hereby expressly acknowledges and agrees that as an independent contractor, Provider is not entitled to indemnification by the City or the provision of a defense by the City under the terms of ORS 30.285. This acknowledgment by Provider shall not affect his/her independent ability (or the ability of his/her insurer) to assert the monetary limitations found at ORS 30.270, the immunities listed at ORS 30.265, or other limitations affecting the assertion of any claim under the terms of the Oregon Tort Claims Act (ORS 30.260 to ORS30.300).

9. Overtime

Any person employed on work under this contract, other than a person subject to being excluded from the payment of overtime pursuant to either ORS 653.010 to 653.261 or 29 USC§201 to 209, shall be paid at least time and a half for all overtime worked in excess of 40 hours in any one week.

10. Indemnity and Insurance

i. Indemnity: Provider acknowledges responsibility for any and all liability arising out of the performance of this contract and shall hold City harmless from and indemnify and defend City for any and all liability, settlements, loss, costs, and expenses in connection with any action, suit, or claim resulting or allegedly resulting from Provider's acts, omissions, activities, or services in the course of performing this contract.

ii. Liability Insurance: Provider shall maintain occurrence form commercial general liability and automobile liability insurance for the protection of Provider, City, its Councilors, officers, agents, and employees. Coverage shall include personal injury, bodily injury (including death) and broad form property damage, including loss of use of property, occurring in the course of or in any way related to Provider's operations, in an amount not less than One Million dollars ($1,000.000.00) combined single limit per occurrence. Such insurance shall name City as an additional insured.

iii. Workers' Compensation Coverage: Provider certifies that Provider has qualified for State of Oregon Workers' Compensation coverage for all Provider's employees who are subject to Oregon's Workers' Compensation statute, either as a carrier insured employer as provided by ORS 656.407, or as a self-insured employer. Provider shall provide to City within ten (10) days after contract award a certificate of insurance evidencing overage of all subject workers under Oregon's Workers' Compensation statutes insured by an insurance company satisfactory to City, if any. The certificate and policy shall indicate that the policy shall not be terminated by the insurance carrier without thirty (30) days' advance written notice to City. A copy of the certificate of self-insurance issued by the State shall be provided to City if the Provider is self-insured.

iv. Professional Errors and Omissions: Provider shall provide City with evidence of professional errors and omissions liability insurance for the protection of Provider and its employees, insuring against bodily injury and property damage and arising out of or resulting from Provider's negligent acts, omissions, activities, or services, in an amount not less than $1,000,000.00 combined single limit per occurrence. Such insurance shall be endorsed to include contractual liability.

v. Certificates: Provider shall furnish City certificates evidencing the date, amount, and type of insurance required by this contract. All policies will provide for not less than thirty (30) days' written notice to City before they may be canceled.

vi. Primary Coverage: The coverage provided by insurance required under this contract shall be primary, and any other insurance carried by City shall be excess.

11. Work is Property of City

All work, including but not limited to documents, drawings, papers, computer programs, and photographs, performed or produced by Provider under this contract shall be the property of City.

12. Law of Oregon

The contract shall be governed by the laws of the State of Oregon. Venue shall be in Clackamas County, Oregon.

13. Errors

Contractor shall perform such additional work as may be necessary to correct errors in the work required under this without undue delays and without additional cost.

14. Extra or Changes in Work

Only the City Manager or the Project Manager may authorize extra (and/or change) work. Failure of Provider to secure authorization for extra work shall constitute a waiver of all right to adjustment in the contract price or contract time due to such unauthorized extra work and Provider thereafter shall be entitled to no compensation whatsoever for the performance of such work.

15. Successors and Assignments

i. Each party binds itself, and any partner, successor, executor, administrator, or assign to this contract.

ii. Neither City nor Provider shall assign or transfer their interest or obligation hereunder in this contract without the written consent of the others. Provider must seek and obtain City's written consent before subcontracting any part of the work required of Provider under this contract. Any assignment, transfer, or subcontract attempted in violation of this subparagraph shall be void.

16. Records

i. Provider shall retain all books, documents, papers, and records that are directly pertinent to this contract for at least three years after City makes final payment on this contract and all other pending matters are closed.

ii. Provider shall allow City, or any of its authorized representatives, to audit, examine, copy, take excerpts from, or transcribe any books, documents, papers, or records that are subject to the foregoing retention requirement.

17. Breach of Contract

i. Provider shall remedy any breach of this contract within the shortest reasonable time after Provider first has actual notice of the breach or City notifies Provider of the breach, whichever is earlier. If Provider fails to remedy a breach in accordance with this paragraph, City may terminate that part of the contract affected by the breach upon written notice to Provider, may obtain substitute services in a reasonable manner, and may recover from Provider the amount by which the price for those substitute services exceeds the price for the same services under this contract.

ii. If the breach is material and Provider fails to remedy the breach in accordance with this paragraph, City may declare Provider in default and pursue any remedy available for a default.

iii. Pending a decision to terminate all or part of this contract, City unilaterally may order Provider to suspend all or part of the services under this contract. If City terminates all or part of the contract pursuant to this paragraph, Provider shall be entitled to compensation only for services rendered prior to the date of termination, but not for any services rendered after City ordered suspension of those services. If City suspends certain services under this contract and later orders Provider to resume those services, Provider shall be entitled to reasonable damages actually incurred, if any, as a result of the suspension.

iv. To recover amounts due under this paragraph, City may withhold from any amounts owed by City to Provider, including but not limited to, amounts owed under this or any other contract between Provider and City.

18. Mediation/ Trial without a jury

Should any dispute arise between the parties to this contract it is agreed that such dispute will be submitted to a mediator prior to any litigation and the parties hereby expressly agree that no claim or dispute arising under the terms of this contract shall be resolved other than first through mediation and only in the event said mediation efforts fail, through litigation. Any litigation arising under or as a result of this contract shall be decided in the court without a jury.

The parties shall exercise good faith efforts to select a mediator who shall be compensated equally by both parties. Mediation will be conducted in Portland, Oregon, unless both parties agree in writing otherwise. Both parties agree to exercise good faith efforts to resolve disputes covered by this section through this mediation process. If a party requests mediation and the other party fails to respond within ten (10) days, or if the parties fail to agree on a mediator within ten (10) days, a mediator shall be appointed by the presiding judge of the Clackamas County Circuit Court upon the request of either party. The parties shall have any rights at law or in equity with respect to any dispute not covered by this Section.

19. Termination for Convenience

The City may terminate all or part of this contract at any time for its own convenience by written notice to Provider. Upon termination under this paragraph, Provider shall be entitled to compensation for all services rendered prior to actual notice of the termination or the receipt of the City's written notice of termination, whichever is earlier, plus Provider's reasonable costs actually incurred in closing out the contract.

20. Intellectual Property

The interest in any intellectual property, including but not limited to copyrights and patents of any type, arising from the performance of this contract shall vest in the City. Provider shall execute any assignment or other documents necessary to affect this paragraph. Provider may retain a nonexclusive right to use any intellectual property that is subject to this paragraph. Provider shall transfer to the City any data or other tangible property generated by Provider under this contract and necessary for the beneficial use of intellectual property covered by this paragraph.

21. Payment for Labor or Material

Provider shall make payment promptly, as due, to all persons supplying to Provider labor or material for the prosecution of the work provided for in this contract. (ORS 279B.220)

22. Contributions to the Industrial Accident Fund

Provider shall pay all contributions or amounts due the Industrial Accident Fund from Provider incurred in the performance of this contract and shall ensure that all subcontractors pay those amounts due from the subcontractors. (ORS 279B.220)

23. Income Tax Withholding

Provider shall pay to the Oregon Department of Revenue all sums withheld from employees pursuant to ORS 316.167. (ORS279B.220)

24. Payment of Claims by the City

If Provider fails, neglects, or refuses to make prompt payment of any claim for labor or services furnished to Provider or a subcontractor by any person in connection with this contract as the claim becomes due, the City may pay the claim to the person furnishing the labor or services and charge the amount of the payment against funds due or to become due to Provider pursuant to this contract. The City's payment of a claim under this Paragraph shall not relieve Provider or Provider's surety, if any, of responsibility for those claims.

25. Hours of Labor

Provider shall pay employees for overtime work performed under the terms of this contract in accordance with ORS 653.010 to ORS 653.261 and the Fair labor standards Act of 1938. (29 USC §§ 201 *et. seq.)*

26. Workers' Compensation

Provider is a subject employer that will comply with ORS 656.017. Provider warrants that all persons engaged in contract work and subject to the Oregon Workers' Compensation law are covered by a workers' compensation plan or insurance policy that fully complies with Oregon law. Provider shall indemnify City for any liability incurred by City as a result of Provider's breach of the warranty under this Paragraph. (ORS 279B.230)

27. Medical Care for Employees

Provider shall make payment of all sums to any person, co-partnership, association, or corporation, furnishing medical, surgical and/or hospital care or other needed care and attention, incident to the sickness or injury of Provider's employee(s), all sums which Provider agrees to pay for such services and all monies and sums which Provider collected or deducted from the wages of employees pursuant to any law, contract or contract for the purpose of providing or paying for such service. (ORS 279B.230)

28. Conflict of Interest

Except with City's prior written consent, Provider shall not engage in any activity, or accept any employment, interest or contribution that would, or would reasonably appear, to compromise Provider's professional judgment with respect to this Project, including, without limitation, concurrent employment on any project in direct competition with the Project.

29. Modification

Any modification of the provisions of this contract shall be reduced to writing and signed by the parties.

30. No Waiver of Legal Rights

A waiver by a party of any breach by the other shall not be deemed to be a waiver of any subsequent breach.

31. Integration

This contract contains the entire agreement between the parties and supersedes all prior written or oral discussions or agreements regarding the same subject.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed in duplicate by their duly authorized officers or representatives as of the day and year first above written.

CONSULTANT:	**CITY OF JOHN DAY, OREGON:**
Donovan Enterprises, Inc.	Melissa Bethel
Company	City Manager
9600 SW Oak Street, Suite 335	450 East Main Street
Address	Address
Tigard, Oregon 97223	John Day, Oregon 97845
City, State, Zip Code	City, State, Zip Code
_______________________________	_______________________________
Authorized Signature	Authorized Signature
President	_______________________________
Title	Title
41-2180168	
Federal Tax ID Number	
May 30, 2024	_______________________________
Date	Date

FCS GROUP
Solutions-Oriented Consulting

CITY OF JOHN DAY

Wastewater and Water Utility Rate Model and System Development Charges Methodology Update

MAY 30, 2024

May 30, 2024

FCS GROUP
Solutions-Oriented Consulting

Melissa Bethel
City of John Day
City Manager
450 E. Main Street
John Day, OR 97845

RE: Wastewater and Water Utility Rate Model and System Development Charges Methodology Update

Dear Ms. Bethel,

Knowing that it will soon need to spend over $20 million on wastewater infrastructure, the City of John Day (City) has made the wise decision to perform a comprehensive review of its rates and system development charges (SDCs) for the water and wastewater utilities. FCS GROUP wants to help the City create a financial plan that strikes the right balance between SDCs, new debt, and rate adjustments. We therefore submit this proposal to provide professional services for the City of John Day's Wastewater and Water Utility Rate Model and SDC Methodology Update.

We look forward to assisting the City as it seeks to provide fair and equitable rates and SDCs that are in line with Oregon legal constraints, industry standards, and the City's policy objectives. FCS GROUP is a leader in financial planning in the West. Some of the distinct attributes offered by our dedicated team of industry leaders and analytical experts include the following:

- FCS GROUP has utility rate experience that is unrivaled and has completed over 3,000 utility rate studies for clients in the Western US. **Benefit: Our broad range of experience in similar efforts will produce industry leading solutions for the City.**
- We have completed well over 200 SDC studies for cities and districts in Oregon, from straightforward technical analyses to complex and comprehensive examinations of SDC policies and sophisticated calculation frameworks. **Benefit: We know Oregon SDC law, as well as the policies and practices of Oregon public agencies.**
- We demonstrate industry leadership by being active leaders, participants, and contributors within key professional associations including the League of Oregon Cities (LOC), American Public Works Association (APWA), and Oregon Government Finance Officers Association (OGFOA). John Ghilarducci teaches all-day courses on SDCs, pro-bono, for LOC, most recently in 2022. John gave an SDC Overview presentation for OGFOA in March 2024. We also contributed to the statewide SDC study recently completed for the Oregon legislature. **Benefit: We are committed to sharing our knowledge for the good of Oregon communities.**
- FCS GROUP facilitates sound decision-making and management by City staff, public officials, and the development community by applying a solutions-oriented analytical approach to building, planning, engineering, fire prevention, inspection, and development-related service fees. **Benefit: We identify key policy issues and provide accessible end products from easy-to-interpret reports to easy-to-maintain financial models.**

Finally, this letter serves to confirm that I, John Ghilarducci, am authorized to represent the firm and sign a contract with the City on behalf of the firm. Please do not hesitate to contact Project Manager Doug Gabbard at (503) 374-1707 or dougg@fcsgroup.com if you have any questions about this submittal. We look forward to working with the City on this important project.

Sincerely,

FCS GROUP	FCS GROUP
John Ghilarducci	Doug Gabbard
Principal-in-Charge	Project Manager

TABLE OF CONTENTS

FIRM INTRODUCTION

FCS GROUP, ESTABLISHED IN 1988, IS ONE OF THE COUNTRY'S OLDEST AND MOST RESPECTED INDEPENDENT PROVIDERS OF FINANCIAL, ECONOMIC, AND UTILITY MANAGEMENT SERVICES IN THE PUBLIC SECTOR.

With over 4,000 engagements for more than 650 government clients, FCS GROUP provides best-in-class analytical solutions that offer our clients the clarity they need to solve their most complex issues in ways tailored specifically to their own communities.
As a private practice dedicated exclusively to state and local government issues, we have accumulated the expertise and the perspective that makes a real difference for the clients we serve. Each engagement is a highly customized experience led by one of our most senior principals who will be your partner in building the solutions and outcomes you need.
At FCS GROUP, we understand that every municipal agency faces its own unique challenges. Our success and reputation comes from the ability to listen to clients and produce customized study results that can be easily implemented and understood by everyone.

Our management and technical staff serve clients throughout the U.S. from four offices located in Lake Oswego, Oregon, Redmond and Spokane, Washington, and Boulder, Colorado.

We Are Part of Your Community

FCS GROUP is proud to be a Northwest small business. We rent office space in three states. We provide quality jobs to thirty hard-working people. The collegiality our staff enjoy results in information and idea sharing both internally and externally – raising the level of the profession across our geographic footprint. FCS GROUP employees spend their earnings buying and renting houses and apartments, purchasing goods and services, paying federal, state, and local taxes, and adding more than $5 million of economic value (GDP) to the region.

Services

UTILITY RATE AND SDC CONSULTING

FCS GROUP has performed over 3,000 utility finance and SDC projects for local communities including defining revenue requirements with comprehensive financial modeling tools, performing long-term capital funding strategies, developing full cost-of-service rates, and legally-defensible system development charges. We work with agencies large and small in urban and suburban areas, rural systems, regions with seasonal/climate sensitivities, and communities with special commercial/industrial needs. We are experts and educators in utility rate policies and practices, and are attentive to legal constraints in every location we work. We have invested time with agency staff, policymakers, stakeholders, and customers to improve your utility's long-term financial health and integrity.

UTILITY MANAGEMENT

FCS GROUP offers tailored business management solutions. We assist with the formation and merger of utilities, perform cost-benefit analyses, develop strategic business plans, and negotiate complicated wholesale agreements—helping your utility maintain its resiliency in an ever-changing environment.

ECONOMIC AND FUNDING STRATEGIES

FCS GROUP economists help governments create vibrant sustainable communities. We model the fiscal and social return on public investments and provide creative ways of funding projects and services. Challenges turn into opportunities as we support goals aimed at fair housing and job creation.

GENERAL GOVERNMENT FINANCIAL ANALYSIS

FCS GROUP financial consultants specialize in helping local and state governments, regional agencies and public safety entities address and solve issues involving policy objectives, public finance, cost recovery, facility financing and long-term facility reinvestment funding, and organizational performance. We have a broad understanding and specific expertise on local and state government policymaking; how the many different governmental functions are performed; and what role elected officials, the public, community organizations and employees have in making governments responsive to community needs.

STUDY UNDERSTANDING

The City of John Day is about to embark on a wastewater system improvement project whose cost exceeds $20 million. While some funding has been secured, most is yet to be identified. The City is therefore taking this opportunity to perform a comprehensive financial analysis of its water and wastewater utilities. The goal of such an analysis is to plan for the financial needs of the two utilities while minimizing rate increases to the greatest extent possible.

The following task plan is designed to allow the City to meet this goal by December 1, 2024.

Task Plan

TASK 1 | PROJECT KICKOFF

Task 1 initiates the study and begins the data collection process. This task includes the following elements:

- Set up the project in our billing system and preparing monthly invoices and progress reports for the City.
- Prepare a request for data needed to complete the study and following up with City staff as needed to obtain additional data and resolve questions.
- Prepare materials for and facilitate a kickoff meeting via video conference.
- Review data provided by the City and follow up as needed.

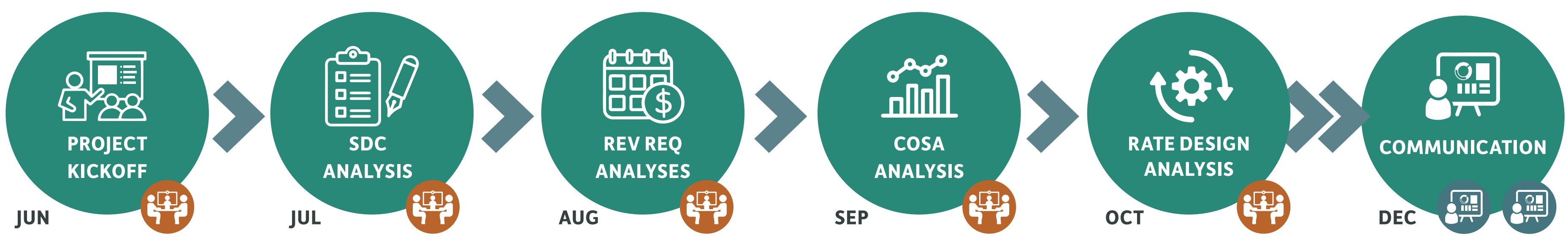
The kickoff meeting will set a clear path for project progression and communication. The meeting will include the formal introduction of the project team members, a discussion of the project objectives and deliverables, and clarification of the project schedule.

TASK 2 | SDC ANALYSES

Task 2 is the development of the system development charge (SDC) calculations for the water (Task 2.1) and wastewater (Task 2.2) and utilities. This task includes:

- Develop the improvement fee cost basis by using the capital projects outlined in the master plans and other documents to calculate the planned cost of capacity for growth.
- Develop the reimbursement fee cost basis by using the City's data on available capacity and the original cost of its existing assets to calculate the cost of existing capacity available for growth.
- Calculate the SDC using the improvement fee cost basis, the reimbursement fee cost basis, and the growth planned for in each system.
- Meet with City staff via video conference to review technical results and gather feedback.
- Revise the analyses as needed.

The outcome of this calculation will be a methodology supporting the maximum defensible SDC for each utility. The methodologies will enable the City to set the SDCs for water and wastewater at any level up to the calculated maximums based on the City's policy preferences.



TASK 3 | REVENUE REQUIREMENT ANALYSES

Task 3 determines the overall revenue needs of the water (Task 3.1) and wastewater (Task 3.2) utilities over the planning period using the City's utility budgets, debt service schedules, capital improvement plans, established financial policies, and agreed upon escalation rates. This task includes the following elements:

- Incorporate the City's data into a rate model and projecting capital and operating needs throughout the forecast period.
- Develop a schedule of annual rate adjustments and potential debt issuances necessary to fund the full revenue requirements of each utility.
- Meet with City staff via video conference to review technical results and gather feedback.
- Revise the analyses as needed.

This task will result in a schedule of annual rate increases necessary to fund the City's water and wastewater utilities and will set the stage for the cost-of-service and rate design analyses.

TASK 4 | COST-OF-SERVICE ANALYSES

Task 4 takes the overall revenue requirements calculated in Task 3 and allocates them to the customer base using several factors. For water, costs are allocated to each class using customer statistics gathered from the billing data such as number of accounts, number of meter capacity equivalents, average consumption, and peak consumption. For wastewater, costs are allocated to each class using customer statistics gathered from the billing data such as number of accounts, amount of wastewater flow, and sewage strength characteristics.

This task includes the following elements:

- Compile customer statistics and validate them against booked revenue.
- Allocate the water and wastewater revenue requirements calculated in Task 3 to the major functions of each utility.
- Allocate each functional cost pool to customer classes based on factors described above.
- Calculate needed shifts in rates between customer classes to achieve equity.
- Meet with City staff via video conference to review technical results and gather feedback.
- Revise the analyses as needed.

This task will identify the extent to which any customer classes are subsidizing other customer classes. If so, a plan (possibly phased in over multiple years) will be provided to achieve equity.

TASK 5 | RATE DESIGN ANALYSES

Task 5 is the design of rate schedules for both the water (Task 5.1) and wastewater (Task 5.2) utilities.

This task includes the following elements:

- Clarify City's policy objectives and preferences.
- Design up to three rate structures for each utility and facilitate comparison between structures by maintaining revenue neutrality.
- Meet with City staff via video conference to review technical results and gather feedback.
- Revise the analyses as needed.

This task will result in rate schedules designed to recover the cost of service and meet City policy objectives. The selected rate schedule can include a phase-in period to allow the customer base to adjust to the changing rate structure.

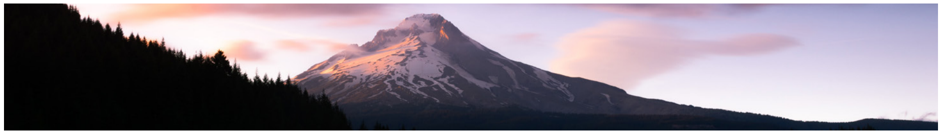
TASK 6 | COMMUNICATION

Task 6 will encompass all of the documentation and presentation of the results garnered from Tasks 2 through 5. This task includes:

- Draft report documenting analyses performed in Tasks 2 through 5. The draft report will serve as the statutory SDC methodology for water and wastewater
- Presentation to City Council at a work session (or any public meeting of the City's choice) via video conference
- Presentation to City Council at the public hearing for adoption of utility rates (or any public meeting of the City's choice) via video conference
- Final report reflecting feedback received on the draft report

Note that Oregon law requires that the City issue a 90-day notice prior to the hearing for adoption of revised SDC calculations, and that the methodologies be available for the last 60 days of the notice period. The draft report will contain these methodologies and should be available in early November (as shown in the schedule below). Therefore, the public hearing for SDC adoption can be held no earlier than early January, 2025.

WORK HISTORY



WATER, STORMWATER, STREETS, AND PARKS RATE AND SDCS UPDATE (2020)

CITY OF CENTRAL POINT, OR

FCS GROUP was engaged to perform a review of the City's utility rate structures for the City's stormwater, streets, and parks utilities, as well as to provide revenue requirement analyses using different fee structure scenarios for the water, stormwater, streets, and parks utilities.

Project Highlights

- Performed a comprehensive water cost of service rate study and subsequent updates.
- Developed an issue paper discussing the City's utility fee structures and provided 20-year revenue requirement forecasts for the water and stormwater utilities based on increases in operation and maintenance (O&M) costs, expected capital costs, and fiscal policies.
- Provided recommendations to improve the legal defensibility and revenue sufficiency of each the stormwater, streets, and parks fees.
- Modeled alternate fee structures for the parks and streets utilities.
- Developed a report summarizing the revenue requirement scenarios and rate design alternatives.
- Performed a multi-service SDC study in collaboration with the neighboring City of Talent.
- Provided utility formation services for both the transportation and stormwater services.

Key Personnel
John Ghilarducci, Principal
Doug Gabbard, Project Manager

Reference
Matt Samitore, Parks & Public Works Director
(541) 664-3321
matt.samitore@centralpointoregon.gov

WATER, WASTEWATER, AND STORMWATER RATE AND SDCS STUDIES (2020-2023)

CITY OF HOOD RIVER, OR

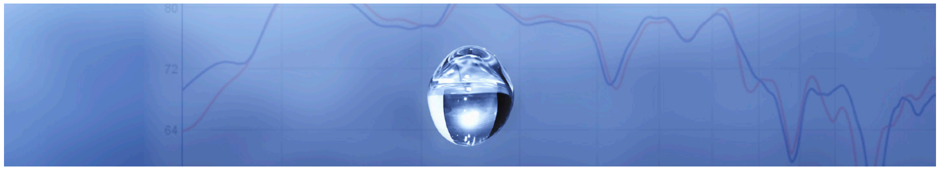
FCS GROUP was retained by the City of Hood River to perform a water, sewer, and stormwater rate and cost-of-service analysis with the goal of ensuring the adequacy of funding in support of utility operations, maintenance and capital improvement programs. The 2020 study was followed up by a water and wastewater SDC study.

Projects Highlights

- Updated growth assumptions, eligible costs, and maximum defensible SDCs under Oregon law.
- Developed water, sewer, and stormwater rate and cost-of-service analyses
- Developed an utility rate affordability analysis.
- Determined it was best for the City to charge stormwater rates based on impervious surface rather than meter size.
- Determined that maximum defensible stormwater SDC was more than three times current SDC and suggested a phase-in to reduce opposition from the development community.
- Completed transportation SDC study.

Key Personnel
John Ghilarducci, Principal
Doug Gabbard, Project Manager

Reference
Chris Longinetti, Finance Director
(541) 387-5214
c.longinetti@cityofhoodriver.gov



WATER, WASTEWATER, STORMWATER, TRANSPORTATION, AND PARKS RATE AND SDCS STUDIES (2006 - 2019)

CITY OF MOSIER, OR

Over the last decade the City of Mosier has hired FCS GROUP to conduct a multi-service system SDC study and a water and wastewater rate update. FCS GROUP developed a detailed financial plan for the water and wastewater services, followed by the water, wastewater, stormwater, transportation, and parks SDC study.

Project Highlights

- Gathered and reconciled data from multiple master plans for each utility.
- Developed the City's first transportation SDC, supported by trip growth estimates provided by the Oregon Department of Transportation Planning and Analysis Unit.
- Completed SDC options for wastewater, parks, and stormwater that provide for single family residential scaling for house size.
- Documented and presented findings to the City Council in a series of Council work sessions and meetings.

Key Personnel

John Ghilarducci, Principal-in-Charge
Doug Gabbard, Project Manager

Reference

John Grim, PE, City Engineer (Contract)
John Grim & Associates
(509) 365-5421
jgrim@johngrimassociates.com

WATER AND WASTEWATER RATE AND SDC STUDY (2019)

CITY OF UMATILLA, OR

FCS GROUP was engaged in 2019 to evaluate rates and SDCs for the water and wastewater utilities. The goals of the study were to ensure that SDCs appropriately recover the cost of existing and planned capital investment and to develop rates that equitably recover costs from the City's customers.

Project Highlights

- Updated the reimbursement fee portions and the improvement fee portions of the SDCs based on the available capacity of the City's assets and projected customer growth.
- Analyzed revenue requirements to ensure that each utility's fund balances remained above minimum targets.
- Forecasted operating costs including personnel services, maintenance and engineering, power costs, and the City's existing debt service commitments.
- Developed a funding plan for the capital projects, incorporating SDC revenue, grants, cash resources, and a series of revenue bond debt issuances.
- Recommended rates for the utilities that recover each customer class' allocated cost of service.
- In addition to the SDC and rate study, FCS GROUP was engaged to calculate the potential yield of a construction tax to provide funding for Umatilla School District #6R.

Key Personnel

John Ghilarducci, Principal-in-Charge
Doug Gabbard, Project Manager

Reference

Melissa Ince, Finance & Administrative Services Director
(541) 922-3226 ext.104
melissa@umatilla-city.org

Select Oregon Rate and SDC Experience

The following matrix summarizes a selection of relevant Oregon cities SDC and rates experience. John Ghilarducci was the principal-in-charge for all of these projects.

Client	Rates	SDCs	Water	Sewer	Storm	Parks	Transportation
Astoria		•	•	•	•	•	•
Banks		•	•			•	•
Beaverton	•	•					•
Bend	•	•	•	•	•		•
Canby		•				•	•
Cannon Beach	•	•	•	•	•	•	•
Central Point	•	•	•		•	•	•
Clackamas Co.	•	•	•	•			•
Coburg	•	•	•	•	•	•	•
Cornelius	•	•	•	•		•	
Corvallis	•	•	•	•	•	•	•
Cottage Grove	•	•	•	•	•	•	•
Depoe Bay	•	•	•	•			
Eagle Point	•	•	•		•	•	•
Forest Grove	•	•	•	•			
Grants Pass	•	•	•	•	•		
Gresham	•	•	•	•	•	•	•
Happy Valley	•	•	•	•	•	•	•
Hermiston		•	•	•			•
Hillsboro	•	•	•		•		•
Hood River	•	•	•	•	•	•	•
Jacksonville		•				•	•
La Pine	•	•	•	•			•
Lake Oswego	•	•	•	•	•	•	•
Madras	•	•	•	•			•

Client	Rates	SDCs	Water	Sewer	Storm	Parks	Transportation
Medford	•	•	•	•	•	•	•
Milwaukie	•	•	•	•	•		•
Monmouth		•			•	•	•
Mosier	•	•	•	•	•	•	•
Newberg		•		•			•
Newport	•	•	•	•	•	•	•
N. Bend W Board		•	•				
N. Clackamas PRD		•				•	
North Plains		•	•			•	•
Oregon City	•	•	•	•	•	•	•
Phoenix		•		•	•	•	•
Prineville		•		•		•	•
Redmond	•	•	•	•	•	•	•
Seaside	•	•	•	•	•	•	
Sherwood	•	•		•	•		•
Silverton	•	•	•	•	•	•	•
St Helens	•	•	•	•	•	•	•
Talent		•		•	•	•	•
Tigard		•				•	
Troutdale	•	•	•	•	•		•
Tualatin	•	•	•		•		
Umatilla	•	•	•	•			
Veneta	•	•	•	•		•	•
Warrenton	•	•	•	•	•	•	•
West Linn	•	•	•	•	•	•	•
Wilsonville	•	•	•				
Woodburn	•						

PERSONNEL

FCS GROUP is promoting a small, focused team who will be available and committed to work on this engagement for its duration. As primary contact, project manager Doug Gabbard will anchor your team and provide day-to-day project management. John Ghilarducci, a nationally recognized expert in utility rates, will be the principal-in-charge. Project consultant Amanda Levine will provide data analysis and modeling. Project examples and references for members of our project team are included on page 4 and 5. A summary of each individual's experience and education is included on the page 8 and 9.

Because FCS GROUP is not an engineering firm and operates as an independent and objective provider of financial consulting services, we only bill on a direct time and materials basis and thereby do not have audited billing rates that would otherwise inform an overhead to direct base salary ratio.

Local Experience

Members of this project team have worked together on rate and SDC studies throughout Oregon including, but not limited to: Umatilla, Mosier, Boardman, Central Point, Tigard, Hillsboro, Sherwood, West Linn, Gresham, Warrenton, Newport, Medford, Bend, Corvallis, Grants Pass, Hood River, Lake Oswego, Oregon City, Redmond, Silverton, Troutdale, Wilsonville, as well as Clackamas County.

John Ghilarducci PRINCIPAL-IN-CHARGE

John Ghilarducci is FCS GROUP's president and a shareholder with 36 years of professional experience including 33 with the firm. His practice focuses on all aspects of rate and SDC studies, from technical modeling and public involvement to ordinance drafting and implementation. John has formed transportation and stormwater utilities and has developed parks, water, sewer, stormwater, and transportation rates and charges for dozens of clients throughout the US.

John is a recognized technical rate and finance expert and provides litigation support/expert witness testimony throughout the Northwest. He offers a broad knowledge of public policy and finance, and a thorough understanding of the institutional issues and options underlying the design of supporting rate and charge structures. In addition, he is a recognized leader in Oregon SDCs and has served as a League of Oregon Cities trainer on the subject since 2005 and most recently in 2022. He also presented *System Development Charges: Trends and Evolving Policy* at the Oregon Government Finance Officers Association conference in March 2024.

John was recently a key member of a team of experts chosen to perform a comprehensive evaluation of SDCs for the Oregon State Department of Housing and Community Services. The study focused on SDC practices statewide, and the effects of SDCs on housing affordability, as well as how charges drive costs for building and developing housing of all types.

John has an MPA in Organization and Management from University of Washington, and an BS in Economics from University of Oregon.

Role: John will be responsible for contract execution, allocation of resources and QA/QC. He will also participate in key meetings with the City Council and the public.

Doug Gabbard PROJECT MANAGER

Doug Gabbard is an FCS GROUP project manager with 18 years of analytical experience in municipal and private sector positions. His comprehensive financial planning experience involves extensive parks, transportation, water, sewer, and stormwater utility fee and rate development. Doug's experience includes the creation of detailed, interactive models that facilitate sensitivity analysis and scenario testing to determine business direction in group decision-making environments. Additionally, Doug has performed nearly 50 rate and SDC engagements throughout the State of Oregon, all of which had a public involvement element. Among his project experience, he has also developed sophisticated rate and impact fee calculators that are being used by several Oregon clients.

Along with John Ghilarducci, he recently contributed to a statewide study of SDCs that was requested by the Oregon legislature and led by the Oregon Department of Housing and Community Services. Doug has been a presenter at the Oregon Government Finance Officers Association's conferences. He has an MBA in Finance from the University of Oregon, and an BA in Classical Languages from Santa Clara University.

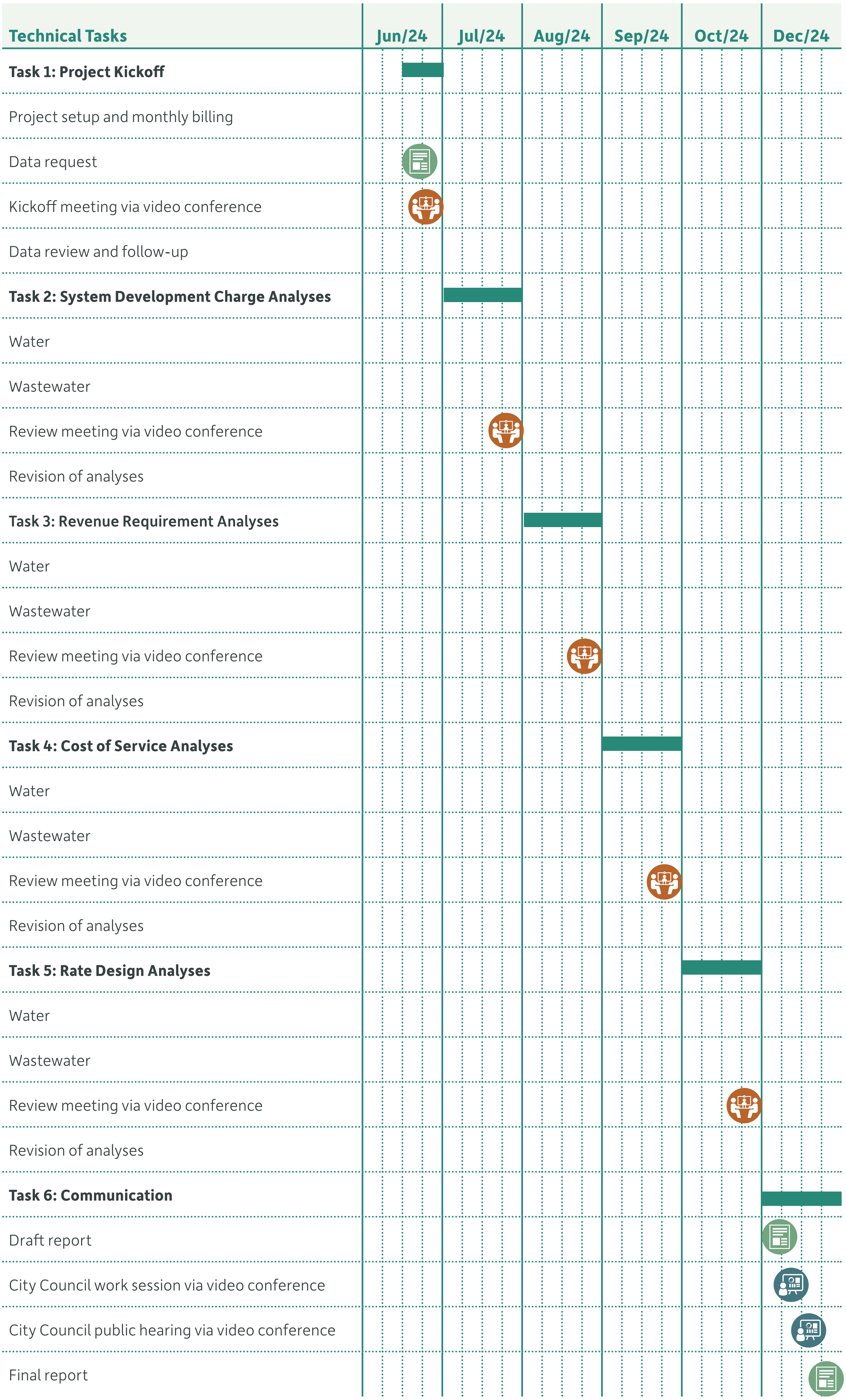
Role: Doug will be responsible for project management, technical direction, project oversight, and quality assurance. He will also be involved with preparing for and presenting at key meetings.

Amanda Levine PROJECT CONSULTANT

Amanda Levine is a project consultant with experience in stormwater, water, sewer, and solid waste rate studies. Amanda has assisted clients throughout the Pacific Northwest with revenue requirement and cost-of-service studies, multi-year financial planning, and connection fee development. Amanda has extensive experience working with complex customer billing data to design water utility rate structures for communities in Oregon, Washington, Idaho, Montana, and California. She has an BA in History and Medical Anthropology and Global Health from University of Washington.

Role: Amanda will be responsible for data management, technical analysis, rate modeling, and drafting project deliverables.

SCHEDULE


Technical Tasks
Jun/24
Jul/24
Aug/24
Sep/24
Oct/24
Dec/24
Task 1: Project Kickoff
Project setup and monthly billing
Data request
Kickoff meeting via video conference
Data review and follow-up
Task 2: System Development Charge Analyses
Water
Wastewater
Review meeting via video conference
Revision of analyses
Task 3: Revenue Requirement Analyses
Water
Wastewater
Review meeting via video conference
Revision of analyses
Task 4: Cost of Service Analyses
Water
Wastewater
Review meeting via video conference
Revision of analyses
Task 5: Rate Design Analyses
Water
Wastewater
Review meeting via video conference
Revision of analyses
Task 6: Communication
Draft report
City Council work session via video conference
City Council public hearing via video conference
Final report

COST ESTIMATE

Task Detail	Ghilarducci Principal	Gabbard PM	Levine PC	Admin Support	Total Hours	Budget Estimate
Task 1: Project Initiation						
1.1 Project setup and monthly billing	1	4	6	6	17	$3,075
1.2 Data request		1	2		3	$635
1.3 Kickoff meeting via video conference	2	2	2		6	$1,480
1.4 Data review and follow-up		4	16		20	$4,140
Task 1 Subtotal	**3**	**11**	**26**	**6**	**46**	**$9,330**
Task 2: System Development Charge Analyses						
2.1 Water	1	6	16		23	$4,915
2.2 Wastewater	1	4	16		21	$4,445
2.3 Review meeting via video conference	2	2	2		6	$1,480
2.4 Revision of analyses	1	2	8		11	$2,375
Task 2 Subtotal	**5**	**14**	**42**	**0**	**61**	**$13,215**
Task 3: Revenue Requirement Analyses						
3.1 Water	1	6	24		31	$6,515
3.2 Wastewater	1	6	24		31	$6,515
3.3 Review meeting via video conference	2	2	2		6	$1,480
3.4 Revision of analyses	1	2	8		11	$2,375
Task 3 Subtotal	**5**	**16**	**58**	**0**	**79**	**$16,885**
Task 4: Cost of Service Analyses						
4.1 Water	2	8	32		42	$8,890
4.2 Wastewater	2	8	32		42	$8,890
4.3 Review meeting via video conference	2	2	2		6	$1,480
4.4 Revision of analyses	1	2	8		11	$2,375
Task 4 Subtotal	**7**	**20**	**74**	**0**	**101**	**$21,635**
Task 5: Rate Design Analyses						
5.1 Water	1	2	8		11	$2,375
5.2 Wastewater	1	2	8		11	$2,375
5.3 Review meeting via video conference	2	2	2		6	$1,480
5.4 Revision of analyses	1	2	8		11	$2,375
Task 5 Subtotal	**5**	**8**	**26**	**0**	**39**	**$8,605**
Task 6: Communication						
6.1 Draft report	1	6	24		31	$6,515
6.2 City Council work session via video conference	2	4	6		12	$2,750
6.3 City Council public hearing via video conference	2	4	6		12	$2,750
6.4 Final report	1	2	8		11	$2,375
Task 6 Subtotal	**6**	**16**	**44**	**0**	**66**	**$14,390**
Labor Total	$9,455	$19,975	$54,000	$630		$84,060
Expenses						$0
Budget Estimate						**$84,060**
Total Hours	31	85	270	6	326	
Billing Rate	$305	$235	$200	$105		

Thank you for taking the time to review our qualifications.

OREGON inc
government executive league

May 29, 2024

Melissa Bethel, City Manager
City of John Day
bethelm@grantcounty-or.gov
RE: Water and wastewater rate study RFP

Dear Melissa,

Please find attached my proposal to perform the rate studies and related work requirements to provide the City with utility rates/structures that adequately fund the City's water and wastewater operations and development over the ten-year plus planning horizon.

For the past twenty plus years, my firm has provided professional services in several management and financial disciplines to municipalities throughout the northwest. I have worked with Anderson Perry Engineers on several occasions with the City of Prineville, including water and sewer rates, system development charges and a complex data center water reservation analysis and fee methodology.

If selected, I will work with the City to establish a mutually agreeable schedule that ensures efficient use of staff and consultant time and results in a product that is supported by the staff, city council and the community.

I will be the contact for the project and am authorized to sign a contract, if awarded. I am agreeable to including required federal contract clauses in the final executed agreements with the City.

Looking forward to discussing my proposal with you and the selection team.

Sincerely,

Andy Parks
President, GEL Oregon, Inc.

City of John Day

Proposal in Response to Request for Proposals

Wastewater and Water Utility Rate Model and System Development Charges Methodology Update

May 30, 2024

Description of Study Understanding

The goal of the study is to secure an independent assessment and evaluation of the City's existing water delivery and wastewater service cost structure and to evaluate potential debt scenarios to fund the City's $20+ million Wastewater System improvement project. The broad objective of the study is to develop a model that provides necessary information for decision makers to make informed decisions to adequately fund water and wastewater utility operations, debt and infrastructure costs while promoting conservation and minimizing rates to the greatest degree possible.

The following professional services will be performed to attain the project goal and objectives.

1. Review existing conditions and documents and collaborate with staff to secure the information and data necessary to complete twenty-year financial forecasts and rate analysis.
2. Prepare twenty-year financial forecasting models, in excel, that provides cost centers for personnel, materials and services (certain elements in M&S may be drilled down), capital outlay, debt service and transfers if appropriate. Each expenditure category will be linked to relevant assumptions such as CPI, population growth, wage and benefit adjustments, and debt service schedules. The model will include debt coverage ratios by year and instructions for City staff to update the model on a periodic basis, e.g., annually, to include changes to capital scheduling, actual revenue and expenditures, adjustments to assumptions, etc.
3. Populate the financial models with information specific to the City of John Day to determine the necessary revenue (resources to include potential debt issues) to meet

the objectives of the City, such as capital replacement, maintenance, anticipated debt service and required debt coverage ratio requirements.

4. Document the City's current rate structure. Compare the current rate structure to best practices of the American Water Works Association (AWWA) and rate structures of Oregon municipalities. (I will use information from Cividata for this task, please see the attached report for Newberg, Oregon).

5. Review the City's SDCs for water and wastewater, document potential recommendations. Per review of the City's last two fiscal year financial statements, given the City's relatively small amount of revenue from SDCs I have limited the scope of this task pending review of the City's SDC methodology, the updated master plans, identifying opportunities and threats and discussing these with City staff before contemplating potential phase II work.

6. Present and discuss two-three rate structure alternatives with staff. Discuss potential recommendations for SDCs with staff, including the relative impacts of decisions on SDCs to utility rates. Rate structures presented will include specific rates, e.g., base rate of $20.00 plus $1.50 per 1,000 gallons, and forecast revenue for each structure, including projected rates throughout the planning period, i.e., twenty years (in my experience a twenty-year forecast coincides with the master plans, allows for improved trending and has just an incremental cost to produce). Note, rate structures presented will work with Caselle software and be easy to understand.

7. Prepare draft report with preferred rate structure alternative(s).

8. Prepare memo with recommendations for SDCs.

9. Present and discuss proposal with City Councilors in a work session. Address comments and questions. Solicit input to incorporate into the final report.

10. Prepare final report incorporating changes per input received at work session.

11. Present final report at a regular City Council meeting.

Work History

Recent and relevant utility rate and system development charge studies for a small Oregon municipality:

City of Prineville

Mr. Parks has served the City of Prineville as a management and financial consultant and financial advisor since 2004. Among his projects are the following relevant rate studies:

- Water and wastewater rate studies – 2018 and May-July 2024

  Comprehensive updates to water and wastewater rates. Prepared twenty-year financial forecast utilizing information from updated master plans, including but not limited to capital improvement schedules, maintenance requirements, and historical and projected growth.

- Water conservation rates – 2021

  Prineville experienced an unexpected increase in water consumption and requested an analysis of potential tiered water rates to encourage water conservation. We utilized detailed consumption information for all customers to identify system usage demographics and forecast revenue given various tiered models and reduced consumption assumptions.

- Water and wastewater system development charge studies – 2018 and 2023

  Performed analysis of the utility systems utilizing updated master plans to determine the maximum system development charges for water and wastewater utilities.

- Water surcharge – data center water reservation fee methodology - 2023

  Prineville is home to several data centers owned and operated by Meta and Apple. The water service agreements with these customers include reserving a significant amount of water to ensure water capacity for their cooling needs. We assisted the City with a detailed analysis of the financial impacts of the water reservation requirements utilizing ten-year usage history. We created a methodology and fee structure that encourages the reduction of the water capacity reservation to help with an incremental implementation to reduce risk and operational impacts to the community and the customers.

City of Prineville references

Casey Kaiser, Public Works Director
541.447.8338
CKaiser@cityofprineville.com
or,

GEL OREGON inc
government executive league

Steve Forrester, City Manager
541.447.5627
sforrester@cityofprineville.com

Personnel

Andy Parks, CPA will complete all aspects of this engagement.

Andy Parks has served local governments for more than thirty-five years as a consultant, advisor and in executive leadership positions. He co-founded GEL Oregon, Inc., in 2003 to share the expertise he gained while providing financial and strategic advice to management and elected officials of Bend, Oregon during its transformation from a small quiet city to a bustling, world-renowned destination.

Andy assists municipal organizations with:

- Strategic planning
- Financial and management "Best Practices"
- Service delivery/business process evaluations
- Performance measures
- Implementation of organization change initiatives
- Long-range financial planning
- Urban renewal/economic development
- Fee and utility rate analysis, studies and plans
- Business intelligence
- Coaching and mentoring

A passionate advocate and user of business principles in local government, Andy has been a pioneer in the collection and analysis of information from comparable organizations to help his clients:

- Better understand their operations and organizations,
- Identify opportunities and strategies to gain a competitive advantage, and
- Attain long-term stability.

Andy's public sector career began in 1988 with the City of Bend. During his tenure, Bend became a leader in the use of technology, best practices and performance management as the city grew from 18,000 to 53,000, while:

- Increasing and expanding services,
- Improving efficiencies and effectiveness, and

- Expanding its infrastructure while keeping its water and wastewater rates among the lowest in the United States.

Mr. Parks founded and operates CiviData, a technology firm that provides business intelligence to the public sector. He has presented expert testimony and has been a speaker at national and state organization conferences of finance, administrative, purchasing and elected officials. He has served on several non-profit boards of directors. Andy has a Bachelor of Science Degree in Finance from the University of Oregon and retains his certified public accountant (CPA) credential.

Please see the attached brochure for additional information.

Project Approach and Schedule

The following schedule is the anticipated work plan, with flexibility to meet city staff requirements.

Task	Aug	Sept	Oct	Nov
Kick off meeting	✓			
Review existing conditions and documents	✓			
Prepare financial models		✓		
Present preliminary rate alternatives		✓		
Present preliminary proposal			✓	
Finalize reports			✓	
Deliver final plan/reports				✓
Follow up review/training rate model				✓

Approach

Prior to the kickoff meeting, I anticipate requesting documents and information that is not available online, e.g., master plans and detailed customer billing records (in excel format). I will review documents and reports such as financial statements, master plans, and rate resolutions prior to the kickoff meeting. The initial review of existing conditions will allow collaboration with City staff at the kickoff meeting to be more productive. Additionally, I anticipate presenting preliminary financial forecasting models to City staff at the kickoff meeting, editing the model based on staff feedback. Lastly, I will present the City's current rate structure and rates in comparison to no less than thirty other Oregon municipalities and to the AWWA best practices for discussion and feedback, including preliminary suggestions for alternative rate structures. In my experience, this process will allow the team to be much more efficient to the overall project.

Based on management team comments and consensus, I will perform the analysis to complete the preliminary proposals for water and wastewater for discussion with the City management team. Prior to presentation of the draft proposals to staff, I will likely present preliminary finding for feedback to ensure the results are headed in an acceptable direction. Based on feedback from the management team to the draft proposals I will finalize the draft for presentation to the City Council.

A bi-weekly video conference with key staff is planned throughout the engagement.

To be most efficient, the Consultant suggests the kickoff meeting be held in person, with all other meetings completed via video conference. During the kickoff meeting visit, the consultant would appreciate an opportunity to meet City Councilors, discuss the project and hear their views and concerns. An in-person presentation of the final report and recommendations at a regular Council meeting is available, however, this comes at an additional fee due to travel. I have included the fees for in-person meetings for the City Council work session and regular meeting in the fee schedule below.

ESTIMATED HOURS and FEES

Hours

Task	Description	Water	Wastewater	SDCs	Total
-	Kick off meeting	1	1	-	2
1	Review existing conditions	4	4	-	8
2	Prepare twenty-year forecasting model	4	4	-	8
3	Update model with John Day information	8	8	-	16
4	Document and compare rate structure	4	4	-	8
5	Review SDCs	4	4	4	12
6	Present and discuss rate alternatives	2	2	-	4
7	Prepare draft report	16	16	-	32
8	Prepare memo with recommendations - SDCs	4	4	4	12
9	City Council work session - present proposal	2	2	-	4
10	Prepare final report	1	1	-	2
11	Present final report	1	1	-	2
		51	51	8	110

Fee Summary:

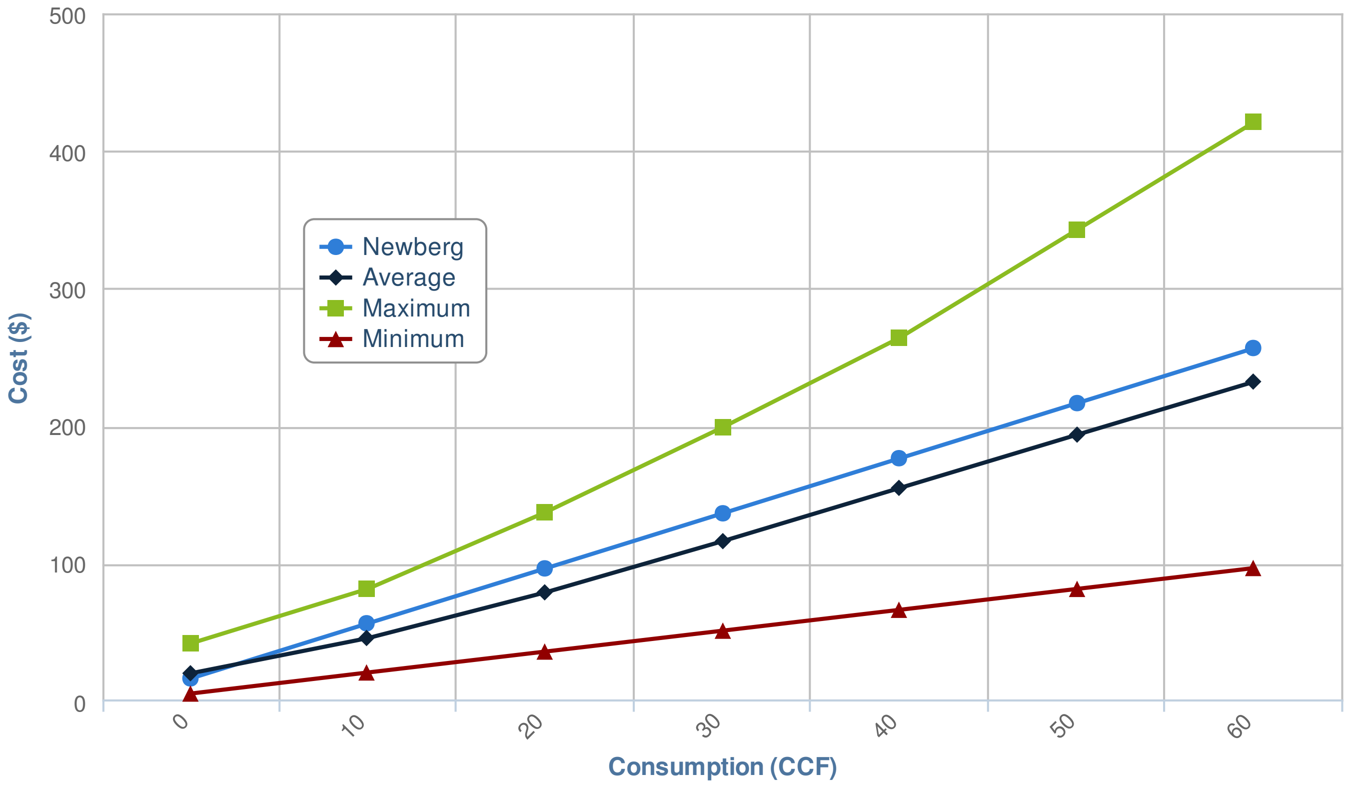
Studies	estimate of 48 hours for each utility, including report writing
SDC Review	estimate of 8 hours, including drafting memo with recommendations
Meetings	3 meetings, estimate of two hours for each meeting, six hours total, including preparation and follow-up
Travel	estimate of 9.5 hours for each round trip, 28.5 hours total

Total estimated fee – professional services, 110 hours @ $250/hour	$ 27,500
Travel – 28.5 hours at $100/hour	2,850
Reimbursable expenses – mileage at IRS rate	
524 miles each trip, 3 trips, total 1,572 miles @ $0.67/mile	1,053
Total estimated cost	$ 31,403

Consultant's billing rates: $ 250 per hour
$ 100 per hour for travel

This proposal is valid for 30 days.

Water Utility Total Costs Report



22 Entities

Search parameters: Water | Average, Maximum, Minimum | Newberg | Oregon | Population 0 - Max | Distance 0 - Max | Single Family | 3/4" meter | Usage 0 - 60

Entities

Entity Name	Location	Population	Cost						
			0	10	20	30	40	50	60
Albany	Albany, OR	53,145	$19.07	$54.69	$81.19	$107.69	$134.19	$160.69	$187.19
Central Point	Central Point, OR	17,895	$14.73	$25.77	$43.77	$70.97	$100.47	$129.97	$159.47
Cornelius	Cornelius, OR	11,935	$32.87	$67.83	$123.17	$191.84	$260.51	$329.19	$397.86
Cottage Grove	Cottage Grove, OR	10,005	$17.98	$29.09	$42.18	$57.51	$72.84	$88.18	$103.51
Dallas	Dallas, OR	15,830	$19.41	$34.04	$54.94	$75.84	$96.74	$117.64	$138.54
Dundee	Dundee, OR	3,230	$21.54	$35.49	$72.30	$114.93	$164.53	$214.13	$263.73
Forest Grove	Forest Grove, OR	24,125	$25.67	$41.22	$71.97	$116.48	$161.07	$205.65	$250.23
Grants Pass	Grants Pass, OR	37,285	$21.57	$30.37	$44.97	$61.07	$78.67	$96.27	$113.87
Keizer	Salem, OR	38,505	$5.86	$21.06	$36.26	$51.46	$66.66	$81.86	$97.06
Lake Oswego	Lake Oswego, OR	38,215	$27.68	$55.14	$107.89	$186.19	$264.49	$342.79	$421.09
Lebanon	Lebanon, OR	16,920	$28.81	$79.41	$130.01	$180.61	$231.21	$281.81	$332.41
Milwaukie	Milwaukie, OR	20,525	$8.69	$49.39	$90.09	$130.79	$171.49	$212.19	$252.89
Molalla	Molalla, OR	9,625	$13.82	$44.12	$74.42	$104.72	$135.02	$165.32	$195.62

Monmouth	Monmouth, OR	9,890	$18.23	$44.43	$70.63	$96.83	$123.03	$149.23	$175.43
Newberg	Newberg, OR	23,795	$16.79	$56.79	$96.79	$136.79	$176.79	$216.79	$256.79
Oregon City	Oregon City, OR	34,860	$16.54	$44.79	$73.04	$101.30	$129.55	$157.80	$186.05
Roseburg	Roseburg, OR	24,820	$15.25	$34.45	$53.65	$72.85	$92.05	$111.25	$130.45
Sherwood	Sherwood, OR	19,505	$23.81	$67.20	$110.58	$158.73	$226.80	$294.87	$362.95
Tigard	Portland, OR	52,785	$42.29	$82.03	$137.43	$199.23	$262.63	$326.03	$389.43
West Linn	West Linn, OR	25,830	$23.67	$31.83	$59.03	$86.23	$113.43	$140.63	$167.83
Wilsonville	Wilsonville, OR	25,250	$20.45	$50.29	$107.89	$165.49	$223.09	$280.69	$338.29
Woodburn	Woodburn, OR	24,760	$15.50	$35.92	$61.90	$95.00	$128.10	$161.20	$194.30

OREGON inc

government executive league

Advancing Communities

Local governments play an essential role in our quality of life. The services they provide, such as water, wastewater, stormwater, transportation, police, fire, parks and recreation, and library among others are capital and labor intensive. Each come with considerable upfront and continuing expense.

GEL consultants understand municipal government, services, and the critical role these organizations have in our lives. We have the knowledge, expertise, experience and temperament to help you deliver these services as effectively and efficiently as possible.

GEL Oregon, Inc.
West Linn, Oregon
541.913.9779

Areas of Emphasis

- Strategic planning
- Financial and management "Best Practices"
- Service delivery/business process evaluations
- Key performance measures
- Implementation of organizational change initiatives
- Long-range financial planning
- Urban renewal/economic development
- Fee and utility rate analysis, studies and plans
- Compensation analysis, studies and plans
- Executive recruiting
- Coaching and mentoring

Clients

Oregon Cities

Albany
Baker City
Bend
Central Point
Corvallis
Dallas
Eugene
Fairview
Florence
Grants Pass
Gresham
Hillsboro
Madras
Milwaukie
Newport
Oregon City
Pendleton
Portland
Prineville
Redmond
Roseburg
Salem
Scappoose
Stayton
Sutherlin
Troutdale
Union
Veneta
West Linn
Wilsonville
Wood Village

Other Oregon Government Clients

Clackamas County
Crook County
Crook County Library
Crook County Parks and Recreation District
LaPine Parks and Recreation District
Madras Aquatic Center
Metro
Housing Works, Redmond

Urban Renewal Agencies

Bend
Dundee
Florence
Lake Oswego
Medford
Newport
North Bend
Oregon City
Redmond

Cities outside Oregon

Bozeman, MT
Elgin, IL
Lake Stevens, WA
Rockford, IL
Vancouver, WA
Burlington, WA
Eukiah, CA
Maple Valley, WA
Seattle, WA
Weatherford, TX

CITY OF
JOHN DAY

CITY OF JOHN DAY
REQUEST FOR COUNCIL ACTION

DATE ACTION REQUESTED: June 11, 2024			
Ordinance ☐	Resolution ☐	Motion ☑	Information
Date Prepared: June 5, 2024		Dept.: City Manager's Office	
SUBJECT: Recommendation of Award of the WWTF Final Design/Construction Engineering Contract to Flagline Engineering/Kennedy Jenks		Contact Person for this Item: Melissa Bethel, City Manager, bethelm@grantcounty-or.gov, (541) 575-0028	

SUBJECT: Recommendation of Award of the Wastewater Treatment Facility (WWTF) Final Design/Construction Engineering Contract to Flagline Engineering/Kennedy Jenks

BACKGROUND: The City of John Day published a Request for Proposals for "Wastewater System Improvements – Final Design & Construction Engineering," on May 1, 2024 in the *Blue Mountain Eagle,* which closed on May 31, 2024. The Scoring Committee (Public Works Director Casey Meyers, City Manager Melissa Bethal, and Grant Administrator Nicholas Ducote) met on June 5, 2024 to rank and review the three proposals provided for Rate Study consulting services to the City of John Day.

The two proposals received were from:
- Flagline Engineering + Kennedy Jenks
- The Dyer Partnership Engineers & Planners, Inc.

The proposals from both engineering teams were excellent and the Scoring Committee was thrilled to see such interest in our project from some of the top wastewater treatment engineers in the state. The crux of the decision came down to the "Method of Approach" and the "Availability; Past Performance with the City." The Flagline/KJ Team has years of experience with our treatment plant project, the permitting, the environmental issues, have been intimately involved in the funding discussions, and authored the Preliminary Engineering Report Addendum 1. Flagline/KJ provide years of institutional knowledge about the "whys" regarding certain design decisions. Flagline Engineering will provide much of the on-site support and is located in Bend, rather than Dyer's locations in Sutherlin and Coos Bay.

These were the average scores:

		Avg	
Category	**Max**	**Flagline/KJ**	**Dyer**
Professional Qualifications of Team	20	19.3	20.0
Experience	20	18.0	20.0
Method of Approach	20	19.7	16.7
Availability; Past Performance w/City	15	14.3	11.0
Understanding of the Requested Services	15	14.3	11.7
References	10	10.0	10.0
Total	**100**	**95.7**	**89.3**

FINANCIAL IMPACT: The work will be paid first through the Community Development Block Grant #18011 grant and any remaining costs will be paid through the Water/Wastewater Financing Program #Y21006; and other funding instruments. The amount of the contract will be negotiated with the chosen firm after the Notice of Award is issued.

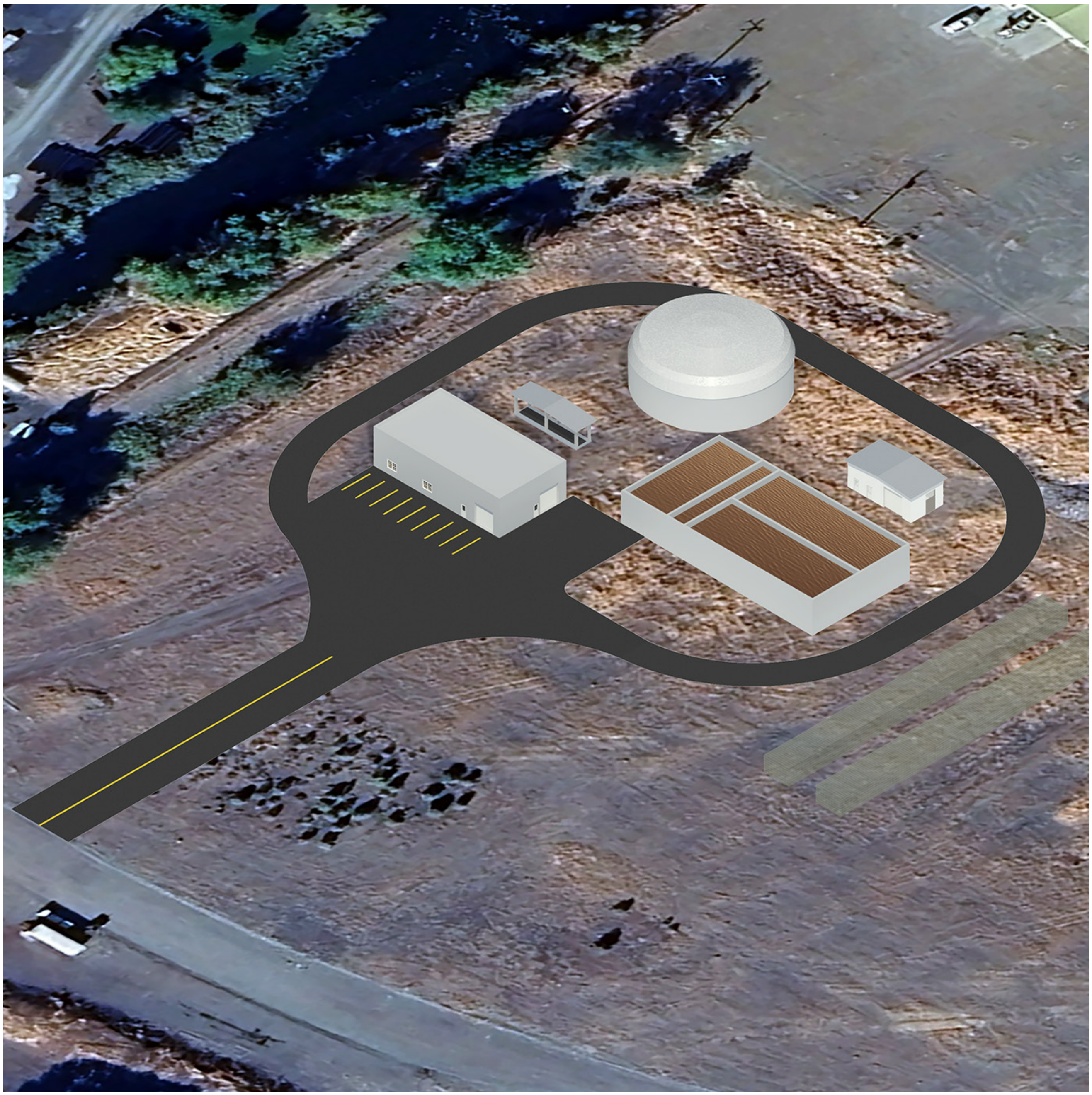
COUNCIL ACTION REQUESTED: Concur with the Committee's recommendation, award the WWTF Final Design/Construction Engineering work to Flagline Engineering/Kennedy Jenks., and direct the City Manager to negotiate a contract.

- (Contract will receive legal review and funding agency review, then be approved by Council before execution.)

ATTACHMENTS:

#1 – Flagline Engineering and Kennedy Jenks Proposal

#2 – Dyer Engineering Proposal



REQUEST FOR PROPOSALS FOR CITY OF JOHN DAY

WASTEWATER SYSTEM IMPROVEMENT – FINAL DESIGN & CONSTRUCTION ENGINEERING

May 31, 2024

FLAGLINE ENGINEERING

2300 NE 4th Street #5248 • Bend, OR • 97701

May 31, 2024

City of John Day
450 East Main Street, John Day, Oregon 97845
Re: **Wastewater System Improvements - Final Design & Construction Engineering**

Flagline Engineering is excited to submit this proposal to continue our professional relationship with the City of John Day (City) to embark on the design and construction of your new Wastewater Treatment Facility. Together in our partnership with Kennedy Jenks, our team has a solid foundation to complete the work on time and on budget. By selecting our team, we offer the following benefits:

Experience with your system to accelerate project delivery:
Over the past 5 years, our team has supported the City by performing multiple tasks that includes a condition assessment of your existing facility, updating the Preliminary Engineering Report (PER), and securing the renewal of your WPCF permit. This experience allows our team to hit the ground running and expedite design.

Relevant qualifications and expertise to deliver best value:
We offer a multi-discipline team experienced in upgrading wastewater treatment facilities for communities similar in size to the City of John Day that includes Dundee, Coburg, Riddle, Estacada, Hermiston, and Pendelton. We understand the need for affordability and reliability to ensure your system is easy to operate and maintain.

Innovation incorporates system flexibility and supports lowest cost of operation:
Our team has been considering your project for over 5 years. Our understanding of treatment alternatives, operational history, and permit requirements will result in a design that will accommodate the City's growth plans and enables potential options such as recycled water.

All of the professionals shown in this proposal have valid licenses in Oregon for their respective roles and have good standing with OSBEELS. Flagline is COBID certified by the State of Oregon and our team has current insurance levels that meet the project requirements.

We appreciate the relationships we've formed with the City of John Day and hope we can continue to serve the City on this endeavor. Our team will be available any time of the day including weekends as required by the construction schedule dictated throughout the life of the contract. If there is anything more we can help with, please call or email me at (541) 797-6781 or email at jpex@flagline.net.

Sincerely,

FLAGLINE ENGINEERING

Jim Pex, PE
Principal Engineer

FIRM
Flagline Engineering, LLC
2300 NE 4th Street #5248
Bend OR 97701
p: 541-808-4407
e: jpex@flagline.net

COBID CERTIFIED
Certification # 11962

PROPOSAL CONTACT
Jim Pex, Principal Engineer, will serve as the main contact and is authorized to sign any contracts.

FEDERAL TAX ID NO.
83-3600394

OREGON STATE TAX ID NO.
1768042-1

PROPOSAL STATEMENTS
No redactions are requested.

INSURANCE REQUIREMENTS
Flagline and Kennedy Jenks meet the minimum insurance requirements identified in the RFP.

Section 1

Professional Qualifications of Project Team

Section 1

Professional Qualifications of Project Team

Our Team Has a Proven Track Record of Working Together to Deliver Results for John Day

We are looking forward to building on the momentum our team created during our 5-year work history with the City, including on the City's Wastewater Preliminary Engineering Report. The collaboration between Flagline and KJ spans over a decade with several members of this team having worked together on similar projects.

Jim Pex, with his years of background knowledge about the project, will lead the team and be your primary point of contact throughout the design and lifecycle of the project. Jim, Michael Humm, and Kyle Bonnet worked together previously on a major pipeline project in the City of Bend and on John Day's PER. Kyle will lead Flagline's design group for the pipeline elements of the project. KJ's PM, Nate Bell, will lead the plant design team and resides in nearby Redmond. Nate will be readily available to you in person as needed throughout the design and construction phases.

Flagline and KJ have developed a cohesive team that collaborates seamlessly, enhancing project delivery. By integrating technical staff who have worked together on local pipeline and treatment projects, we minimize internal coordination time for efficient delivery.

LEGEND

- ► Key Personnel
- Kennedy Jenks[1]
- CwM-H2O[2]
- Povey and Associates[3]
- GRI[4]
- Advanced Control Systems[5]

CITY OF JOHN DAY

Technical Advisor & QA/QC
► David Seymour, PE[1]

Principal Engineer & Contract Manager
► Jim Pex, PE

Design Manager
► Michael Humm, PE[1]

Project Manager Treatment
► Nate Bell, PE[1]

Sr. Project Manager Collection System & Site Civil
► Kyle Bonnet, PE

WWTP

Permitting
► Mark Cullington[1]

Electrical
Erin Hoepfl, PE[1]

Structural
Jake Salter, PE[1]

Testing/Startup/ Commissioning
Laura Thomas, CCP[1]

Mechanical
Jeff Foray, PE[1]

Process
Eun Kim, PE[1]

Cost Estimating and Scheduling
Kieran Christie, PMP, CCP[1]

TECHNICAL RESOURCES

Hydrogeologist
Bob Long[2]

Survey
Matt Blanton, PLS[3]

Geotechnical
Jason Bock, PE[4]

SCADA & Telemetry
Steve Thomsen, PE, BSEE[5]

Grading, ADA Site Infrastructure
►Victoria Chun, PE

JIM PEX, PE *Principal Engineer & Contract Manager*

Jim has over 24 years experience as an Engineer in Oregon and over 150 public agency projects to his name carried through design and construction. His expertise is in project management for a wide range of utility and transportation projects and alternative delivery methods for construction. Jim has been the Principal Engineer for nearly every project for the last decade under his purview and Founded Flagline in 2019. A substantial portion of his public agency projects have been in coordination with multiple grant agencies, including Community Development Block Grants (CDBG) and the US Department of Rural Development (USDA). He has also worked closely with the Department of Environmental Quality (DEQ) and other regulatory agencies throughout his career with several in motion currently. He has the overall ability to manage a multi-faceted project of this caliber to make sure multiple pieces come together correctly for this project.

KYLE BONNET, PE *Sr. Project Manager Collection System & Site Civil*

Kyle has 14 years of experience designing and providing construction oversight for public agency infrastructure and an expertise in hydraulic analysis and design for gravity systems. Kyle developed and found a hydraulic solution on the North Interceptor project that allowed the project to use 54-inch pipe vs 60-inch previously expected. It may seem small in nature, however that amount extrapolated over 12,000-LF with depths that exceeded 20-feet saved the project over $4M. He co-authored the City of John Day's PER report and found several solutions to lingering issues, where and how to place critical infrastructure locations for the new WWTF that were previously unresolved. His expertise in public agency specifications and construction administration makes him a perfect fit for this role.

NATE BELL, PE *Project Manager Treatment*

Nate Bell brings a wealth of practical experience to municipal engineering and project management. A diverse, hands-on background provides the foundation for his expertise in wastewater treatment, pump stations, conveyance, and asset management. Nate has served as the senior engineer at small municipality and his design projects are informed by his more than four years of field deployment on major wastewater construction projects.

MICHAEL HUMM, PE *Design Manager*

Michael has 19 years of experience that includes planning, design, and construction support of wastewater treatment plant facilities, new and rehabilitation of existing pump stations, secondary treatment modifications, hydraulic modeling, and potable water system improvement projects. He has served as Project Manager for numerous Oregon clients, including managing quality control on contracts for wastewater treatment plant services with Clean Water Services and Portland BES.

DAVID SEYMOUR, PE *Technical Advisor & QA/QC*

David is Kennedy Jenks' Wastewater Community of Practice Lead. He has 21 years of experience and has worked at over 40 different wastewater treatment facilities in Washington, Oregon, California and Hawaii. These facilities range in size from 0.5 to 300 MGD, and he has served in a variety of roles including project manager, project engineer, and technical advisor. David's relevant experience includes design of new headworks facilities, aeration basins, tertiary filters, UV disinfection, and effluent disposal.

MARK CULLINGTON *Permitting*

Mark has over 24 years of experience as a consultant, facilities owner, and regulator. He has worked as a Project Manager, Contract Manager, Principal-In-Charge, and technical professional in Oregon's planning, design, and construction management of wastewater treatment facilities. Mark is well-versed working with Oregon DEQ on multiple NPDES permitting projects throughout Oregon.

VICTORIA CHUN, PE *Grading, ADA Site Infrastructure Design*

Victoria is a multi-talented engineer with expertise in site development, grading and public utility design. Additionally, she has certifications for a Certified Erosion and Sediment Control Lead (CESCL) and as an ODOT Inspector. Her ability to not only design but maintain new 1200-C compliance for our clients is a tremendous asset. When construction is in full swing, her understanding of inspection requirements will help set the tone for the contractor and verify the project follows all regulatory and grant requirements until completion.

Subconsultants

KENNEDY JENKS

KJ is an employee-owned, full-service engineering and environmental sciences consulting firm with a reputation for excellence and innovation in planning, multi-discipline design and construction services to municipalities. The collaboration between Flagline and KJ spans over a decade with several members of this team on similar projects. With 105 years of engineering excellence and more than 500 staff in 30 offices across the United States, KJ staff works seamlessly with clients across geographic boundaries, and offers local resources so the City's project is delivered with efficiency and accuracy.

CWM-H2O

CwM-H2O is a specialized water resource, groundwater, and water rights consulting firm. Since its founding in 2013, CwM-H2O has focused on water resources planning and development strategies for municipal, agricultural, and private development client across the Pacific Northwest. Their staff have extensive experience in groundwater resources, developing water demand forecasts in municipal and agricultural settings, and use of geographic information systems to assess water resource options. CwM-H2O works primarily with small city leadership to help formulate water resource goals and partner to work through regulatory and logistical challenges to meet goals.

POVEY AND ASSOCIATES

Povey and Associates is a regional surveying company with expertise in traditional, drone, LiDAR and boundary surveys in Central and Eastern Oregon. Located in Redmond, Povey has worked with Flagline and KJ on countless projects, including the City of Bend North Interceptor Sewer project. Povey has provided the existing survey data currently being used by the City of John Day for the preliminary services for mapping and work related to the PER amendment. All of the existing control and new survey will be on the same coordinate system to reduce vertical or horizontal errors to the pre-design work completed in John Day.

GRI

GRI is a NW geotechnical engineering company that specializes in public agency projects. Flagline and KJ have worked with GRI for decades on agency projects throughout Oregon on similar projects involving pipes and structures. GRI has the ability to be a resource to the project not only in facility and piping design but also provide feedback on HazMat and testing services if required for demolition of the existing plant in the future. GRI has experience in the region and knowledge of the future WWTF location as they were consulted during the PER amendment to identify potential geotechnical issues with the location and type of structure previously.

ADVANCED CONTROL SYSTEMS

Advanced Control Systems has been serving the Automation and Controls industries since 1992. Our SCADA and factory automation installations number in the hundreds, spanning North America and the world. ACS provides direct support to the City of John Day currently and will be a seamless partner to our team going forward to create a simple and efficient plant. ACS will also be able to integrate the existing system into the new plant to create a complete system for the City going forward.

Section 2

Experience

WASTEWATER ENGINEERING REPORT UPDATE

City of John Day, OR

Completed Aug. 2022

Flagline & KJ completed a Preliminary Engineering Report (PER) to evaluate the treatment and collection system upgrades and improvements for the John Day WWTP to improve effluent quality and provide future capacity (peak flow of 1.2 mgd). The existing facility was operating under an expired WPCF permit and upgrades were necessary to renew the City's discharge permit and correct plant deficiencies due to aging infrastructure. The evaluation identified deficiencies of the existing plant; location within the flood plain, structurally compromised clarifiers and digester, and classification issues in the common walled electrical and digester facility. Rehabilitation of the existing plant to correct these deficiencies was not cost-effective. Rather, a membrane bioreactor, sequencing batch reactor, and oxidation ditch technologies coupled with tertiary filtration, were evaluated, with the SBR with tertiary filtration recommended. KJ also assessed options for configuring the collection system to facilitate the plant relocation. Ultimately, KJ recommended a plant location that would eliminate a high-risk sewer siphon under the John Day river and two aging lift stations.

KEY STAFF: ***Jim Pex, Kyle Bonnet, Michael Humm, Mark Cullington***

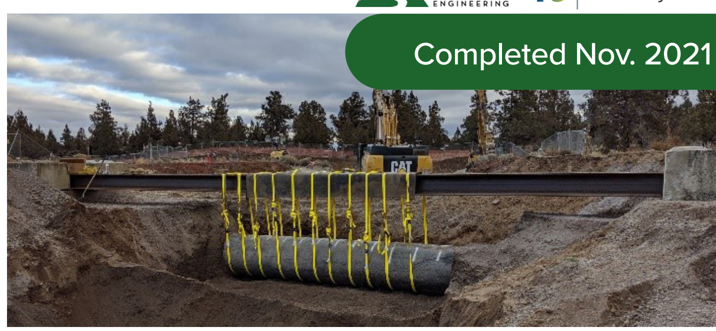
PROJECT RELEVANCE

- Same teaming partners were responsible for the PER that has led to this design phase
- Continuity of team members over 4 years working with John Day on various efforts related to the WWTP, conveyance, and community planning

NORTH INTERCEPTOR SEWER PROJECT AND PUMP STATION

City of Bend, OR

Completed Nov. 2021



North Interceptor Sewer Project (NISP) is a large diameter sewer transmission main that provides additional capacity to the City's existing sewer infrastructure, replaces portions of the existing sewer in need of repair, and allows the City to decommission up to 14 regional pump stations. The NISP was divided into three phases, including a 36 mgd pump station at the City's Water Reclamation Facility (WRF) and 37,000 feet of gravity sewer, ranging in size from 24-inch to 54-inch diameter. Flagline performed design and permitting services related to the pipeline and Kennedy Jenks performed all facility designs that included a 36 mgd pump station, connection to the WERF, trenchless crossings, drop structures, and diversion structures.

For Phase II, Flagline transitioned to permitting and transportation efforts with ODOT as the design crossed Hwy 97. KJ collaborated with City planning to provide preliminary designs for Phase III to optimize alignment alternatives with future private developments. This project was completed on time and almost $4 million under budget

KEY STAFF: ***Jim Pex***, ***Kyle Bonnet***, ***Michael Humm***, ***Mark Cullington***, ***Erin Hoepfl***

PROJECT RELEVANCE

- Same teaming partners collaborated for 5+ years on an expansive upgrade to some of the City's most vital infrastructure
- Gravity sewer project allowed decommissioning of multiple pump stations
- Team minimized disruptions to other utilities and traffic in busy, high-visibility areas

WASTEWATER TREATMENT PLANT EXPANSION

City of The Dalles, OR

Kennedy Jenks

The Dalles completed the first progressive design-build undertaken by a municipality for a major WWTP retrofit in the State of Oregon. KJ provided planning and preliminary design, final design, permitting assistance, and construction phase services for new pumping equipment, an anorexic selector, the addition of primary filtration, microturbine, and converting a second anaerobic digester to sludge storage. By adding primary filtration to the process, KJ eliminated the need to add an aeration basin saving the City over $5 million. The project won an ACEC Oregon "Grand Award" in 2019 for engineering excellence. This project was completed on time and within budget.

KEY STAFF: ***Michael Humm, Jake Salter, Erin Hoepfl***

PROJECT RELEVANCE

- Regulatory drivers and cost-constrained project
- State and federal funding assistance
- Permitting assistance
- Resident engineer services

Kennedy Jenks

WASTEWATER TREATMENT PLANT EXPANSION AND UPGRADES

City of Arlington, Department of Public Works, WA

KJ was selected to design an upgrade and expansion to the City of Arlington's Wastewater Treatment Plant (WWTP). The WWTP was upgraded and expanded to a membrane bioreactor facility with aerobic sludge digestion designed to meet projected growth and comply with more stringent NPDES permit limits, particularly with regard to phosphorus. The new facility was installed for an initial capacity of 2.7 mgd and constructed for a total capacity of 4.0 mgd. **KJ's design maximized the use of existing infrastructure and featured energy-efficient improvements that resulted in the award of a $450,000 energy grant.**

KEY STAFF: ***David Seymour, Mark Cullington, Jake Salter***

PROJECT RELEVANCE

- Construction of two new aerobic digesters (0.67 MG each)
- New 3,000 SF solids handling building
- New solids dewatering equipment
- Three aerobic digester blowers
- Two-stage screw conveyor
- New electrical room supporting solids handling equipment

Kennedy Jenks

WASTEWATER TREATMENT PLANT UPGRADE AND EXPANSION

City of La Center, WA

The City of La Center needed to significantly expand its wastewater treatment capacity to meet the needs of its growing community, improve effluent quality, and address effluent temperature issues – all on a highly visible 0.75 acre site. To assist services to increase peak wastewater treatment capacity from 1 to 3 mgd (easily expandable to 6 mgd in the future). Our design featured an innovative approach to reusing existing infrastructure, resulting in nearly $1M in cost savings and the award of **$373,000 in energy efficiency incentives from Clark Public Utilities**.

KEY STAFF: ***Mark Cullington***, ***David Seymour***

PROJECT RELEVANCE

- Converting an SBR into an aerated sludge basin
- Intense public and regulatory scrutiny
- Grant funding assistance
- Design of new solids dewatering facilities, allowing the optimization of Class A biosolids production while reducing natural gas use

In addition to the projects described in detail above, our team has completed the projects in **Table 1** that are relevant to your project in several respects. We have expertise in each element of your project which will translate to efficiency and cost savings for the City.

Client - Project	CDBG Funding	Other Funding	Permitting	Collection System Improvements	Existing Collection System Rehab/Improvements	Hydraulic Modeling	Certified Inspection
FLAGLINE ENGINEERING ***Direct experience with similar elements to your project***							
City of Bend - North Interceptor Phase I		●	●	●	●	●	●
City of Bend - North Interceptor Phase II		●	●				●
City of Bend - 3rd and Pinebrook	●						●
City of Bend - Summit Loop Access			●			●	●
City of Bend - SW Sewer Basin Phase I & 2A	●		●				●
ODOT - Oakland Bridge			●	●	●	●	●
ODOT - Coos County Maint Station			●	●	●	●	●
USFS - Emigrant Creek Fire Facility			●	●	●	●	●
Red Moon Development			●	●	●	●	●

Client - Project	CDBG Funding	Other Funding	Permitting	Design & Construction	SBR Evaluation	Headworks	Blowers	UV	Tertiary	Solids Processing	Recycled Water
KJ Kennedy Jenks ***Projects for small communities with population fewer than 20,000***											
City of The Dalles - WWTP Rehabilitation			●	●		●				●	
City of La Center - WWTP Upgrade & Expansion		●	●	●	●	●	●	●	●	●	●
City of Riddle - WW Liquid Stream Improvements	●	●	●	●	●	●	●	●		●	
City of Dundee - WWTP Design & Construction		●	●	●	●	●	●	●	●	●	●
City of Pendleton - WWTP Upgrades		●	●	●	●	●	●			●	
City of Hermiston - New MBR WWTP		●	●	●		●	●				●
City of Warrenton - WWTP Capacity & SBR Evaluation		●	●		●	●	●	●	●	●	

Section 3

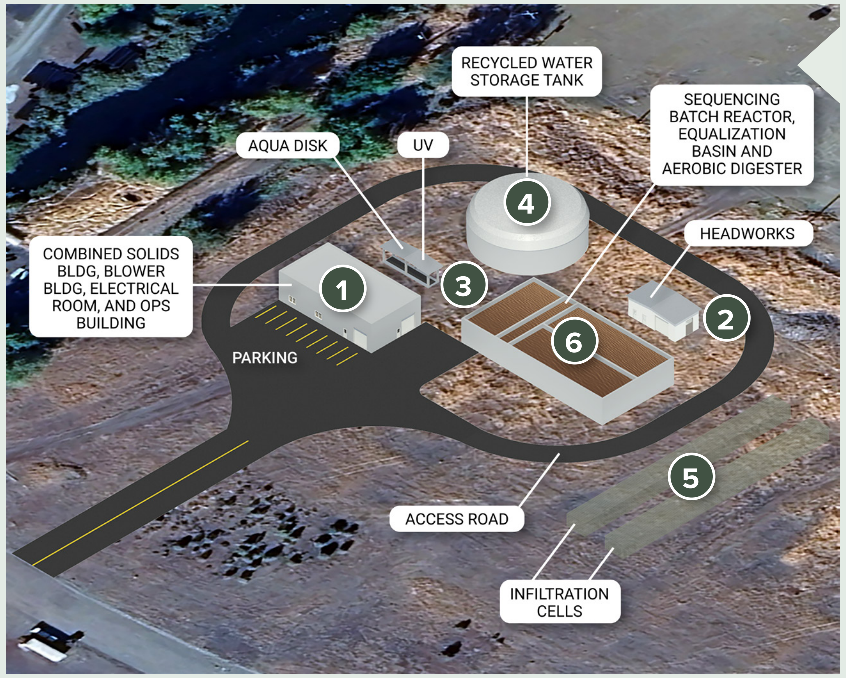
Method of Approach

Section 3

Method of Approach

The table below describes our overall approach to the major project tasks and how our approach will benefit the City. This is followed by a map that outlines our approach some key challenges of the proposed pipeline and treatment plant projects. Finally, we've highlighted some key services we plan to provide and how those will benefit the City.

Tasks	Overall Approach	Benefits to the City
Task 1: Project Management	Open communication, frequent coordination, consistent tracking, and quality control.	Our team will be responsive to the City's needs, obtain input through collaborative meetings, build consensus with your operations staff and submit high-quality deliverables.
Task 2: Engineering Services	Frequent workshops, plant tours, and City staff involvement early in the design phase.	City staff will be able to help control costs and optimize features from the beginning.
Task 3: Additional Engineering Services	Leverage our permitting experience and recycled water and solids experts to vet alternatives, coordinate with regulators, and guide the City's decisions.	By identifying viable alternatives, the City can make informed decisions about the future of their recycled water and solids disposal programs.
Task 4: Engineering - Pre-development	Leverage our extensive past experience to assist the City with strategically-timed early materials procurement	The City will be able to meet grant spending deadlines and maximize grant funding opportunities, and the design team can focus on optimizing the design for specific equipment.
Task 5: Engineering Services During Construction	Our team will maintain continuity of staff throughout design and construction. Flagline has certified inspectors on staff and will utilize local assets as much as possible throughout the construction while meeting grant requirements throughout this phase.	The City will meet grant-mandated inspection requirements in a cost-effective manner. Background project knowledge will result in more robust contractor-engineer collaboration.



KEY TREATMENT PLANT CHALLENGES

1 Site layout requires careful consideration for optimal operation, maintenance, future expansion, and nuisance mitigation. **Approach:** KJ will develop alternatives and work with City staff in Workshops to achieve the optimal balance of cost effectiveness and practicality. **Example:** La Center, WA had a very constrained site and required creative packaging to fit all of the required elements on the site.

2 The number and type of buildings adds compounding cost. **Approach:** As part of a value engineering effort, we will use a Workshop setting to help you determine the types of structures that will meet your operational and cost objectives. Some structures, such as the UV building, may not need to be fully enclosed. Others can be combined into one building. **Example:** As part of our ongoing greenfield WWTP design for the City of Estacada, KJ has combined a solids processing facility, blower building, electrical room, and maintenance shop into a single building.

3 Being remotely located, getting materials and equipment to the site may be a significant challenge. Getting adequate amounts of concrete, for instance, may be difficult and may change seasonally. **Approach:** Our PM's will maintain a risk register for the project and we will actively mitigate these risks through design and inclusions in the contract documents. **Example:** The Willamette Water Supply Project, a massive $1Billion program, involved a risk register for each program element. Each risk register contained dozens of significant risks, those risks were actively managed in dedicated meetings, and the register was delivered to the General Contractor as a reference.

4 There is uncertainty surrounding the future of the City's biosolids disposal options and the potential for establishing a recycled water program. **Approach:** In a workshop setting, our experts will help clarify the City's options for recycled water and biosolids disposal and help the City pursue their desired alternatives with DEQ, end users, and other stakeholders early on the project. **Example:** We have helped the cities of Hermiston, Dundee, Amity, Banks, Nehalem Bay, Lincoln City and many other Oregon cities permit and manage their recycled water and biosolids programs.

5 The effluent infiltration cells are heavily scrutinized by DEQ, NYMPHS, and ODFW. **Approach:** We will coordinate closely with all stakeholders to ensure that the design complies with their requirements. **Example:** The Cascadia WWTP in WA was a greenfield, 1.0 mgd design that primarily discharges to rapid infiltration basins and also incorporates Class A recycled water. KJ led the extensive monitoring and permitting effort for the infiltration basins and recycled water.

6 Existing City grant funding requires $1.5M be spent by the end of Q1/2025. **Approach:** The design team will develop a cash flow analysis that will depict estimated design spend rate, which will inform where and how much money should be directed towards early equipment procurement to allow the City to maximize their funding opportunity. **Example:** Nate Bell has led multiple early procurement efforts for treatment equipment and custom metal fabrications and KJ is currently in the process of pre-procuring MBR equipment for the City of Estacada.

KEY PIPELINE CHALLENGES

1 New collection system piping installation requires sequencing and coordination with both the existing collection system infrastructure and startup of the new WWTP. **Approach:** Our team will develop a robust Work Sequencing specification to define installation requirements, required sequencing and completion milestones. **Example:** Flagline and KJ PMs meet weekly internally to discuss parallel design efforts to verify projects are on track and accommodate changes during the design phase. This allows our team to move quickly and efficiently on tight schedules.

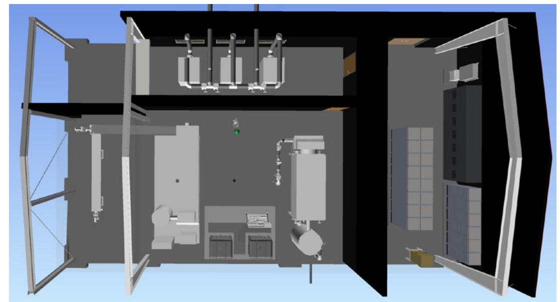
2 New improvements need to facilitate future development in this area. **Approach:** Development assumptions will be vetted early in the project and if there have been any changes to the planned development, the collection system piping can be modified to best suit the current development approach. **Example:** Our team will review potential connections to the new piping system. Flagline is experienced within site development and accounting for future development with over 20 different projects designed and accounted for future development as part of the final submittals.

3 Weather will impact the construction schedule. **Approach:** We will explore phasing the design and construction of the pipeline to ensure that trenching and paving occur during suitable construction season. **Example:** During Phase I of the North Interceptor Sewer Project, our team reviewed historical weather patterns and placed deadlines for certain aspects of construction within those windows as part of the bidding strategy. This ensured the best possible sub-surface construction times and wouldn't open potential change requests or schedule extensions from the contractor.

4 Peak flows during seasonal snow melt will drive basin sizing at the WWTP. **Approach:** The team will develop a pipeline configuration that provides the ability to manage peak flows by diverting influent to the existing WWTP effluent ponds. **Example:** The KJ design of the Dundee WWTP includes passive weir gates that allow high flows to divert into equalization tanks. This trims the peak flow and allows the treatment basin sizing to be optimized. Once peak flows subside, the stored water is returned to the process basin for full treatment.

Additional Engineering Services to Benefit the City

3D Design: With construction costs escalating so rapidly, all of our clients are pushing us to be more efficient in the use of space, material selection, lifestyle costs, construction methods, and optimization of our own design processes. **3D design enables us to add value** by revealing construction conflicts, optimizing building footprints, facilitating virtual client tours for valuable feedback, performing accurate material takeoffs for cost estimating, facilitating revisions in multiple drawing sheets simultaneously, and producing a more robust design resulting in a better ownership experience.



KJ are currently at 60% design of a greenfield treatment plant for the City of Estacada. KJ leveraged 3D design to add a blower room, solids processing facility, and maintenance facility into a single building. KJ staff are also assisting the City with MBR system pre-purchasing.

Regulatory Experience: As a long-standing co-chair of Oregon's Association of Clean Water Agencies Biosolids and Recycled Water Committee, **Mark Cullington is at the forefront of Oregon's regulatory changes**. He will use his knowledge of Oregon's permitting processes, and relationships with regulators and local policymakers, to facilitate the City's plant operation, biosolids management, and water reuse objectives.

Recycled Water: KJ has developed Recycled Water Use Plans for Nehalem Bay, Amity, and Hermiston, Oregon. We understand that John Day has an initiative and potential revenue stream related to reusing a portion of the plant effluent. We will help facilitate commitments from end users, including Malheur Lumber, and define the level of treatment required for the specific end use. **Establishing these commitments early on will also aid in capital planning for storage and delivery of recycled water.**

Biosolids Land Application Approvals and Management Plans: At the pre-proposal meeting, there was uncertainty related to the City's long-term plan for biosolids management. The existing land application site is in question and, as of yet, identification of prospective sites has been limited. **The solids processing equipment in the new plant will be largely driven by the biosolids disposal method, and there is a cost-benefit analysis that should be done to help inform these decisions.** Our Oregon-based team has completed over a dozen biosolids management plans within the past 10 years for small cities including Lebanon, Dundee, and Nehalem Bay. Our team has also planned thickening, dewatering and digestion facilities for numerous Oregon communities, streamlining their biosolids programs to reduce operating costs. Mark Cullington will be available, should the City desire, to lead efforts on updating the City's Biosolids Management Plan, permitting a new land application site, and make recommendations on plant equipment.

KJ completed a biosolids alternatives evaluation for the City of Lincoln City's SBR plant. We investigated long-term options for biosolids management in the face of reduced demand for local Class B biosolids on the Oregon Coast. The study included evaluating elements of the solids digestion process, solids dewatering and production of Class A biosolids through drying, and other upgrades throughout the facility.

Early Materials Procurement: KJ has assisted many of our clients with early materials procurement. With grant spending deadlines associated with the project, early materials procurement will play a key role in allowing the City to maximize their low- and no-cost funding sources. This approach is not without its risks, and KJ's experience will be valuable to mitigating those risks for John Day. **We are proposing not only to purchase the SBR equipment early, but to meet spending deadlines for the City's existing grant funding, we are also proposing to assist the City with purchasing some materials and equipment prior to 30% design.**

Section 4

Availability and Past Performance

Availability

All primary design managers for the plant and collection system are located within a few hours of John Day. Flagline and Kennedy Jenks have staff located in Bend and Redmond, Oregon, who will be assigned to this project. All of Flagline's staff are located in Central Oregon and are available for the project. In addition to Flagline's staff, Kennedy Jenks' proposed PM for the treatment plant design, Nate Bell, is located in Redmond. This project is of the utmost importance to our team and will be regarded as a Tier 1 project. That means that the deadlines and responsiveness of our team is the highest priority and the City will have full access to our management team and other resources at any time during the life of the contract to resolve any issue in a timely manner. **Our team is highly committed to your project.** The Matrix below estimates the time commitments required for delivery of this project along with the avilability of our staff to deliver on this project.

Project Staff	Role	Project Commitment Required	Availability to John Day	Location
Jim Pex	Contract Manager	25%	50%	Redmond, OR
Michael Humm	Design Manager WWTP	10%	25%	Portland, OR
Nate Bell	Project Manager WWTP	50%	90%	Redmond, OR
Kyle Bonnet	Collection System & Site/Civil	50%	90%	Bend, OR
Mark Cullington	Permitting	5%	15%	Portland, OR
Victoria Chun	Grading, ADA Site Infrastructure	50%	90%	Bend, OR
David Seymour	Technical Advisor and QA/QC	5%	15%	Federal Way, WA
Erin Hoepfl	Electrical	25%	60%	Portland, OR
Jake Salter	Structural	20%	50%	San Francisco, CA
Bob Long	Hydrogeologist	5%	30%	Lake Oswego, OR
Matt Blanton	Survey	10%	50%	Redmond, OR
Jason Bock	Geotechnical	15%	50%	Portland, OR

Past Performance with the City of John Day

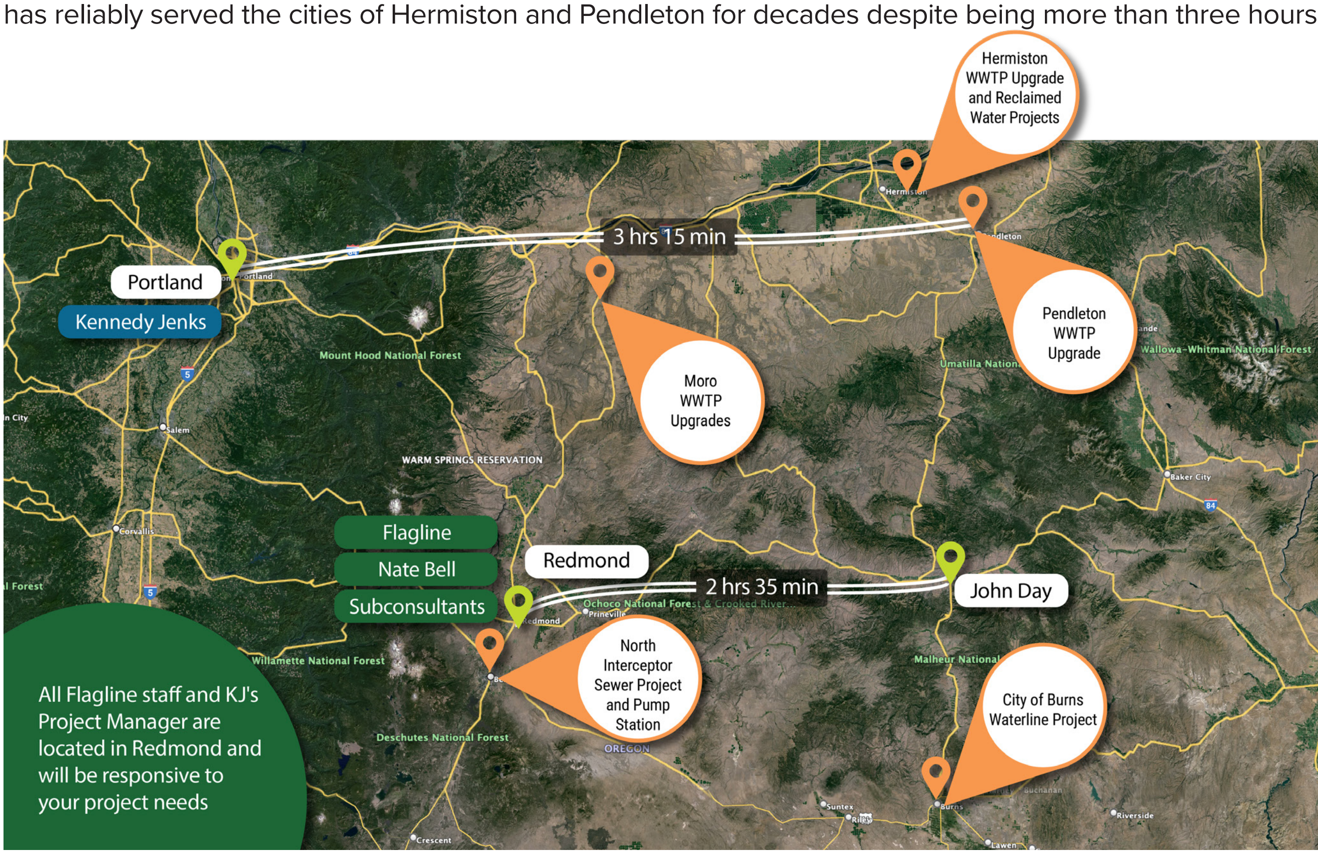
The collection includes an assembly of past documents we've developed for the City.

Flagline and Kennedy Jenks have teamed to provide services to the City of John Day since 2020. During that time, our team has helped navigate and successfully obtain approvals for the WPCF permit from DEQ, an approved Preliminary Engineering Report (PER) for the project and assisted with meetings with various funding agencies and permitting requirements. We have also helped coordinate efforts with the hydrogeologist, mapped the region and solved some collection system questions that have lingered for nearly 30 years.

Flagline and Kennedy Jenks staff were instrumental in navigating the technical requirements of USDA's review team to get the overall buy-off on the project parameters via the PER and balancing the different requirements between USDA and DEQ to make sure both entities would approve the overall approach and recommendations. **The same individuals who were vital for all of these steps will also be committed to this project to maintain the knowledge base and consistency for the City.**

We are Committed to Serving your Commnity

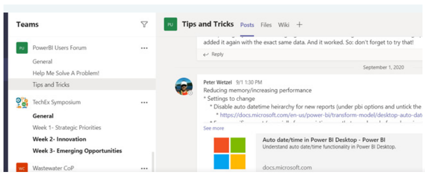
Our team understands the importance of being nearby. Not only are there cost implications for the City's consultants traveling from afar, but being a familiar face and in touch with the community go a long way toward fostering a sense of camaraderie and trust with stakeholders. **Flagline's staff is nearby in Redmond and Bend, and will provide daily resident inspector services throughout the duration of the project via their team of certified inspectors. Nate Bell will be based in Redmond for the duration of the project and be available on short notice to represent the KJ design team in person.** In addition to having staff available for in-person site visits and meetings, our team is accustomed to remote work, digital collaboration, and serving clients in Eastern and Central Oregon. Kennedy Jenks has reliably served the cities of Hermiston and Pendleton for decades despite being more than three hours away.



Tools We Will Use to Bridge the Gap

We intend to leverage technology both within our team and external to our organizations to seemlessly collaborate. We've highlighted below a few of the tools we intend to use to collaborate with you and keep you informed.

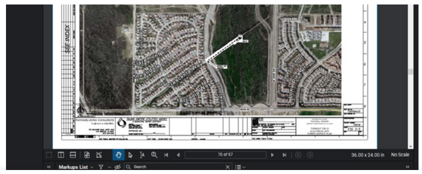
Utilizing Technology and Software to Enhance Project Execution



Collaboration

MS Teams

Offers a comprehensive platform that integrates chat, video meetings, file sharing, and application integration in a unified workspace. It enables real-time communication through persistent chat channels, which keep conversations organized and accessible. Video conferencing capabilities allow for face-to-face meetings regardless of location, fostering a more personal and immediate interaction.



Design Review

Bluebeam Revu

An integral part of our collaborative review and team environment. Provides a cloud based system to receive timely feedback from project stakeholder. Allows for design review, document management and comment tracking. This provides improved QA/QC speed and accuracy as well as accountability for resolving conflicts.

Construction Management

Procore

Our specs will require the use of cloud-based construction mangement software. Platforms such as Procore are designed to facilitate seamless communication between contractors, subcontractors, and clients, ensuring everyone is on the same page. This software helps construction teams manage resources, mitigate risks, and deliver projects on time and within budget.

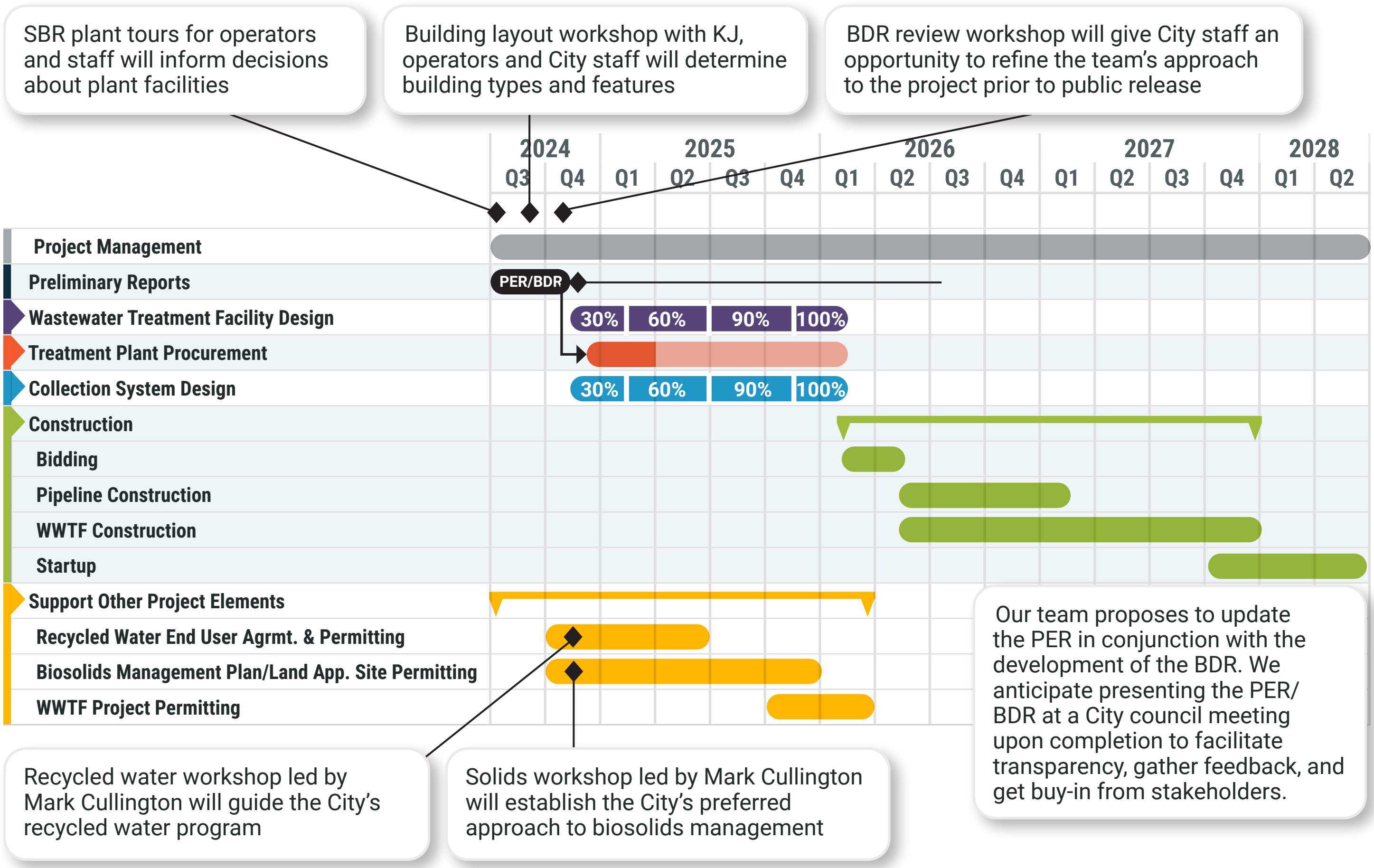
Section 5

Understanding of Requested Services

Section 5

Understanding of Requested Services

We have broken the project down into six work activities in the timeline shown below. Each activity is described in greater detail in the following sections.



PRELIMINARY REPORTS

Due to cost-driven revisions to the treatment plant layout and the time elapsed since it was submitted, an update to the PER is required. After completing a series of workshops with the City to develop the vision for the plant and its associated programs, we intend to produce the PER and BDR in parallel. **This will help reduce the overall project duration and allow the City to meet grant funds spending deadlines in Q1 of 2025.**

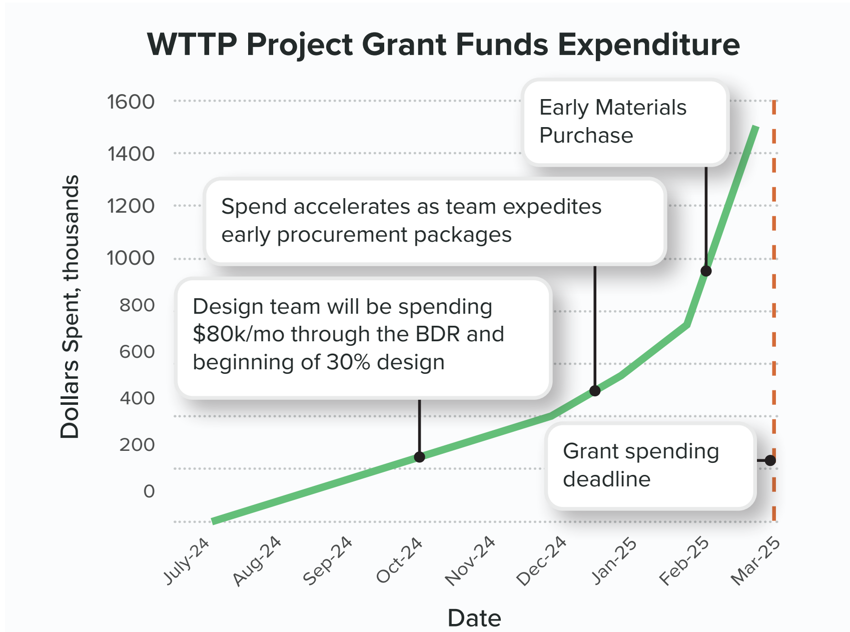
WASTEWATER TREATMENT FACILITY DESIGN

The primary driver for the project surrounds the need for a new WWTF. Our team's Site Walk Findings memo dated 29 October 2020, noted the existing plant is "in marginal to poor condition" and "the existing site does not present the City with a viable alternative" as the existing WWTF is nearly 70 years old and in the floodplain. The treatment plant design team is tasked with developing a treatment solution that meets projected flow and loading demands and is able to safely the discharge into the proposed infiltration gallery. There are additional considerations related to bioslolids management and development of a recycled water program. The final product must appropriately balance the fundamental treatment needs and the preferred approaches to the management of these byproducts with operational efficiency and cost.

TREATMENT PLANT PROCUREMENT

The City's PER identifies opportunities to use an early procurement process for major equipment items. Early procurement will not only help the City meet grant spending deadlines, but will streamline the design process by allowing engineers to design around known parameters. This strategy is not without risk, including contractual and warranty issues.

Our team has successfully implemented early procurement and helped our clients mitigate the associated risks by engaging prospective vendors early on, involving our legal staff for contract review, anticipating storage and hand-off problems, and with thorough QA/QC of the design criteria developed for equipment specification.



We understand the City's incentive to purchase equipment early in the project and use all of your available grant funds. It will likely be too early at the end of Q1 2025 to actually issue a payment on the SBR equipment. We have identified other plant equipment that the City could pre-purchase with very low risk.

COLLECTION SYSTEM DESIGN

The existing siphon under the river is a liability for the City due to the potential environmental impact to the John Day River should the pipeline fail. Our team evaluated two options for mitigating this risk in the PER and has recommended siphon rehabilitation using the Cured in Place Pipe (CIPP) process. This approach aligns with the USDA requirements, provides an economical option, and restores long term reliability in the siphon. In addition to the siphon work, our team will finalize the conveyance pipe design between the existing WWTF and new WWTF with features to allow the overflow equalization pond at the existing plant to be utilized. **During design, consideration must be given to facilitate the future development of the land surrounding the new plant.**

CONSTRUCTION

Grant programs require full time inspection from qualified inspectors during the life of the project. Our team has certified inspectors on staff and have the ability to work with regional inspectors if we can find someone in the local area with the required credentials. We will find the most economical answers to meet the requirements of the lending agencies involved. **Our design team will be available throughout the life of the construction to support implementation of the design intent.**

SUPPORT FOR OTHER PROJECT ELEMENTS

We understand there are multiple parts to this project that will require coordination during the project. Early in the project, the City will be completing a rate study that has financial questions that will be asked of the design team. Our team will be helpful in those efforts to support the steps to help the community find financial solutions for this project and beyond. At the plant, the effluent discharge will utilize an infiltration gallery that needs to coordinate efforts with CwM-H2O to comply with the water aquifer testing and agency requirements. We also need to recognize the work completed by HECO and the purple pipe project that incorporates a pump station and 500,000-gallon holding tank on the WWTF footprint. **Our team understands support for these other project elements. We will coordinate with the City and it's partners to maximize the City's current investments into these other components.**

In addition to understanding the specific project needs, our team understands the elements of project delivery that are required to provide a cohesive design solution while maintaining controls to meet the schedule and budget. Our team has the flexibility to align the project delivery to the needs of John Day, but we provide the City the rigidity of delivery systems, processes, and standards needed to deliver high quality, sound improvements. These include:

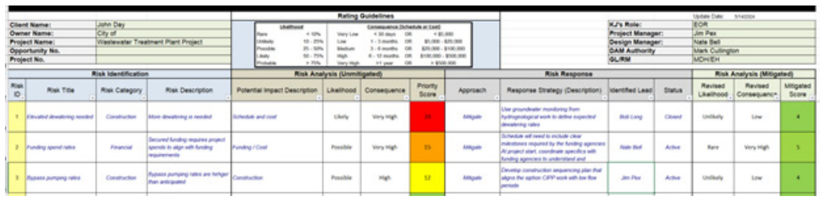
PROJECT MANAGEMENT APPROACH

A project management plan will be developed specific to this project. The plan will be used as the roadmap to:

- Communicate expectations with the entire team
- Document targeted goals and objectives and how to achieve them
- Identify roles, responsibilities, and expectations
- Detail content of deliverables
- Document the overall project schedule

Three central documents will be used throughout the project to maintain a clear design delivery pathway between all parties.

MANAGEMENT OF DECISION AND RISK



Example of a risk register our team has begun assembling for your project

1. **Risk Register:** Ensures proactive identification, assessment, and management of potential project risks, promoting a culture of preparedness and minimizing the impact of uncertainties on project outcomes.
2. **Decision Log:** Provides a comprehensive record of key project decisions, ensuring clarity and accountability, and serving as a valuable reference for future actions and decisions.
3. **Change Management Log:** Provides a structure to evaluating and implementing changes, fostering a controlled environment where all parties can understand and adapt to project adjustments efficiently.

QUALITY MANAGEMENT PLAN (QMP)

Quality assurance and quality control (QA/QC) are integrated into our team's project management system from project inception. Our QA/QC process includes the following:

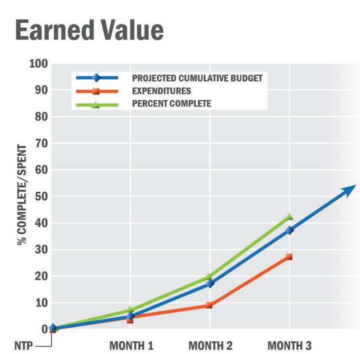
Review Type	Review Details	Reviewer	Date Due	Completed
Design	30% Submittal	Gregory B. Behnke	2023-05-10	2023-05-17
Design	C&CR	Gregory B. Behnke	2023-02-15	2023-02-22
Design	10% Submittal	Gregory B. Behnke	2023-02-15	2023-02-08
Study	Quality Management Plan	Michael D. Humm	2023-12-15	2023-01-05

Example of project setup and compliance tracking of QA/QC process.

- **Independent Review:** Our Quality Review Team (QRT) members bring a "fresh set of eyes" to the project.
- **Strong Organization:** During project setup we will identify each deliverable and the qualified staff assigned to review the deliverable. Our project controls ensure compliance is performed as planned.
- **Thorough Documentation:** The QMP will define procedures, lines of communication and responsibility, and methods for checking and correcting work.

EARNED VALUE MANAGEMENT REALISTICALLY INTEGRATES COST, SCHEDULE, AND SCOPE

An accurate prediction of the planned spending to complete the project is needed to allow the City to plan and manage their expenditures and the different funding requirements. Our team will use an earned-value method to obtain a consistent, accurate assessment of the project's budget and schedule performance against the plan. Earned Value Management (EVM) is central to our project management approach.



Section 6

References

Section 6

References

CLIENT REFERENCE | **FIRM INVOLVED**

COOS COUNTY MAINTENANCE STATION SITE DEVELOPMENT AND HIGHWAY IMPROVEMENTS

Oregon Department of Transportation, OR
Raymond F. Cooper OPMCP, Facilities Construction Project Manager
(541) 643-0211

Firm involved: FLAGLINE ENGINEERING

BEND NORTH INTERCEPTOR SEWER PROJECT AND PUMP STATION

City of Bend, OR
Jason Suhr, PE, PMP, Principal Engineer
(541) 317-3053

Firm involved: Kennedy Jenks; FLAGLINE ENGINEERING

[Jim Pex and Kyle Bonnet participated in Phase 1 while employed with another firm. Flagline is involved in Phase 2.]

MBR WWTP UPGRADE DESIGN AND CONSTRUCTION MANAGEMENT

City of Dundee, OR
Chuck Simpson, Public Works Superintendent
(503) 538-6700

Firm involved: Kennedy Jenks

WASTEWATER SYSTEM IMPROVEMENTS

City of Estacada, OR
Elaina Turpin, Assistant City Manager
(503) 630-8265

Firm involved: Kennedy Jenks

BIOSOLIDS HANDLING FACILITIES AND ODOR CONTROL IMPROVEMENTS

City of Washougal, WA
Rob Charles, Public Works Deputy Director
(360) 695-7041

Firm involved: Kennedy Jenks

WHAT CLIENTS SAY ABOUT FLAGLINE AND KENNEDY JENKS

The following quotes, testimonials, and statistics speak to the value our firms bring to every assignment. We look forward to providing the same level of service to the City of John Day.

“

Jim Pex has been a pleasure to work with on projects for the City. Jim understands the intricacies of large projects and the efforts it takes to manage contractors, subconsultants, property owners, and resource agencies. I have appreciated Jim's ability to keep the focus on the big picture while also understanding the details to deliver projects.

– Robert Miller, City Engineer and Public Works Director, City of Eagle Point, OR

“

Part of why we selected **KJ** for this work was their ability to listen. Aside from doing a fantastic job on the technical aspects of the project, what struck me was the team's ability to listen and provide support during the challenging design and construction process—for the community, City Council, the plant's Operations Supervisor, and myself.

– Jeff Sarvis, Public Works Director (prior), City of La Center, WA

Not only has Flagline completed every design within budget, with over $85M in construction in the last 5 years we have yet to have a single dollar attributed to our design via change order from a contractor during construction. It speaks volumes to our QA/QC process overall helping our clients save on projects where the industry average is 12%.

“

...I have come to appreciate their [**KJ's**] responsiveness, technical capability, teamwork, and customer service. A project of this magnitude really depends on these elements for success. KJ met our expectations by delivering a new water reclamation facility that meets the needs of our city as well as the state and federal requirements, and exceeded our expectations by giving our city added benefits that we didn't even realize were possible when the project first began.

– James Kelly, Public Works Director, City of Arlington, WA

Appendix

Resumes

JIM PEX, PE

Principal Engineer/Contract Manager

Jim has over 24 years experience as an Engineer in Oregon and over 150 public agency projects to his name carried through design and construction. His expertise is in project management for a wide range of utility and transportation projects and alternative delivery methods for construction. Jim has been the Principal Engineer for nearly every project for the last decade under his purview and Founded Flagline in 2019. A substantial portion of his public agency projects have been in coordination with multiple grant agencies including Community Development Block Grants (CDBG) and the US Department of Rural Development (USDA). He has also worked closely with the Department of Environmental Quality (DEQ) and other regulatory agencies throughout his career with several in motion currently. He has the overall ability to manage a multi-faceted project of this caliber to bring together multiple pieces correctly for this project.

SELECT PROJECT EXPERIENCE

NORTH INTERCEPTOR SEWER (PROGRESSIVE DESIGN-BUILD), CITY OF BEND, OR

Principal Engineer & Contract Manager | July 2018-2021 | $28 M Phase I, $14M Phase II

In Phase I, Jim led the sewer pipeline evaluation and design team to determine the best route and sizing requirements for 37,000 LF of new sewer pipe to connect the North end of town. Phase I had over 10,000 LF of 54-inch pipe with depths up to 30-feet in several locations. Jim's team worked in coordination with Kennedy Jenks' personnel designing a massive influent pump station at the WWTP at the same time in order for both facilities to come online simultaneously. In addition to the pipeline design, Jim's team also found solutions to remove 19 individual pump stations within the original route. During Phase II, Flagline's team moved to support the design with Traffic Control and Permitting assistance between ODOT and the City of Bend.

COOS COUNTY MAINTENANCE STATION SITE DEVELOPMENT AND HIGHWAY IMPROVEMENTS, ODOT

Principal Engineer | June 2019-Ongoing | $40 million

Jim is the Principal for all engineering efforts for a massive design in Coos County for a new regional ODOT facility. The project includes over 2,000-feet of new roadway in hillside terrain, water/sewer/storm facilities and nearly 60 acres of site improvements for new buildings. His work with multiple agency department leads help shape and value engineer the project to where it is today and saving over $14M to date for the project. In addition to the design, Jim oversees all field inspections, reviews Change Order requests if asked from ODOT personnel, sit in on meetings with the contractor and general oversight during construction activities.

ON-CALL INSPECTION, CITY OF BEND, OR

Principal Engineer & Contract Manager | 2020-2024

Jim is the overall Contract Manager for the ongoing services provided to the City. His role has been scoping the appropriate work loads for inspectors, overseeing field work, providing advise on critical decisions when requested, and generally oversight of the entire field operation to verify its meeting the City's expectations. Jim's work is never billed to the City and is seen as a commitment of our services on a daily basis.

FIRM
Flagline

YEARS OF EXPERIENCE
24

EDUCATION
BS Civil Engineering, OIT, Northwestern University Center for Public Safety

CERTIFICATIONS
Professional Engineer - OR & WA

ASSOCIATIONS/ AFFILIATIONS

- American Public Works Association (APWA)
- American Water Works Association (AWWA) sub-section President 2017
- Oregon Association of Water Utilities (OAWU)

Nate Bell, PE

Project Manager Treatment

PROFESSIONAL SUMMARY

Nate Bell brings a wealth of practical experience to municipal engineering and project management. A diverse, hands-on background provides the foundation for his expertise in wastewater treatment, pump stations, conveyance, and asset management. Nate has served as the senior engineer at small municipality and his design projects are informed by his more than four years of field deployment on major wastewater construction projects.

TOTAL YEARS OF EXPERIENCE

17

EDUCATION

BS, Civil & Environmental Engineering, Virginia Tech, 2007

REGISTRATIONS

Professional Engineer - Civil - Oregon (83039PE)

Professional Engineer - Civil - Washington (57279)

SELECT PROJECT EXPERIENCE

Caustic Feed Facilities, Medford Water Commission, Medford, OR | *Project Manager*

He served as Project Manager for two chemical feed facilities that were intended to control the pH of the water in the agency's distribution system. The design of this $8M project involved extensive site improvements, a major expansion of the treatment plant's electrical system, structural and architectural design for two new 4000 SF buildings, and complex mechanical and controls systems.

Lime Feed Facility, Clean Water Services, Durham, OR | *Project Manager*

Project Manager for $4M worth of upgrades to the lime feed systems at the agency's Durham AWWTF. The project began with an extensive alternatives selection process during which he worked closely with the owners to vet several vendors and methods of lime slurry processing and delivery. The design involved the replacement of three lime mixing and pumping systems, structural modifications to the existing lime storage silos, HVAC replacement, and an overhaul of the building's electrical system.

River Intake Pump Station, City of Lake Oswego, Lake Oswego, OR | *Project Manager*

Project Manager for adding a 400 HP pump to the City's existing drinking water pump station. The $1.5M project involved structural modifications to the facility to meet updated code requirements, new electrical switchgear and a VFD, control system updates, and piping modifications.

WWTP Upgrade, City of Washougal, Washougal, WA | *Project Engineer/Resident Engineer*

Produced plans and specifications for a major upgrade of a wastewater treatment plant. The project doubled the plant's capacity and touched almost every process. The work included a new influent pump station, oxidation ditch, UV disinfection, effluent pump station, and over a mile of distribution piping for various process liquids. I led the mechanical design and coordinated the other disciplines (structural, electrical, I&C, civil). After design, he served as the resident engineer during construction. He was on-site daily, performing inspections and coordinating work with the contractor and plant operators. Led weekly meetings and coordinated all submittal reviews, RFIs, and change orders.

Kellogg Creek Aeration Basin Upgrade, Clackamas County Water Environmental Services, Oregon City, OR | *Project Engineer*

He was the project engineer/lead designer for upgrades to the aeration basins at the wastewater treatment plant. Considered alternatives for diffuser disk suppliers, calculated oxygen transfer rates, sized air distribution piping, and designed replacement baffles. Produced plans and specifications for public bidding and performed construction phase services, including submittal review, RFI, and change order processing.

Rock Creek Headworks Improvements Project, Clean Water Services, Hillsboro, OR | *Project Engineer*

Produced plans and specifications for a major upgrade to the headworks facility at a very large wastewater treatment plant. Involved in extensive equipment selection process and alternatives development/selection process. Involved the replacement of five mechanically raked bar screens, isolation gates, instrumentation, replacement of five washer/compactors, and replacement of a screenings conveyor with a screenings sluiceway. also involved the addition of two sludge screens. I led the mechanical design and coordinated the other disciplines (structural, electrical, I&C).

Westside Plant UV Upgrade, City of Vancouver, Vancouver, WA | *Project Engineer*

Produced plans and specifications for replacing the UV disinfection equipment at the Westside wastewater treatment plant. He led the mechanical design and coordinated the other disciplines (structural, electrical, I&C). The project involved the replacement of UV equipment, level control gates, and lifting devices.

Chambers Creek WWTP Upgrade, Pierce County Planning & Public Works, University Place, WA | *Project Engineer*

Produced plans and specifications for two major facilities as part of a $353M upgrade to a wastewater treatment plant. One facility housed multiple chemical feed systems, the plant's electrical room, the plant's control center, and the locker/break room for staff. He led the mechanical design and coordinated the other disciplines (structural, electrical HVAC, I&C, civil). Chemical feed systems included polymer, PAC, and methanol storage, pumping, and distribution piping. The other facility he led the design of was used for dewatering vactor truck and street sweeper debris. It involved a structural slab, walls, drainage, pumping, and distribution piping.

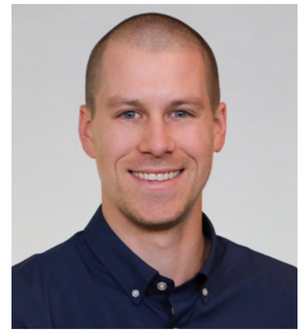
Near Shore Sewer Rehab Project, City of Lake Oswego, Lake Oswego, OR | *Project Engineer*

$5M rehabilitation and replacement effort for over three miles of submerged 8-, 10-, and 12-inch sewers along the perimeter of Oswego Lake. The project required extensive coordination with more than 200 property owners to restrict service while the sewers were CIPP- lined. Nate served as the City’s point of contact for this 6-month process that also involved the replacement of 70 private service laterals.

KYLE BONNET, PE

Sr. Project Manager Collection System & Site Civil

Kyle has 14 years of experience designing and constructing public agency infrastructure and an expert in hydraulic analysis and design for gravity systems. Kyle developed and found a solution on the North Interceptor project hydraulically that allowed the project to use 54-inch pipe vs 60-inch previously expected. It may seem small in nature, however that amount extrapolated over 12,000-LF with depths that exceeded 20-feet saved the project over $4M. He co-authored the City of John Day's PER report and found several solutions to lingering issues regarding where and how to place critical infrastructure locations for the new WWTF that were previously unresolved. In addition to his expertise in public agency specifications and construction administration makes him a perfect fit for this role.



FIRM
Flagline

YEARS OF EXPERIENCE
14

EDUCATION
BS, Civil Engineering, Oregon State University

CERTIFICATIONS
Professional Engineer - OR

ASSOCIATIONS/ AFFILIATIONS

- American Public Works Association (APWA)
- Professional Engineers of Oregon (PEO)
- ODOT ADA Design and Inspection Training

SELECT PROJECT EXPERIENCE

PRELIMINARY ENGINEERING REPORT CO-AUTHOR, CITY OF JOHN DAY, OR

Sr. Project Manager | $165k

Kyle was instrumental in the report amendment findings, data analysis and cost estimating for the report. In addition to the report itself, Kyle also found solutions and options for future planning for the City regarding gravity options that removed the pump stations going west in the City to a gravity pipe solution reaching the WWTF. Although that option wasn't the most cost effective for the current plan, knowing that option exists for future planning is something that hadn't been seen as an option at all. The significance of this finding is that a secondary route is available if something happened to the siphon crossing, which was always a concern that it is the only option.

NORTH INTERCEPTOR HYDRAULIC MODELING AND SEWER DESIGN PHASE I, CITY OF BEND, OR

Project Manager | $28 million

Kyle was the lead design engineer for the hydraulic modeling and sewer system design for the largest sewer infrastructure project in the City of Bend's History. He was not only tasked with the design of the first phase, but also modeling future phases to verify none of the future build-outs would conflict with any design parameters of Phase I. In six weeks, he was able to put together over 46,000-LF of solutions that remained as the footprint for projects in excess of $38M in pipe improvements. This work was in concert with Kennedy-Jenks and continued into multiple phases since.

CITY OF COOS BAY AND RED MOON DEVELOPMENT – SEWER HYDRAULIC ANALYSIS AND DESIGN, OR

Project Manager | $10M

On this project, Kyle is providing overall design support for the upgrades to a large development located in Coos Bay. In this design, Kyle not only had to design the development but also the downstream affects to the City's infrastructure to verify conditions for potential pipe upsizing requirements.

Kennedy Jenks

Michael Humm, PE

Design Manager

PROFESSIONAL SUMMARY

Michael is a dynamic civil engineer and project manager focusing on infrastructure improvement projects across the water environment. His experience with KJ has focused on planning and design of wastewater treatment plant facilities, designing, and construction of new and rehabilitation of existing pump stations, planning, designing, and constructing of secondary treatment modifications, hydraulic modeling, potable water improvement projects, and sanitary and stormwater master planning. Michael is a strong internal and external communicator who has successfully delivered multidisciplinary designs across the planning, design, and construction phases. Michael is adept at developing his client's vision, leveraging his strong leadership to ensure the design team maintains focus on the project-specific goals and by doing so, delivering operationally sound, successful, and long-lasting improvements.

TOTAL YEARS OF EXPERIENCE
19

EDUCATION
BS, Civil Engineering, Oregon State University, 2005

REGISTRATIONS
Professional Engineer - Civil - Oregon (76443PE)

MEMBERSHIPS / AFFILIATIONS
Pacific Northwest Clean Water Association, Member

Water Environment Federation, Member

SELECT PROJECT EXPERIENCE

WWTP Planning TM, City of John Day, John Day, OR | *Project Manager*

KJ evaluated options for upgrades to the existing John Day WWTP to improve effluent quality and provide future capacity (peak flow of 1.2 million gallons per day). KJ coordinated with DEQ to ensure plant upgrades are compliant with future permit requirements. Previous regulations on the John Day River required evaluation of technologies that addressed ammonia and nutrient removal. KJ ensured recommended capital improvements will qualify the City for USDA Rural Development Loan. Michael lead the team in evaluating a membrane bioreactor, sequencing batch reactor and oxidation ditch coupled with tertiary filtration. The location of the WWTP also needed to move due to lack of space to construct the new plant and maintain operation of the current plant. KJ assessed options for configuring the collection system to facilitate the plant relocation. Ultimately, KJ recommended a plant location that would eliminate a high-risk sewer siphon under the John Day River and two aging lift stations.

Wastewater Treatment Plant Design and Construction, City of Dundee, Dundee, OR | *Project Engineer*

Responsible for facility plan update, preliminary, and final design, of plant improvements to upgrade the existing three cell facultative lagoon system into a new 1.5 mgd (3.0 mgd expanded) MBR WWTP membrane bioreactor (MBR) plant. Acted as the Project Engineer, coordinating and directing the efforts of the multi-discipline design team from preliminary design through the development of Contract Documents. Also acted as the mechanical design lead for the new headworks and influent pump station, process basins, MBR basins, UV disinfection, and Class A recycled water facilities.

North Interceptor Sewer, Mortenson Construction, Bend, OR | *Project Engineer*

The project includes designing and constructing a 72-mgd pump station and 54-inch diameter sewer transmission pipeline to accommodate the City of Bend's growth plans and policies and incorporate redundancy into the system. Project features for the NISP include 37,000 feet of gravity sewer, trenchless construction, and multiple trenchless crossings.

Wastewater Treatment Plant Rehabilitation PDB, City of The Dalles, The Dalles, OR | *Project Engineer*

Responsible for the facility plan update and alternative evaluations used during the project concept development phase of work. This included the development of improvement concepts in concert with our design-build partner Mortenson. The Choosing By Advantage selection process was used to refine the project concepts presented in the Master Plan and further develop the new improvement project. The Choosing by Advantage selection tool allowed the team and City to identify the advantages associated with each alternative configuration. Selection factors and weightings were then applied to each alternative's advantages, including consideration of capital and lifecycle costs, to identify the most advantageous project for the City. This process resulted in identifying the improvement project which would be carried into preliminary design.

Tehaleh WWTP Design, NASH Cascadia Verde, LLC, Bonney Lake, WA | *Quality Assurance/Quality Control*

Responsible for multi-discipline quality assurance and quality control for the planning and multidisciplinary design of the Cascadia Wastewater Treatment Plant at Tehaleh. The plant was a greenfield MBR serving a new residential community east of Tacoma in Pierce County, Washington. The MBR will discharge to rapid infiltration basins and will also supply Class A reclaimed water to meet irrigation demands at the development. The MBR system is sized to allow capacity to be increased in stages from the initial 1.0 million gallons per day (mgd) of average capacity to a peak capacity of 8 mgd by adding membrane units and equipment, deferring major facility expansion until occupancy in the development increases.

CWS- Primary Clarifier 4 Final Des., Clean Water Services, Hillsboro, OR | *PROJECT MANAGER*

Responsible for delivering the fourth primary clarifier at the Rock Creek AWWTF. The project began as a technology review of available primary treatment options, finding a 140’ diameter primary clarifier as the best available option to provide an additional 50 MGD capacity to meet the peak wet weather flow needs. The project design includes the primary clarifier, primary sludge and scum pumping gallery and connected utility tunnel, new alum coagulation pumping, a septage receiving station, and significant site civil improvements to the entry road and parking areas.

Wastewater Treatment Plant Phase 1, Improvement Facility Plan, Pre-Design, and Design, City of Pendleton, Public Works Department, Pendleton, OR | *Project Engineer*

Project responsibilities include civil and mechanical design, coordination of project disciplines, ongoing coordination and interaction with City and Plant staff, and working to the schedule and budget. Upgrades include a new headworks, new in-plant pump station, new secondary process basin, modifications to the recycle pump station and chlorine contact chamber, a new outfall, a new dewatering facility, new digester mixing system, FOG and food waste receiving stations, installation of co-generation engines, and associated upgrades across the plant to aged equipment. Both the In-Plant pump station and Recycle pump station utilize triplex 45 HP submersible pumps with a firm capacity over 6.5 MGD.

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VICTORIA CHUN, PE

Grading, ADA Site Infrastructure Design

Victoria is a multi-talented engineer with an expertise in site development, grading and public utility design. Additionally, she has certifications for a Certified Erosion and Sediment Control Lead (CESCL) and as an ODOT Inspector. Her ability to not only design but maintain new 1200-C compliance for our clients is a tremendous asset. After completion of design and when construction is in full swing, her understanding of inspection requirements will help set the tone for the contractor and verify the project follows all regulatory and grant requirements until completion.

FIRM
Flagline

YEARS OF EXPERIENCE
7

EDUCATION
BS, Environmental Engineering, UC San Diego

CERTIFICATIONS
Professional Engineer - OR

ASSOCIATIONS/ AFFILIATIONS

- American Public Works Association (APWA)
- Certified Erosion and Sediment Control Lead (CESCL)
- ODOT ADA Design and Inspection Training
- Certified ODOT Inspector

SELECT PROJECT EXPERIENCE

SITE DESIGN AND IMPROVEMENTS, US FOREST SERVICE SITE DESIGN, HINES, OR

Sr. Project Engineer I $1.5M

Victoria was the lead designer for the site development and utility improvements on the US Forest Service project in Hines, Or for their new facility. She was able to find solutions between existing infrastructure and pavement grading options and mold them into the new facility to meet all grading and ADA requirements. The project was built in 2022 without a single change order within the design.

COOS COUNTY MAINTENANCE STATION SITE DEVELOPMENT AND HIGHWAY IMPROVEMENTS, ODOT

Sr. Project Engineer I $73 million

Victoria is responsible for two key roles within the massive site design for the new regional facility for ODOT. First and foremost is her ability to design, grade and incorporate all site design attributes on the 12 acre facility. Second is her responsibility for overseeing the compliance with ODOT's 1200-c permits from DEQ. Both of these unique design and oversight attributes fit perfectly with her background and expertise. The 100% design is complete and moving into the construction phases in the summer of 2024. ODOT and the contractor have complimented her design capabilities and ability to quickly provide answers to help the project swiftly move forward.

SITE REVIEW AND REPORT FOR NEW FACILITIES, ODOT

Sr. Project Engineer I Project size varies

In 2022, the ODOT facilities group asked Flagline to review potential project locations for new regional maintenance facilities. This included preliminary designs for the site grading, utility extensions and cost estimates for the projects. Victoria was critical in this process as her knowledge of site development, relation to grading for public facilities and ADA compliance was a crucial piece to the review. The first site was located in Newport, Oregon and within 6 weeks, Victoria was able to find solutions for 8 different scenarios for the multi-million dollar facility and compare them against each other. The projects varied in cost from $43M to $62M and Victoria's ability to quickly compare, evaluate and determine the best value was critical in the state's decisions overall.

Kennedy Jenks

David Seymour, PE, PMP

Technical Advisor & QA/QC

PROFESSIONAL SUMMARY

David's professional career has focused on wastewater treatment plant design and he has worked at over 40 different wastewater treatment facilities in Washington, Oregon, California, and Hawaii. These facilities range in size from 0.5 MGD to 300 MGD, and he has served in a variety of roles on these projects including project manager, project engineer, process lead, and technical advisor. He has served as a design lead on multi-disciplinary designs, working in teams of over 30 multi-discipline engineering staff and 13 subconsultants. David's relevant experience includes design retrofits at treatment plants that must remain operational throughout construction.

TOTAL YEARS OF EXPERIENCE
21

EDUCATION
BSCE, University of Washington, 2003

REGISTRATIONS
Professional Civil Engineer

Hawaii (PE-16905)

Washington (44270)

Texas (146740)

CERTIFICATIONS
Project Management Professional, Project Management Institute

MEMBERSHIPS / AFFILIATIONS
Water Environment Federation (WEF) Pacific Northwest Clean Water Association, Member

SELECT PROJECT EXPERIENCE

Biosolids Handling Facilities & Odor Control Improvements, City of Washougal, Washougal, WA | *Technical Advisor*

Served as a technical advisor for the City of Washougal's wastewater treatment facilities upgrades as part of a project with an estimated cost of $29M. David is leading quality control reviews to ensure all deliverables have been reviewed by discipline experts not directly connected to the project and multidiscliplinary reviews to assure KJ’s high-quality standards are maintained. The project includes the construction of a new aerobic digester, solids handling building, and anoxic selector to improve sludge treatment and compliance with regulations. KJ is overseeing the design, permits, and funding options, aiming to minimize costs and enhance efficiency.

WWTP Retrofit, City of Arlington, Arlington, WA | *Process Engineer*

KJ provided planning, design, and construction support services to the City of Arlington to convert their sequencing batch reactor facility to a membrane bioreactor plant. David served as a process engineer on this project and was responsible for the development of a process design to achieve low levels of effluent nitrogen and phosphorus. He evaluated a combination of biological and chemical treatment schemes to project relative performance and future plant loadings. The MBR retrofit added, rotary drum fine screens, aeration basins and membrane tanks, aeration and membrane blowers, Kubota membranes and permeate pumps, closed-vessel UV, and other solids-handling and odor control facilities.

Wastewater Treatment Plant Design and Construction, City of Dundee, Dundee, OR | *Process Engineer*

David performed process modeling of a new MBR system for municipal wastewater treatment. The facility's design was unique in that the process design needed to consider high seasonal loadings from local wineries and differing wastewater characteristics during grape pressing/de-stemming activities, and again during bottle washing and bottling of wine. The new facilities included headworks and an influent pump station, new aeration basins and membrane bioreactor system, new UV disinfection and conversion of an existing lagoon to a facultative sludge pond.

Brightwater Reclaimed Water, King County, Department of Natural Resources, Woodville, WA | *Project Manager*

King County Wastewater Treatment Division operates a 44 mgd membrane bioreactor (MBR) facility called Brightwater in Woodinville, Washington. Brightwater went into operation in 2011. Since Brightwater came online, WTD has had 300-800 outages per year in its reclaimed water system due to ammonia breakthrough in the secondary process and an inability to effectively manage chlorine residual in its RW distribution system. King County contracted with KJ and its teaming partners to recommend alternatives that provide a more reliable reclaimed water supply and to design those improvements. Improvements include installation of a new 11.6 mgd UV disinfection facility with closed-vessel UV units, a chloramination building, and a 750,000 gallon reclaimed water storage tank. In addition, the team will be performing exploratory testing to measure virus reduction through Brightwater's MBR process and may perform longer-term Tier 2 testing to demonstrate that UV disinfection is not needed to achieve the 4-log virus removal standard required by Washington state for production of RW.

Wastewater Treatment Plant Upgrade and Expansion, City of La Center, La Center, WA | *Process Engineer*

The City of La Center needed to significantly expand its wastewater treatment capacity to meet the needs of its growing community, improve effluent quality, and address effluent temperature issues – all on a highly visible 0.75acre site. To assist the City, KJ provided facility planning, design, and construction services to convert the treatment process from a sequencing batch reactor to a membrane bioreactor. Our design featured an innovative approach to reusing existing infrastructure, resulting in nearly $1M in cost savings and the award of $373,000 in energy efficiency incentives from Clark Public Utilities. David was responsible for biological process design and simulation of the proposed membrane bioreactor design.

Water Reclamation Facility, City of Coburg, Coburg, OR | *Process Engineer*

David was responsible for biological process modeling as part of the design of a 0.44 MGD membrane treatment system for the Coburg WWTP. The modeling included simulation of several influent loading and operational scenarios to validate the preliminary biological process design and set the framework for pre-selection of a membrane manufacturer. Modeling also included a sensitivity analysis to determine the impact of variable influent wastewater loads that may be associated with septic tank effluent.

Ventura Water Reclamation Facility Membrane Bioreactor and Ultraviolet Disinfection Project, City of San Buenaventura, Ventura, CA | *Project Engineer*

David is serving as the project engineer for a project to replace the existing aeration tanks and secondary clarifiers with a MBR process in order to improve treated water quality, increase treatment capacity to 11 mgd average dry weather flow, and replace aging infrastructure. Improvements include new fine screens, aeration basins, membranes, chemical facilities, odor control, and other support buildings.

Kennedy Jenks

Mark Cullington, PMP

Permitting

PROFESSIONAL SUMMARY

Mark is a Vice President and Director of Operations for Kennedy/Jenks Consultants in Portland, Oregon with 24 years of experience in engineering consulting and as a state water quality manager. Mark primarily works on wastewater planning, design, and construction oversight projects with a focus on biosolids, recycled water and NPDES permitting.

TOTAL YEARS OF EXPERIENCE
24

EDUCATION

BA, Humanities, Ithaca College, 1990

BS, Soil Science, University of Washington, 1998

MS, Soil Science, University of Washington, 2000

CERTIFICATIONS

Project Management Professional

MEMBERSHIPS / AFFILIATIONS

Oregon Association of Clean Water Agencies, Member

Biosolids & Recycled Water Committee, Board Member and Co-chair of

Northwest Biosolids; Biosolids & Recycled Water Committee

SELECT PROJECT EXPERIENCE

WWTP Planning TM, City of John Day, John Day, OR | *Permitting Lead*

KJ evaluated options for upgrades to the existing John Day WWTP to improve effluent quality and provide future capacity (peak flow of 1.2 million gallons per day). KJ coordinated with DEQ to ensure plant upgrades are compliant with future permit requirements. Previous regulations on the John Day River required evaluation of technologies that addressed ammonia and nutrient removal. KJ ensured recommended capital improvements will qualify the City for USDA Rural Development Loan. Our team evaluated a membrane bioreactor, sequencing batch reactor and oxidation ditch technologies coupled with tertiary filtration. The location of the WWTP also needed to move due to lack of space to construct the new plant and maintain operation of the current plant. KJ assessed options for configuring the collection system to facilitate the plant relocation. Ultimately, KJ recommended a plant location that would eliminate a high-risk sewer siphon under the John Day River and two aging lift stations.

Wastewater Treatment Plant Upgrade and Expansion, City of La Center, La Center, WA | *Permitting Lead*

The City of La Center needed to significantly expand its wastewater treatment capacity to meet the needs of its growing community, improve effluent quality, and address effluent temperature issues – all on a highly visible 0.75acre site. To assist the City, KJ provided facility planning, NPDES permitting, design, and construction services to convert the treatment process from a sequencing batch reactor to a membrane bioreactor. Our design featured an innovative approach to reusing existing infrastructure, resulting in nearly $1M in cost savings and award of $373,000 in energy efficiency incentives. Additionally, Mark lead the process of permit negotiations to allow for continues discharge for the new treatment facility.

Wastewater Treatment Plant Design and Construction, City of Dundee, Dundee, OR | *Permitting Lead*

Responsible for all DEQ regulatory permitting, federal/state environmental permitting, Oregon Department of Environmental Quality Biosolids Management Plan and Recycled Water Plan development for a new Class A recycled water Membrane Bioreactor tertiary wastewater treatment plant design. Mark lead the negotiations with Oregon DEQ to obtain year-round effluent discharge into the Willamette River.

National Association of Clean Water Agencies, Member

Pacific Northwest Clean Water Association, Member

WWTP Retrofit, City of Arlington, Arlington, WA | *Permitting and Biosolids Assistance*

KJ provided planning, design, and construction support services to the City of Arlington to convert their sequencing batch reactor facility to a membrane bioreactor plant. David served as a process engineer on this project and was responsible for the development of a process design to achieve low levels of effluent nitrogen and phosphorus. He evaluated a combination of biological and chemical treatment schemes to project relative performance and future plant loadings. The MBR retrofit added, rotary drum fine screens, aeration basins and membrane tanks, aeration and membrane blowers, Kubota membranes and permeate pumps, closed-vessel UV, and other solids-handling and odor control facilities.

WWTP Mixing Zone Study, City of Lincoln City, Lincoln City, OR | *Project Manager*

As part of the City's NPDES permit renewal, a WWTP mixing zone study was successfully completed in accordance with Oregon DEQ's regulatory requirements. The study involved: Environmental Mapping to identify sensitive receptors; measurements of the outfall and river geometry; estimated ambient river conditions; calculations of effluent flow and temperature under peak or design conditions; and modeling of the discharge plume to estimate mixing factors. This project included extensive commenting on the draft NPDES permit, lead permit negotiations with Oregon DEQ, and negotiations of favorable permit compliance schedules.

Bend North Interceptor Sewer, Mortenson Construction, Bend, OR | *Project Advisor*

The project included designing and constructing a 72-mgd pump station and 54-inch diameter sewer transmission pipeline to accommodate the City of Bend's growth plans and policies and incorporate redundancy into the system. Project features for the NISP includes 37,000 feet of gravity sewer, trenchless construction, and multiple trenchless crossings.

NPDES Permit Assistance, City of Hermiston, Hermiston, OR | *Project Team Member*

Assisted City staff with their negotiations with DEQ in the development of a new NPDES and Temperature Management Plan (TMP). The TMP negotiations revolved around the interpretation of DEQ's new water quality standards and the implementation of these standards when endangered species are present in the receiving stream.

Biosolids Permitting Services, Madison Farms, Echo, OR | *Project Manager*

Currently responsible for providing agronomic and DEQ permitting assistance for Class B biosolids land application activities for 5000 new acres of dryland wheat sites in Central Oregon. This included state and federal requirements associated with soil, groundwater, crop, surface water considerations for the City's 13,700 wet ton biosolids recycling program.

Wailua Wastewater Treatment Plant Alternative Effluent Disposal System Design, County of Kauai, Wailua, HI | *Technical Leader*

Technical Leader for the design of the recycled water force main turnout and soil aquifer treatment basin to serve as an alternative disposal method for the Wailua WWTP. The project included the development of alternative effluent disposal options for to address NPDES permit new stringent nutrient discharge requirements. The study was completed in the required permit timeline in identifying a recommended option for the County of Kaua`i to implement.

Appendix

Attachment C - Certificate of Non-Discrimination

Attachment C

Certificate of Non-Discrimination

Pursuant to ORS 279A.110, discrimination in subcontracting is prohibited. Any contractor who contracts with a public contracting agency shall not discriminate against a subcontractor in awarding a subcontract because the subcontractor is a disadvantaged business enterprise, a minority-owned business, a woman-owned business, a veteran-owned business, or an emerging small business that is certified under ORS 200.055.

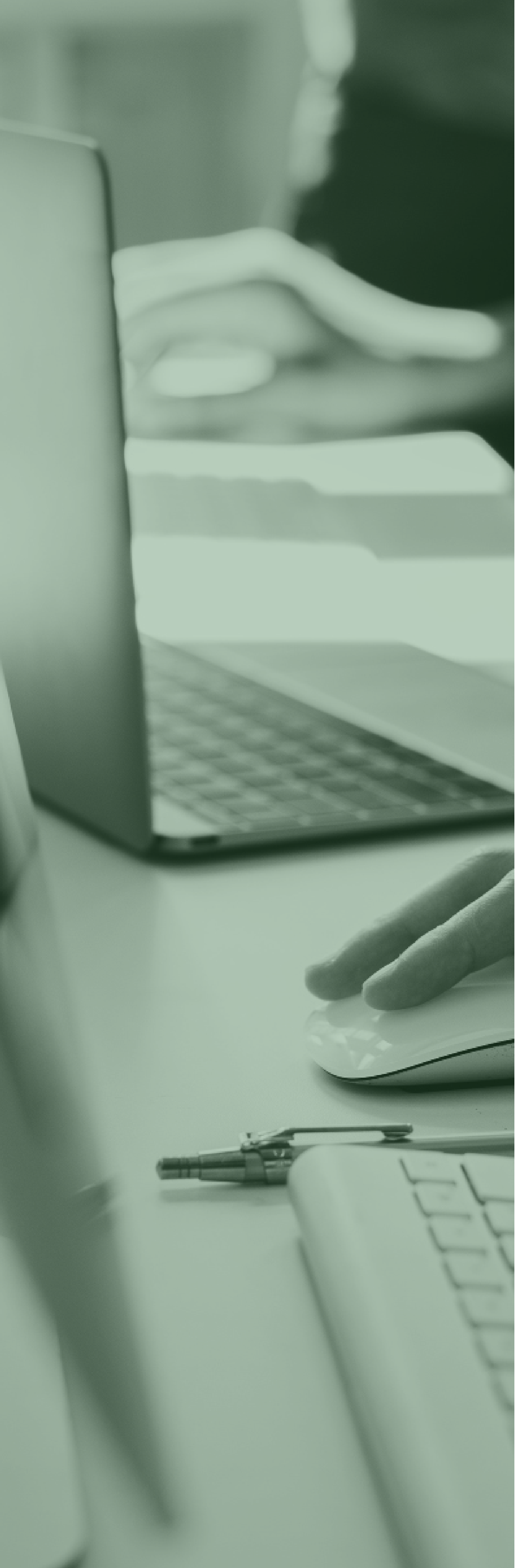
By signature of the authorized representative of the proposer, the proposer hereby certifies to City of John Day that this proposer has not discriminated, and will not discriminate, against a disadvantaged business enterprise, a minority-owned business, a woman-owned business, a veteran-owned business, or an emerging small business in awarding a subcontract, and, further, that if awarded the contract for which this bid or proposal is submitted, will not so discriminate.

Date: 5/30/24

Signature: [signature]

Printed or Typed Name: James D. Pex

Name of Firm: Fluglize Engineering



FLAGLINE ENGINEERING

2300 NE 4th Street #5248
Bend OR 97701

Flagline.net

541 797 6781

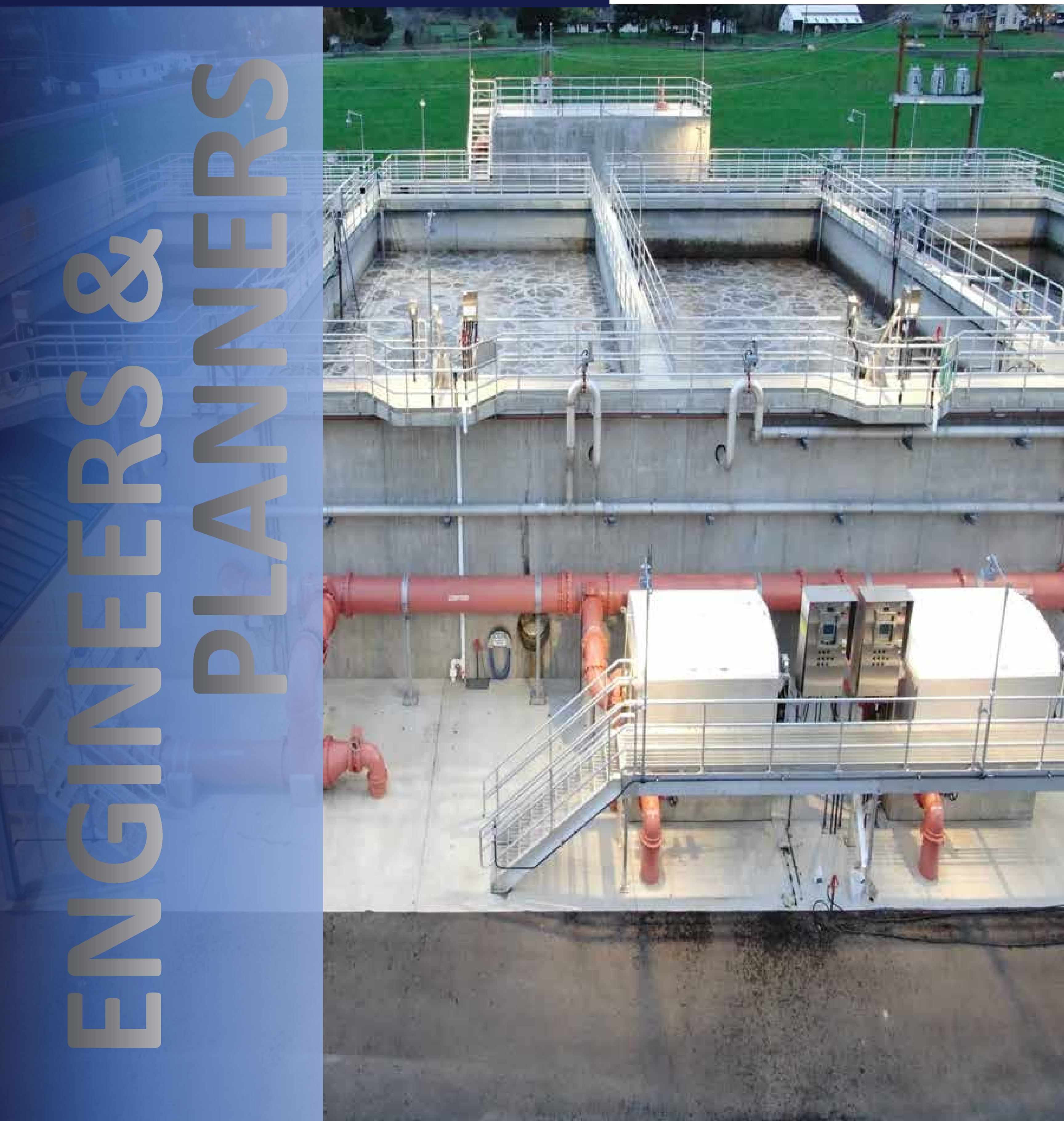
info@flagline.net

OREGON COBID CERTIFIED FIRM

CITY OF JOHN DAY
WASTEWATER SYSTEM IMPROVEMENTS FINAL DESIGN & CONSTRUCTION ENGINEERING

MAY 31, 2024

The Dyer Partnership Engineers & Planners, Inc.



MISSION STATEMENT

TO PROVIDE SUSTAINABLE COST-EFFECTIVE INFRASTRUCTURE TO THE COMMUNITIES WE SERVE

RELATIONSHIPS MATTER TO THE DYER PARTNERSHIP

PROVIDE TRANSPARENCY

RESPONSIVE & SUPPORTIVE

AWARE OF IMPACTS TO RATE PAYERS

SUPPORT COMMUNITY

CONTENTS

1 INTRODUCTORY LETTER

INTRODUCTORY LETTER

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS, INC.

May 31, 2024

Melissa Bethel, City Manager
City of John Day
450 East Main Street
John Day, Oregon 97845

RE: City of John Day
Proposal for Wastewater System Improvements – Final Design & Construction Engineering
Proposal No. P24-007

Dear Ms. Bethel:

The Dyer Partnership Engineers & Planners, Inc. is pleased to present our proposal to provide final design and construction engineering for the Wastewater System Improvements for the City of John Day. The proposal that follows includes all terms and conditions as stated in the City's Request for Proposals.

The Dyer Partnership has both the capabilities and experience necessary to successfully complete the proposed engineering services. Our office headquarters are located at 1330 Teakwood Avenue, Coos Bay, Oregon 97420, (541) 269-0732. Two of the Principals of the firm, Aaron Speakman, PE, President, and Rachel Arbuckle, Office Manager are based out of this office. Ryan Quigley, PE, Senior Vice President is based out the Lebanon office. Tyler Molatore, PE, Vice President is based out of the Sutherlin office. All four principals are authorized to execute contracts.

Dyer believes our firm has designed more Sequencing Batch Reactors (SBR) Wastewater Treatment Plants (WWTPs) than anyone in the State of Oregon. We understand SBR wastewater treatment and have innovated the design over the years to provide our clients with state of the art, functional, and cost effective SBR treatment plants. Our firm has a combination of strengths that set us apart from other firms, including the following:

1. **Depth.** We propose a full and experienced team of qualified individuals and experts who complement and supplement each other's expertise and background. The staff we are proposing are the individuals who will perform the work for the various assigned project tasks. This is a team that has worked together on numerous projects through the years. Our team includes engineers and operators to ensure the City is presented with all the information to make informed decisions on the design and operation of their new WWTP.

2. **Familiarity with Small to Medium Size Systems.** One of our principal business focuses has been to provide municipal engineering services for small to medium size cities throughout Oregon. These municipalities range in size from the City of Canyonville with approximately 1,730 people to the City of Coos Bay with over 16,000 people. Based on Dyer's depth, wealth of experience, and knowledge of the public sector, we are able to provide individual attention, flexibility, and specialized services to our clients on every project. Dyer understands for clients with limited staffing and resources costs will impact the rate payers of these communities. We

will assist with navigating the client through the hurdles and challenges that come with these large projects.

3. **Experience with Similar Projects.** The Dyer Partnership has assisted communities with their wastewater needs for over four decades. We have earned the nickname of "SBR Engineers" because we have designed and constructed over eight (8) SBR treatment plants in Oregon. Numerous headworks and sludge dewatering screw presses have been installed as part of projects we have designed. SBR design include both two and four-basins with tertiary filtration, UV disinfection, and Class A effluent reuse facilities. We thoroughly understand the nature of the work that must be completed in order to support the City. Over the years we have developed trusting relationships with the regulatory agencies, funding agencies including OBDD CDBG, and local and state officials.

4. **Creativity & Technical Innovations.** The Dyer Partnership believes in applying established engineering principles in a creative manner while maintaining system dependability and operability. As an example, our firm was the first to apply municipal flow-through Sequencing Batch Reactor (SBR) treatment technology in Oregon, flat plate Membrane Bioreactor (MBR) treatment technology in the United States, and pre-filters to a drinking water plant in the United States. We have designed and installed what we believe to be the first contactless UV disinfection systems in Oregon for municipal SBR plants.

5. **Location.** The Dyer Partnership has offices in Coos Bay, Lebanon, and Sutherlin, Oregon. We will provide engineering services for the City of John Day out of all three offices with the Project Manager located in our Sutherlin office; as well as offer the assistance of Dale Richwine, PE, who is an environmental engineer and Level IV licensed WWTP operator; who is available to assist in offering support out of Redmond, Oregon.

6. **Service.** The Dyer Partnership and its parent organization, Gary L. Dyer Consulting Engineers, have been providing consulting engineering services to municipal clients in Oregon since 1982. One of the reasons that the firm continues to be successful in a very competitive market is service. We strive to provide superior consulting engineering services in a timely and comprehensive manner that is within the agreed upon or quoted budget. We only request additional monies to complete a task or project if there is a substantial change in project scope. We invite you to contact our references to verify our service and capabilities.

The following proposal presents the requested information in the same order as presented in the Request for Proposals. We can meet the required insurance limits, and the insurance certificates will be provided during the contract phase.

We look forward to discussing our qualifications, plan for providing services, and proposed scope of services with you further. Should you have any questions with regard to this Proposal, please give me a call, (541) 269-0732.

Sincerely,

Aaron Speakman, PE
President

2 PROFESSIONAL QUALIFICATIONS OF PROJECT TEAM

PROFESSIONAL QUALIFICATIONS OF PROJECT TEAM

SECTION 2 - PROFESSIONAL QUALIFICATIONS OF PROJECT TEAM

OFFICES

- COOS BAY
- LEBANON
- SUTHERLIN

STAFF

- 32 TOTAL
- 11 OREGON REGISTERED ENGINEERS
- 1 REGISTERED LAND SURVEYOR
- 2 CERTIFIED WATER RIGHTS EXAMINERS
- 5 ENGINEERS-IN-TRAINING
- 16 TECHNICAL & CLERICAL

COMPANY PROFILE

Our firm was established in 1982 as Gary L. Dyer Consulting Engineers. The company incorporated as The Dyer Partnership Engineers & Planners, Inc. in January 1994. The Company is registered with the State of Oregon and the Federal Government. Our business license numbers are 08032390-0 and 93-1130649, respectively.

Over the last forty-two years, our consulting firm has focused on planning, design and construction management of publicly owned water and wastewater infrastructure projects for small rural communities in Oregon. The Dyer Partnership specializes in working with small to medium-sized clients and with associated public works projects. Currently we represent seventeen municipalities as City Engineer or Engineer of Record.

The company has continued to grow since inception, and remains robust in a competitive market. The company has never failed to meet its financial obligations.

QUALIFICATION STATEMENT

The Dyer Partnership Engineers & Planners, Inc. has made a commitment to the public sector since the inception of our company. Our services have always focused on providing the best technical and support services possible. Our staff is comprised of highly motivated, experienced, and qualified licensed professionals with significant experience designing Wastewater Treatment Plants (WWTP).

PROJECT TEAM

Dyer is excited to present our proposed team for the City of John Day's Sequencing Batch Reactor (SBR) WWTP project. We have hand selected the most experienced SBR Team that includes Professional Civil, Mechanical, Geotechnical, and Electrical Engineers. A Level IV licensed WWTP Operator and full support staff are part of the SBR Team to ensure the City receives the most experienced SBR focused WWTP team.

The key team members proposed for this project, a description of their roles and responsibilities, qualifications, and experience is summarized below. Resumes for the proposed team are included within the Appendix.

AARON SPEAKMAN, PE – PRINCIPAL MANAGER, PRESIDENT

Aaron Speakman, PE is a registered Civil Engineer with over twenty-two years of experience and serves as the President of The Dyer Partnership. Aaron is authorized to sign and execute contracts for Dyer. He is known for his work on all phases of WWTPs with a special focus on SBR with UV disinfection, effluent disposal, and sludge dewatering. He designed and provided construction management on his first SBR WWTP for the City of Yachats in 2006. Since then, he has completed over five (5) other SBR WWTPs utilizing UV disinfection and sludge dewatering in Oregon. He is currently overseeing the designs of two other SBRs for the Cities of Molalla and Siletz. He prioritizes maintaining relations with clients. He has also prepared numerous wastewater and environmental studies and has been Project Manager on numerous other municipal projects including planning documents, pump stations, mixing zone studies, treatment plant upgrades, disinfection systems, digesters, storm drain improvements, and bridge replacements. *Responsibilities:* Aaron will be one of two points of contact for the City and will provide oversight and coordination for the project. He will coordinate with both the engineers and subconsultants.

TYLER J. MOLATORE, PE – PROJECT MANAGER, VICE PRESIDENT

Tyler Molatore, PE is a registered Mechanical Engineer with over twenty-two years of experience in the water and wastewater industry. Tyler has considerable experience as a Project Manager and has designed both Membrane Bioreactor (MBR) and SBR WWTPs while with Dyer. He has significant knowledge of the design of headworks, pump stations, biological processes, tertiary systems, disinfection systems, recycled water systems, and biosolids management systems. Tyler also has experience with NPDES permitting, wastewater process modeling, and value engineering and analysis. Tyler collaborates closely with clients, funding agencies, and DEQ to ensure project objectives are achieved. *Responsibilities:* Tyler will be the primary contact for the City. Tyler will be in charge of ensuring that schedules and project budgets are met. He will be responsible for coordination with regulatory and funding agencies as well as leading basis of design and 30 percent design reports, addressing permitting requirements, and serving as the Engineer of Record for the final design, bidding, and construction management.

JESTEN BRENNER, PE – PROJECT ENGINEER

Jesten Brenner, PE is a registered Civil Engineer with over fourteen years of experience in civil engineering. He has worked on a variety of projects that include pump station design, construction management, water and wastewater master plans, and water and wastewater treatment plants. *Responsibilities:* Jesten will assist in the Preliminary Engineering Report (PER) amendment, WWTP design, site grading, specification development, and Operations and Maintenance (O&M) manual development.

TRISH RICE, PE – PROJECT ENGINEER

Trish Rice, PE, CWRE is a registered Civil Engineer who recently joined the Dyer staff after working for the City of Sweet Home for over thirteen years. She coordinated design reviews, funding applications, and state and local permitting. Trish has also completed several federal and state funding applications in coordination with the funding agencies. *Responsibilities:* Trish will assist with funding agency coordination and compliance, state and local permitting, PER amendments, and offer design and construction support services.

BLAIR HOPWOOD, PE – PROJECT ENGINEER

Blair Hopwood, PE is a registered Civil Engineer with over seven years of experience. She has assisted with the development of several master plans, construction management, and the design and construction management of municipal infrastructure improvement projects. *Responsibilities:* Blair will assist with PER amendments, cost estimates, design support services, and construction management.

DAVE SCHMIDT – DESIGNER / OBSERVER

Dave Schmidt has approximately nineteen years of experience in observation and design in the municipal construction field. Dave is highly experienced in SBR construction and was the Onsite Resident Project Representative for the Cities of Yachats, Gold Beach, Drain, and Sutherlin SBR WWTPs. *Responsibilities*: Dave will be responsible for design support and construction observation services.

SUBCONSULTANTS

VLMK CONSULTING ENGINEERS: STRUCTURAL AND ARCHITECTURAL SERVICES

VLMK has provided structural engineering to The Dyer Partnership for over twenty years, including six (6) SBR WWTP designs. They have a proven track record of providing sensible designs at a reasonable cost. VLMK's experience with Dyer and SBR WWTP design has been instrumental to the success of our previous WWTP designs. VLMK will provide structural engineering and architectural support during the design and construction phase of the project.

R&W ENGINEERING, INC.: ELECTRICAL ENGINEERING SERVICES

R&W has been providing electrical engineering services since 1978. They have an excellent track record on wastewater pump stations and wastewater treatment facilities. R&W was the electrical engineer for several of Dyer's projects including three (3) SBR WWTPs. R&W is also experienced in automation, Supervisory Control and Data Acquisition (SCADA) systems, and sustainable design. R&W will provide electrical engineering services during the design and construction phase of the project.

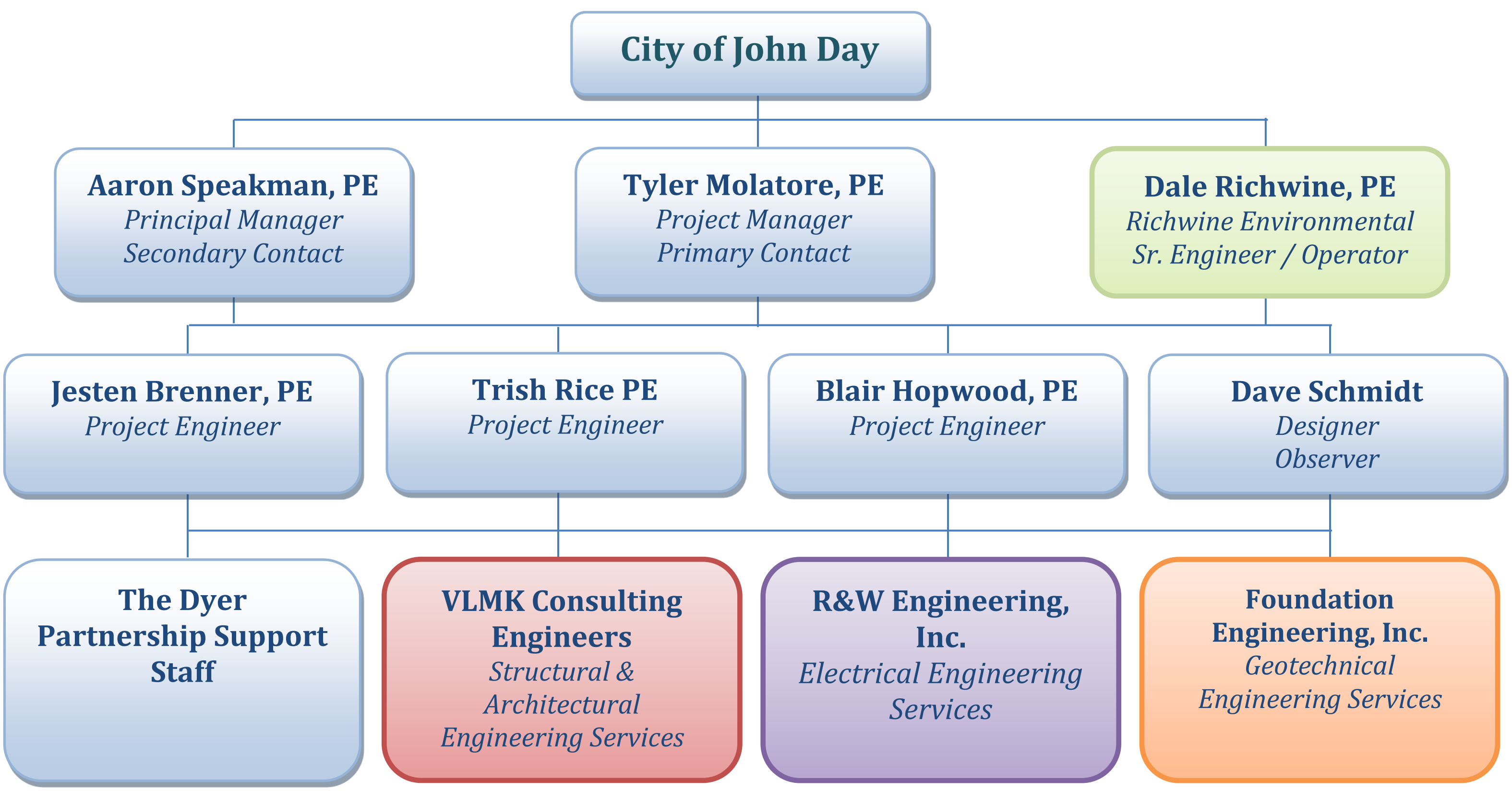
FOUNDATION ENGINEERING: GEOTECHNICAL ENGINEERING SERVICES

Foundation Engineering, Inc. has over thirty-five years of experience as Geotechnical Engineers, including extensive experience with municipal projects. Foundation Engineering has provided geotechnical engineering services to Dyer on six (6) SBR WWTP projects and several other municipal projects. Dyer will depend on Foundation Engineering, Inc. to provide geotechnical services during the design services.

RICHWINE ENVIRONMENTAL, INC.: ENVIRONMENTAL ENGINEERING, STARTUP, & OPERATIONS

Dale Richwine is an environmental engineer with over fifty years of experience in the wastewater industry. He is well known and respected in the northwest as an expert in both engineering and plant operations. He understands all aspects of wastewater treatment and biosolids management. Dale has a broad background in the operation and management of treatment plants including SBRs, biosolids, and recycled wastewater utilization programs. Dale brings this management experience to his projects by applying an appropriate decision process utilizing members of the public, key decision makers, and operations and maintenance staff. Dale will offer support to the SBR Team, provide recommendations on the equipment selection process, attend 30, 60 and 90 percent review meetings, provide support services to the City operators, attend regulatory review meetings, provide Quality Assurance / Quality Control (QA/QC) checks of documents, and startup and performance testing of the plant. Dyer has worked with Dale on a number of projects including as a team member of a Value Analysis (VA) Design review provided for the City of Coos Bay's WWTP No. 1 expansion project.

PROJECT TEAM - ORGANIZATIONAL CHART



EXPERIENCE

3 EXPERIENCE

SECTION 3 – EXPERIENCE

The Dyer Partnership has been providing engineering services for over forty-two years. Not only are we highly experienced and qualified, we are well suited to provide engineering services to the City of John Day. Dyer is currently contracted with over twenty-five municipal clients including seventeen as the City Engineer or Engineer of Record. Our longest tenured client is the City of Bandon, who we have worked with for over 29 years.

Roughly sixty percent of our business revolves around wastewater engineering, with nearly half of our staff being dedicated to wastewater treatment. In all the various wastewater sectors listed below, our firm is experienced in planning, design, bidding, construction management, and startup services.

GENERAL WASTEWATER TREATMENT PLANT EXPERIENCE

Dyer has designed, bid, and provided construction management for over seventeen Wastewater Treatment Plants (WWTPs). Over half of those plants were completed under the oversight and assistance of the current President, Aaron Speakman, PE. Three of the plants were designed and constructed in the past five years.

PUMP STATION AND GRAVITY WASTEWATER COLLECTION SYSTEMS EXPERIENCE

Design, bidding, and construction management has been provided for over thirty wastewater pump stations, and miles of sewer force main and gravity collection systems. Pump stations have ranged from 250 gallons per minute (gpm) to 12,000 gpm. Dyer is very experienced in providing pump station designs that have multiple discharge locations, multiple pumps, multiple force mains, and multiple design duty points which is applicable to the John Day influent and effluent pump configurations to be considered in this plant upgrade.

HEADWORKS AND GRIT REMOVAL EXPERIENCE

Dyer has designed and constructed over twenty headworks facilities including: course and fine screening, grit removal, sampling, and flow splitting components. When possible, headworks are elevated in order to allow operators to utilize dumpsters and/or trash receptables to catch the dewatered disposable waste with ease from under the structures. Maintenance and access are closely evaluated to ensure operators have the room and equipment to maintain the equipment designed.

WPCF AND NPDES PERMIT REGULATIONS AND COMPLIANCE EXPERIENCE

Dyer is accustomed to assisting our clients during the permit renewal or modification processes and works closely with the Oregon Department of Environmental Quality (DEQ) to reduce some of the new restrictions which do not apply to communities. The Cities of Bandon, Gold Beach, Yachats, Drain, Coquille, Sutherlin, Lakeside, Molalla, and Siletz have utilized Dyer’s experience with permits when addressing their WWTP upgrades.

SEQUENCING BATCH REACTOR EXPERIENCE

More than once, Dyer has been referred to as ***“The SBR Engineers”***, particularly by some regulators at the DEQ. To the best of our knowledge, Dyer has the most Sequencing Batch Reactors (SBR) WWTP designs with nine (9) designs in the state. The completed SBR WWTPs include Spirit Mountain Casino and the Cities of Rogue River, Siletz, Yachats, Gold Beach, Coquille, Sutherlin, and Drain, Oregon. Two 4-basin SBRs have been designed for the Cities of Sutherlin and Molalla. The City of Molalla’s project will bid in summer of 2024. The flow rates of these SBRs range from 0.175 Million Gallons per Day (MGD) to peak flow rates of 9.0 MGD. Dyer offers significant experience and time-tested proven design elements which make our SBR designs better than the average packaged SBR. Our engineers and staff know how to tailor and customize SBR packages with design elements to surpass a cookie-cutter design.

Some additional items provided to clients in our designs include:

- **Operator Input -** Operator's expertise and client objectives will be utilized with collaboration from Dale Richwine, PE.
- **Simplified Headworks -** Designs are provided which self-clean and limit grit accumulation.
- **Assistance for Grit Removal -** Sloped SBR floors with wash down troughs are used.
- **Operator Access -** Walkways around all perimeter SBR walls for maintenance and operation access. Manway access points in the bottom sector of the SBR walls.
- **Efficient -** Simplified process piping resulting in efficient and lower cost design.
- **EQ -** Flow Equalization (EQ) incorporated into SBR tanks allows for the elimination of the need for EQ basins, where applicable.
- **Equipment Options -** Multi-level SBR decant levels allow operators to turn the WWTP into a clarifier in high flows.
- **Algal Issues -** Covered effluent EQ basin design will be utilized.
- **Client Communication -** Flow through SBR versus batch SBR analysis information is provided.
- **Common Wall Construction -** Incorporation of the headworks into a SBR wall design provides common wall construction. Incorporating common wall buildings with the SBR for electrical, dewatering, and equipment rooms reduces building numbers, footprint, and costs of the project.

DIGESTER AND SLUDGE DEWATERING EXPERIENCE

Dyer has significant experience in providing Class B aerobic digester design for SBR WWTP projects. Designs include in-tank thickeners, above grade glass-fused-to-steel digesters, concrete digesters, and rehabilitation of old WWTP tanks into new digester space. We have experience designing and operating an SBR without digesters, which allows the client to elect to save costs by delaying the installation of a digester until a future phase of the project or considering a smaller digester with the initial design.

Dyer has designed and installed over thirteen (13) sludge dewatering facilities, with eight (8) facilities utilizing screw press technology, which is what the City is considering for their new facility. Practical designs and layouts for the dewatering facilities are utilized to provide cost effective, operators and maintenance staff preferred options. Having an experienced team means we can explain what concepts work, and which will create headaches and issues in the future, which we avoid through reliance on our extensive experience. Conveyors, macerators, and polymer feed systems are all items we regularly incorporate in our designs. We have experience addressing dewatered sludge (cake) storage and transport as well as being well versed in addressing screw press waste stream impacts to the SBR process.

DISINFECTION EXPERIENCE

We have designed and constructed over fifteen (15) UV disinfection systems. The disinfection limits have ranged from Class D to Class A effluent standards. We have expertise with in-channel and contactless UV disinfection units proposed in the City's reports. We believe we were the first engineering firm to design and install a contactless UV system in the state, and have now installed or designed five (5) contactless UV systems in Oregon. We understand how to design UV systems while ensuring operator's maintenance and serviceability requirements are met. Energy and overall cost savings are provided through ballast dimming, flow equalization, and structuring UV design with SBR decant characteristics in mind.

FINANCING EXPERIENCE

Dyer has extensive experience with municipal financing and the development of financing programs for public works improvement projects. Since Dyer has historically served small to medium-size cities, which may not have access to financial advisors, Dyer has become proficient in assembling complete funding packages and assisting its clients in all phases of the funding programs. Dyer has worked with all of the major funding agencies (DEQ SRF, USDA RD, OBDD CDBG) and has attended numerous "one-stop" financing meetings to assist our clients in obtaining funding. You are encouraged to contact our client references to verify our familiarity and experience with these programs.

EXAMPLES OF SERVICES RENDERED ON PROJECTS IN LAST 5 YEARS

Dyer has provided funding support, predesign, design, construction, and startup services for the following spotlight projects which are very similar to the City's project. These are project within the past five (5) years. The projects funding sources are noted.

CITY OF SUTHERLIN - WWTP - SBR

This project included the Wastewater Facilities Plan, Predesign Report, design, bidding, and construction management of the four (4) basin SBR. The project included a new collection system pump station, new headworks, new influent pump station, new SBR, new digesters, new tertiary filters, new UV disinfection facilities, new screw press dewatering facilities, and an operations building (electrical room, blower room, biosolids dewatering, and cake storage) and lab facility. Plant capacity 7 MGD Completion: April 2021. Funding Sources: DEQ SRF. Contact: Kristi Gilbert, Community Development Director (541) 459-2856. A photo of the Sutherlin SBR WWTP with headworks and tertiary filters is included on the front cover and the Table of Contents.

CITY OF CANYONVILLE - WWTP PHASE II - MBR

This project included the Wastewater Facilities Plan Amendment, Predesign Report, Membrane Bioreactor (MBR) Equipment preselection and prepurchase bid, design, bidding, and construction management for the, installation and commissioning of a new secondary screening system, new MBR, new contactless UV disinfection system, new solids treatment (aerobic digester and biosolids screw press) and management systems, and new control panels and Supervisory Control and Data Acquisition (SCADA) system. Phase I provided a new influent screening system, new grit removal system, and new influent pump station. Plant capacity 1.7 MGD Completion: August 2021. Funding Sources: CDBG/USDA RD/DEQ SRF. Contact: Dawn Bennett, City Administrator (541) 839-4258.

CITY OF DRAIN - WWTP IMPROVEMENTS - SBR

Planning, Predesign Report, design, bidding services, construction management of improvements, and commissioning including: influent pump station with four 694 gpm pumps; headworks screening, grit removal, metering, and sampling; two (2) basin SBR; non-contact UV disinfection system; Operations Building (electrical room, generator, laboratory, and office); new recycled water irrigation pivot system and pump station for irrigation field; a new facultative sludge lagoon; demolition of existing plant and a new SCADA System. Plant Capacity 2.4 MGD. Completion: DATE: July 2019. Funding Sources: Water/Wastewater Financing Program/CDBG/OBDD-IFA. Contact: Harold Burris, Public Works Superintendent (541) 836-2037. A photo of the Drain SBR WWTP is on the back cover.

CITY OF MOLALLA– WWTP IMPROVEMENTS – SBR

The planning, Predesign Report, design, bidding services, and construction management of improvements including: Transfer Pump Station; grit removal system; flow splitter structure; four (4) basin SBR; tertiary filtration system; non-contact UV disinfection system; Operations Building including new laboratory/office, electrical room, blower room, dewatering screw press room, and cake storage area. Design is complete. Plant Capacity 8.8 MGD. Completion: Bidding summer of 2024 Funding Sources: USDA RD/DEQ SRF. Contact: Dan Huff, City Manager (503) 829-6855.

CITY OF REEDSPORT - FOREST HILLS PUMP STATION & FORCE MAIN REPLACEMENT

This project included a predesign services, design, bidding, and construction management for the installation of 425 lineal feet of 6-inch diameter force main and a new 450 gpm pump station. The new pump station includes two non-clog submersible sewage pumps, diesel backup generator, new electrical building, and instrumentation. Construction is approximately eighty percent complete. Completion: Estimated Summer 2024. Funding Sources: CDBG. Contact: Deanna Schafer, City Manager (541) 271-3603.

4 METHOD OF APPROACH

- Proven Track Record with over eight (8) Oregon SBRs constructed with this Process
- Highly Qualified SBR Engineers and Staff
- SBR and Equipment Tours Prior to Final Design
- Ensure City Understands the offerings and differences in Flow Through vs. Batch for SBR Designs
- City Input Is Critical

Section 4 – Method of Approach

Our Method of Approach is predicated around three main components throughout the entire project: communication, responsiveness, and transparency. Dyer ensures there are clear routes for communication, the correct staff is on the project, timely responsiveness is provided, and detailed answers and comments are offered to facilitate full transparency for the City of John Day and staff. This transparency is provided in all steps of the process allowing advancement to be clearly seen in preselection, design, bidding, construction, startup, and post construction activities of the project.

The project will begin with a kickoff meeting to establish and understand project goals, funding aspects and limitations, regulatory limits, and Wastewater Treatment Plant (WWTP) staff input. Dyer will coordinate with the City's hydrogeological engineering team to get an understanding of their data and goals and investigate how their reports and findings may impact design.

After the meeting, Dyer will coordinate with funding agencies, and let them know of potential plan changes, and outline their requirements. Those requirements along with other hurdles, obstacles, and challenges will be combined into an overall project schedule, complete with milestones, deadlines, and critical dates. It is crucial to get the entire team operating off a single schedule, with all parties working together on the project.

Basis of Design

Based on the feedback from the City, regulatory agencies, and staff, Dyer will develop a Basis of Design report to submit to the City of John Day. The report will include geotechnical work and preliminary comments from the structural and electrical engineering team. The intent of this Basis of Design report is to develop the overall scope of the project in regard to process areas, types of equipment needed, buildings, general site layout, and identify the scope for pre-selection of basis of design equipment. This report will be used to communicate and inform the funding agencies and keep them up to date. If regulatory permit modifications are identified, we will notify the Oregon Department of Environmental Quality (DEQ), and request feedback from them which will be used in development and finalization of the report.

Predesign – 30 Percent Design

After the Basis of Design is complete, Dyer will start the WWTP and Sequencing Batch Reactor (SBR) Preselection by touring SBR plants. These WWTP tours will typically include City staff, operators, our lead designers, and Dale Richwine, PE. Headworks, solids handling, sludge dewatering, tertiary filtration, and other related process areas including laboratory and building layouts will be discussed on the tours. SBR plants that utilize shared wall construction between buildings and the SBR structures will be examined and evaluated during the tours. This is usually a two-day activity, typically visiting four to five plants during the trip. The intent of the plant tours is to provide in-person viewings of the various WWTP equipment types, SBR layout options, building types, and design features. The SBR Team can explain the pros and cons of plants and equipment arrangements, and provide recommendations based on our decades of experience designing and constructing SBRs in Oregon. Dyer wants to ensure the City fully understands exactly what the SBR Team is proposing and confirm the City is achieving their objectives. City input is prioritized.

If a team member, city staff, or operator prefers a technology our SBR Team is not familiar with, Dyer will coordinate and schedule a tour of the equipment and provide our recommendations and findings to the client. We find great benefit in the client and SBR Team viewing equipment and installations together, in-person. After the site visits, we meet and debrief with the City staff, operators, and the SBR Team in order to select the intended equipment to utilize for the City's SBR WWTP.

The preferred equipment is further described as the "Best" equipment, meaning it meets the design criteria and is the City and Engineer's first preference after review and selection. The SBR Team will then work on equipment alternatives and develop a "Good-Better-Best" criteria for each major piece of equipment and process area to ensure the final design adequately covers the "Good-Better-Best" alternatives that may arise if the "Best" equipment option is not provided through the low bid process. Dyer has found this process reduces the impacts and need for major redesign efforts after bidding.

After the preferred type of SBR is selected, Dyer will develop a bid package including preliminary design drawings and specifications for the "SBR Prepurchase Package Treatment Plant." We assist the City with advertisement of the bid package, administer questions and issue addendums as necessary, utilizing online bidding services through the use of QuestCDN. An evaluation of the bids is completed after the bids are submitted and received. Next a recommendation will be provided to the City. Recently the prepurchase bids for the City of Canyonville and Lakeside were developed and administered.

After selection of the prepurchase equipment, Dyer will complete the 30 percent Predesign Report. The 30 percent Predesign Report will outline performance criteria, sizing, and layouts for all process areas of the plant, and all final permit requirements will be identified. Upon approval of the report by the City, the report will be sent to DEQ for review and approval. The 30 percent Predesign Report will be finalized after the receipt and incorporation of DEQ's review and comments. At this point, an updated cost estimate and schedules will be provided.

Final Design

The 30 percent predesign will advance to final design while conducting formal design review meetings at the 60 and 90 percent design points. The SBR Team and subconsultants will also provide informal process area design meetings outside of the 60 and 90 percent meetings to ensure design is advancing and communication is occurring throughout the design process. As needed, Dyer will schedule and attend funding agency and regulatory reviews. Most meetings will be conducted on-line, but as needed, we will schedule in-person meetings. Our staff and SBR Team are accustomed to providing all aspects of design support, so the City is encouraged to let us know what level of involvement they prefer. If the City selects bi-weekly meeting for example, Dyer can easily accommodate this request. Our goal is to work with the City, and to provide a solid design. Final design will include final plans, specifications, cost estimation, funding required front end bid documents, and identification of final permitting required for the project.

If required, Recycled Water Reuse Plans, Water Pollution Control Facilities (WPCF) Permits, or Biosolids Management Plans will be amended and/or created during the final design phase.

Bidding

Once final design, bid documents, cost estimates, and specifications are complete, Dyer will send the documents to the funding agencies, legal counsel, and City for approval to bid. During the bidding phase, we will assist with providing the advertisement to bid, administer online bidding support, issue and address addendums, requests for information, equipment vendor requests, and notify the client of any possible concerns prior to receipt of bids. Upon receipt of bids, recommendations will be provided to the client for contract award, contract execution, and ultimately start the construction phase. An anticipated construction schedule will be proposed, and Dyer will be ready for construction administration at that time.

CONSTRUCTION

Our approach for construction management and onsite observations also rely on: communication, responsiveness, and transparency. Dyer will provide support staff as needed to ensure submittals, deadlines, and onsite observations are carried out as required. Established meeting times with the contractor, regulators, funding agencies, and the City will be conducted to ensure communication, compliance, and forward progress. The SBR Team who worked on the project design, will assist in the construction management. The SBR Team assisting with construction management of the project limits the Change Orders, improves responsiveness, and provide efficiency to the project.

Proposed staffing plans are reviewed with the City to ensure the needs and expectations of the City are addressed. Dyer intends to utilize the SBR Team experienced with the project on the construction administration team; however, if there is an opportunity to hire local project managers or construction observers, we will notify, review, and coordinate with the City to determine if this is the best choice for the City's construction management team. Dyer is experienced in construction management, establishes a clear chain of command, oversees regular scheduled meetings, and runs a very tight ship when it comes to addressing and administering construction contracts. Procedures are in place for answering Requests for Information (RFIs), Field Orders, and Contract changes which are systematic and supported by the regulatory and funding agencies. Assistance in providing all documentation as well as assistance during regulatory or funding agency reviews, audits, or site visits is given and available. Full transparency is provided on all aspects of our projects.

A critical element often overlooked during the construction phase is the development of Operation and Maintenace Manuals (O&M). A electronic O&M manual format including all past reports, drawings, and documents on the City's server or networks is proposed. The electronic O&M manual is word searchable, user friendly, and available to the operators. Operators are assisted in obtaining documents from the Contractors and uploading all submittals and O&M documents. The client and DEQ are provided a draft O&M manual at the fifty percent construction mark for review and prior to commissioning of the WWTP.

A meeting with the City to outline the startup process prior to startup and commissioning will be scheduled. The meeting is to prepare, communicate, and align the City staff, Contractor, and SBR Team for plant startup. The outlined schedule will include the anticipated required involvement of City operators, down-times, items to watch for, and likely concerns. The SBR Team and Dale Richwine, PE will provide support at startup. All SBR Team members will be available for assistance to help the City as needed which is an instrumental part of the process.

Upon completion of plant startup, Dyer will periodically check in with the City and operators to ensure the plant is operating correctly. Performance testing will be performed and all required documentation will be submitted to the respective parties for project closeout. The City of John Day will receive all as-built construction drawings, surveys, and reports required. It is our goal to ensure the City has all the tools to run their new plant when we leave the site; but to also build a relationship with the City so that they know they call or contact any member of the SBR Team and get assistance.

5 AVAILABILITY; PAST PERFORMANCE WITH CITY

SECTION 5 – AVAILABILITY & PAST PERFORMANCE WITH THE CITY

AVAILABILITY

- ONE CALL AWAY
- OPERATIONS & DESIGN SUPPORT SERVICES FROM REDMOND, OR
- ADDITIONAL ENGINEERING SUPPORT FROM SUTHERLIN, LEBANON, AND COOS BAY OREGON
- 11 REGISTERED ENGINEERS IN 3 OFFICES
- IN-HOUSE SURVEY AND CONSTRUCTION STAKEOUT TEAMS
- IN-HOUSE CONSTRUCTION MANAGERS AND OBSERVERS

OFFICE AND CLIENTELE LOCATIONS

The Dyer Partnership has offices in Coos Bay, Lebanon, and Sutherlin, Oregon. We plan on serving the City of John Day out of all three offices including support from Dale Richwine, PE located in Redmond, Oregon. The Project Manager Tyler Molatore, PE, the Vice President, manages our Sutherlin office. A fully staffed office with a team ranging from engineers to technicians is in Sutherlin. The City can contact Dyer via phone or teleconference as needed. Dyer is able to travel to the City upon request as well. If one team member is unavailable, we have additional staff ready to assist from other offices if needed.

Dale Richwine, PE is a licensed Wastewater Operator located in Redmond, Oregon. Dale is available to attend meetings, offer operational support, and assist with any aspect of the project as needed by Dyer or the City.

Dyer looks forward to establishing a working relationship with the City of John Day. Our goal is to provide a cohesive and responsive supporting team with a single call or email to our experienced Sequencing Batch Reactor (SBR) Team.

WORKLOAD

By submitting this Proposal, Dyer is prepared to commit the necessary manpower and resources required by the City to provide the services specified in the Request for Proposals. We typically have multiple wastewater or water treatment plants in design or construction at any given time officewide. Currently, Dyer is approaching final design of two plants, the City of Molalla SBR Wastewater Treatment Plant (WWTP) and the City of Lakeside Membrane Bioreactor (MBR) WWTP. We are well positioned to begin another WWTP, and our SBR Team is available to start in July, as requested in the proposal.

With eleven in-house registered engineers and sixteen technical personnel available, Dyer is able to absorb a variety of projects and prioritize effectively to maintain project schedules yet retain the flexibility to respond to urgent or emergency situations.

Dyer will not submit Proposals on projects which we think are beyond our capacities, experience, or limitations.

EXPERIENCE WITH THE CITY OF JOHN DAY

Although Dyer has not had the opportunity to work with the City of John Day, we look forward to establishing a working relationship with the City. We approach new clients in a calculated manner, and after careful review of the proposal, previous reports, and the City's intent to utilize SBR technology, we believe we can offer significant value, efficiency, and experience to the City to save design and construction costs. Cost savings will be realized with the use of a SBR Team, lead by experienced SBR engineers and operators. The City of John Day is similar to many of our clients throughout Oregon. We believe we are structured to exceed the City's goals and expectations.

Dyer does have experience working with the City of John Day's City Manager while she was at the City of Lakeside. We believe the City Manager can speak to our attention to detail, client service, and prompt response times provided to our clients. We take pride in our communication skills, and working with City Council and staff members while holding transparency, honesty, and professionalism at the highest levels. We truly treat all our clients the same, and believe we showed excellent support for the City of Lakeside and intend to provide the same support to the City of John Day. We hope to be able to work with her again.

Construction and WWTP Startup Phase Staffing

Dyer understands that construction services are a large component of the overall WWTP project. We have in-house experienced construction managers who will regularly attend construction meetings as needed, and propose having a full-time onsite observer as required by the funding agencies and City preferences to oversee daily construction work and address items onsite. Since Dyer has designed and constructed several SBR plants, we have experienced SBR staff in each of our office locations. Our preference is to utilize the SBR Team through the construction phase. This provides efficiency in items such as submittal reviews and Operations and Maintenance (O&M) manual development. Dyer finds a great deal of efficiency and continuity when we have the SBR Team overseeing these activities.

In an effort to be cognizant of impacts to rate payers, and overall project costs, Dyer will advertise and attempt to hire a local resident onsite representative (observer) or discuss if the City wanted to hire their own representative in an effort to reduce costs and provide a stronger local presence. The same option will occur for a surveyor. If a local surveying team is available, Dyer will also review the options with the City. If however, local staff is not available, Dyer will provide staff onsite from one of our offices. Many WWTPs that Dyer has designed and constructed have all been located several hours from our main offices, and we regularly staff those projects with a full-time observers. Our preference and goal is to find a local presence when possible.

Dale Richwine, PE, a licensed Wastewater Operator, will be a large asset to our SBR Team during design, construction, plant startup, and during the one-year performance testing of the facilities. Starting and performance testing a WWTP and all the accessory items can be challenging and overwhelming if experienced staff are not involved. Dyer and Dale have assisted in numerous plant startups, and have experience assisting operators with these activities. Having an experienced operator on the SBR Team means the City operators have direct connection to someone who "speaks their language" and understands the plant, construction sequence, and challenges from the operators perspective. Dyer is more than willing to discuss post-startup support as well, knowing that after the plant is designed and started, operation issues can come up. Dyer wants to be available to support the City in all phases, and do not want to overlook or understate the importance of having an experienced engineer and operator on the team.

Conflict of Interest

If selected, Dyer will never contract with any other agency, developer, supplier, or firms that represents a potential conflict within the City. In doing so, Dyer is solely committed to the City and its interests. We provide similar dedication to other cities where we serve as Engineer of Record or City Engineer. This commitment demonstrates our loyalty and emphasizes that we strive to serve the City's best interests.

"Behind the Scenes" Support and additional Availability

After review of the last three wastewater plants designed and constructed by Dyer (Sutherlin SBR, Drain SBR, and Canyonville MBR) in the last five (5) years, the average percent of Change Orders during construction has been less than three (3) percent. This value of Change Orders also includes Owner added items and upgrades. Dyer attributes our historically low amount of Change Orders on plant projects to our support staff and team that is often "behind the scenes."

The "behind the scenes" services we provide to our clients extend well beyond the services of just professional engineering. Dyer understand that small communities are often short staffed. We take pride in providing a complete support staff to offer assistance in all aspects of the project. Having a diverse staff means the client always has someone to call. Assistance with funding applications, funding questions, environmental reports, biological assessment coordination, wetland delineations, and bidding may be provided.

Dyer's dedicated staff will manage bidding documents, contract documents, advertisements, and the online bidding processes. Our staff members who create and manage the bid documents work hand-in-hand with the regulatory and funding agencies and City staff to ensure compliance and required forms are completed.

After offering design and municipal engineering for over forty years, Dyer has developed a vast network of outside support options as well. If a question or need comes up, we can be a first point of contact to offer assistance to the City. If the item cannot be addressed by Dyer staff in-house, we will provide a recommendation or point the City in the direction to get the item addressed timely. For example, if the City needs labor law compliance checks, or certified payrolls checked during construction, arrangements or coordination with a consultant will be made to assist the City. It takes a diverse staff to provide our level of support; and we are excited to offer the full Dyer team to support the City of John Day.

Having an in-house survey team is a luxury for our design staff, and provides cost savings to the client through efficiency and knowledge of what our SBR Team needs to develop top-notch constructible plans. It is very convenient and efficient to perform site surveys and incorporate that information into our plan sets when we have a complete survey staff that is familiar and experienced with our AutoCAD formats and wastewater design tendencies. Construction stakeout work and addressing issues in-field with the availability of our in-house survey team has proven to reduce delays during construction, and provide a level of accuracy in our designs and projects that we feel we would not have if we had to rely upon an outside firm to provide our survey work. Our survey crews are familiar with working with City staff, and providing pot-holing plans and utility coordination maps. It is rare that our crews will not be able to be onsite within a few days notice, because two of our survey crew members also provide design support when not in the field surveying.

During construction our "behind the scenes" support staff include project coordinators who enter and track submittals, Requests for Information (RFIs), and pay requests to ensure the contract dates and time allowances are met. Our support staff is often able to get our client requested information the same day it is requested. American Rescue Plan Act (ARPA) and Build America, Buy America (BABA) Act funding requirements and submittal checks are conducted by staff who are experienced with a wide array of requirements and regulations.

Having in-house designers and AutoCAD managers ensures we have continuity between our SBR Team and our subconsultants. Our AutoCAD managers are also an experienced SBR designers, and both of our AutoCAD managers have worked for Dyer for over seventeen (17) years. Having the experience and skills to understand how a complete bid-ready drawing set should be arranged, and in accordance with DEQ and regulatory requirements, all while being constructable by tradesmen, ensures we obtain timely approvals from regulatory agencies and reduced Change Orders in-field during construction.

PRESCHEDULING MEETING TIMES

Our managers will work with the City to select preselected monthly dates that will be allocated specifically to the City of John Day for meetings, support, and dedicated time. These dates could be weekly, monthly, or variable, but getting the dates on everyone's schedules has proven to be a great help on other plant projects previously completed. This ensures that meetings occur regularly, staff is available, and items do not linger and or create delays which can impact project progression.

6 UNDERSTANDING OF REQUESTED SERVICES

SECTION 6 – UNDERSTANDING OF REQUESTED SERVICES

Having decades of experience in designing and constructing Sequencing Batch Reactor (SBR) Wastewater Treatment Plants (WWTPs) for municipal clients, Dyer clearly understands the requested services needed by the City of John Day as presented in the *Request for Proposals (RFP) Attachment A.*

We recognize the City is requesting engineering services for the preselection of SBR equipment, design, bidding, and construction management of a new SBR treatment facility. The experienced Dyer SBR Team will develop Preliminary Engineering Report (PER) amendments as required for funding and final plant design configuration, as well as development a Basis of Design report. The basis of design for the SBR will be preselected through a bid procurement process referred to as Phase I bidding, administered by Dyer. A 30 percent Predesign Report (Design Development) and cost estimate will be provided per Oregon Department of Environmental Quality (DEQ) guidelines, and ultimately final design documents produced. Geotechnical, electrical, and structural engineering will all be included by our proposed SBR Team. We will provide the City with design meetings at the 30, 60 and 90 percent completion marks, as well as conducting intermediate process area meetings as required. We have in-house surveyors who will provide our SBR Team with the needed survey information and construction stakeout services. The project services will include full design documents including Phase I and II projects with specifications, bid documents (including funding requirements), bidding and construction administration, resident construction representative, and post construction support and performance testing. All tasks outlined will be administered, completed, and deliverables provided as outlined in the *RFP Attachment A.*

The City has made great strides in completing a wastewater facilities plan, advancing to selection and scoping of a SBR WWTP, and seeking funding for the project. Dyer understands the City is now at the point of selecting a design engineering team to preselect a SBR manufacturer, complete design, assist with funding updates and reports, bid the project, and oversee construction of the plant. All of our previous SBR WWTPs have followed a similar path as this project. The scope of work as presented is clear to the SBR Team; however, there are some important areas of this project that deserve critical understanding and consideration given to, which are outlined below.

RATE PAYER IMPACT

As engineers, it is relatively easy to design a solution for a problem without consideration of cost, operability, or long-term maintenance requirements. Overlooking these items, or failing to understand that the most robust and state of the art project may have the highest cost to the rate payer, will result in a project that is not affordable. A design that is state of the art, yet inoperable, or difficult to maintain by City staff is also not sustainable.

Our experienced SBR Team is familiar with small Oregon cities, the burden associated with a new plant, and the impacts to rate payers and City operations and staff. The SBR Team focuses on reasonable and practical designs that provide regulatory compliance, meet or exceed City and operator objectives, and are affordable to rate payers. Designs can be modest, cutting edge, resilient, and practical, while fitting within a budget. Dyer believes our track record, ability to evaluate phasing options, and SBR plants experience reflects this key project consideration.

FUNDING SUPPORT

Dyer understands the City has started the process of obtaining funding through the assistance of a grant administrator, with the intent to utilize CDBG funds for design, and USDA RD WEP Funds for the preselected SBR equipment and construction of the WWTP. The SBR Team is well versed in working with funding agencies, and funding support teams. The SBR Team has experience amending PERs, providing cost analysis as required by lenders, and evaluating funding requirements to develop a funding package road map, complete with milestones, objectives, and obstacles to ensure overall project goals are met. Most of the SBR projects completed have included two or more funding agencies. Dyer has completed several projects working with the USDA RD, CDBG, and DEQ CWSRF funding. Regulatory hurdles which potentially impact funding packages are identified and immediately addressed resulting in less disruption to project timelines and lenders. Support to the grant administrator or offer to lead funding efforts, will be provided as requested.

DEQ PERMITTING

The City is currently operating under WPCF Permit Number 103281. The permit states the WWTP is a SBR with UV disinfection. The City can rely on the SBR Team to coordinate and address any required DEQ permitting and compliance issues arising with the final WWTP design. For example, if tertiary treatment is ultimately not the preferred option, coordination will be provided with DEQ to outline the requirements and means to modify the permit accordingly. We will lobby on behalf of the City for provisions that are favorable to the City, while still allowing the environmental compliance requirements to be met. We have significant experience working with the DEQ regulators, operators, and City staff to achieve an alignment of permit requirements, plant operations, and compliance.

BASIS OF DESIGN – PRESELECTION OF EQUIPMENT

We understand that funding agencies and procurement rules do not allow sole sourcing of equipment, which is why it is critical to have a design team with a clear understanding and firsthand knowledge on the various SBR suppliers, processes, and equipment lines. Dyer’s SBR team has extensive experience in preselecting and administering bids for SBRs that ensure the City obtains the requested technology. Plant tours with Dyer’s staff and the City allow us to demonstrate pros and cons in person with the City. Simply because the project is “low bid” does not mean the City has to accept inferior treatment technology, low grade equipment, or below average packaged SBR systems. We will clearly identify the benefits and weaknesses associated with the various SBR manufacturers and provide recommendations to the City. We will diligently defend the specifications and design parameters to ensure the City obtains equipment that meets their expectations and goals, while adhering to the funding agency requirements.

INFLUENT FLOW EQUALIZATION

Finding a solution for the influent flow Equalization (EQ) will be key to the overall project and ultimate SBR sizing. The City Council’s preference to reuse the existing pond to store raw sewage during periods of high influent plant flows is noted. Design of the influent flow EQ basin will impact the overall cost of the project; therefore, we will evaluate utilization of the existing pond as an influent flow EQ basin. The City of Molalla SBR design also included the development and design of an influent flow EQ basin, and our staff is very familiar with this evaluation and design consideration. A number of key design elements will be evaluated and suggested to the City to ensure the flow EQ basin does not create odor or other unexpected results that will tarnish the overall project if not addressed early in design. We have significant experience in designing peak-hour influent storage into our SBR designs as well, which has resulted in large cost savings to clients.

PURPLE PIPE PROJECT

Assistance in determining the final phasing and path forward for the “Purple Pipe Project” will be provided. We will outline design options and costs, while addressing the City’s goals, funding requirements, and regulatory requirements related to recycled wastewater and assist the City with finding the best route forward. An option to design the SBR plant to have a hydraulic grade line that allows the future installation of tertiary filters, grit removal systems, future SBR expansions, and other items is advised. Since the tertiary filtration, or Class A effluent, is not required or may not be cost effective, an alternative final design to fit the funding and City goals will be explored. Incorporating the “Purple Pipe Project” glass-fused-to-steel recycled water storage tank into the SBR plant project will also be evaluated. Final effluent pumping design will be provided including multiple points of effluent discharge like the Cities of Gold Beach, Sutherlin, Molalla, Drain, and Lakeside. Each of these WWTPs were designed with two or more effluent disposal sites or reservoirs, utilizing a common effluent pump station, similar to what John Day will likely need.

Biosolids Management

An evaluation of the long-term goals of the City in regards to their biosolids management will be an important element to evaluate in the Basis of Design report phase. City operators have suggested the City may go away from the development of Class B biosolids and land application. Elimination or significant reduction in the digester volume should be evaluated. Dyer has extensive SBR, digester, and biosolids dewatering experience. Biosolids management plans will be presented as well as running solids directly from the SBR through a screw press without digesters. The option of sending dewatered biosolids directly to a landfill, which could provide cost savings to the City, will be evaluated. Class A capable dewatering units is also an option, which offers expansion should the City choose to evaluate potential Class A biosolids in the future.

Project Aesthetics and Appearance

The WWTP will be a major piece of infrastructure located in town. A functional, cost-effective WWTP which is aesthetically pleasing and cognizant of the operator's responsibilities will be designed. The client's appearance and aesthetic goals will be included in the final design. Practical design incorporating aesthetics or ergonomics does not mean excessive costs. Cost effective design will be recommended and utilized to provide great-looking plants at an affordable cost. Having a plant that is well laid out, and considerate of staff, is key to a successful SBR WWTP design. Odor control, color selections, and concrete artistic molds are all items to be offered to the City during design. See page 7-2 for a photo of the Coquille SBR with artistic concrete.

City Integrator / SCADA

Dyer is experienced in working with ACS, the City's control integrator named for the WWTP project. Previous experience includes the Cities of Drain and Yoncalla, who utilizes ACS for their Carefree Supervisory Control and Data Acquisition (SCADA) system. Dyer proposes to work with ACS and during the design process to ensure the SCADA system is functional and the process is streamlined. We look forward to discussing our methods and techniques of how we integrate ACS's work into our bid documents. The integration could streamline the startup process including SCADA options (from tablet operations to remote monitoring) offered to the City.

Building for the Future

Dyer WWTPs are designed and built for the future, not just to meet current permit compliance. To ensure this plant provides decades of life, SBR concrete structures with an intended fifty-year design life are suggested. Piping and mechanical components will be specified with a design life of fifteen to twenty years, or more where practical. Dyer designed and administered construction of the City of Siletz's SBR in 1992. Currently, Dyer is beginning work to replace their existing SBR mechanical components and computer systems, but are able to reuse the main concrete structure, piping, walkways, etc., resulting in significant cost savings to the City.

Engineering Additional Services

Dyer is accustomed to providing, and is pleased to offer, additional engineering services outside of the WWTP scope. We understand the City may request cost estimates or task orders for additional services such as site, utility, and road design. We offer Engineering of Record services to over seventeen (17) municipal clients and have staff ready and willing to assist as needed. Additional design elements can be incorporated into the final plant design bid package at little to no cost change to the client, if communication of objectives, expectations, and goals are clearly outlined early in the project.

While not requested explicitly in the RFP, we offer support services after construction, during the one-year performance period of the plant and after the one (1) month period outlined in the scope of work. Offering on-call-support of engineers and operators (Dale Richwine, PE) will reduce stress on City staff and offer a significant resource for the City during startup and beyond. Our staff has significant experience in assisting City's with design and operation of SBR plants, beyond just the design-build period.

7 REFERENCES

REFERENCES

SECTION 7 - REFERENCES

REFERENCES

- 17 MUNICIPALITIES
- 1 MARINA
- 2 SANITARY DISTRICTS
- 5 WATER DISTRICTS, BOARDS, & ASSOCIATIONS

The Dyer Partnership strives to maintain its reputation for sound engineering and timely delivery with each and every project. We are committed to delivering excellence in all services while maintaining the highest standards of professional integrity. Our mission is to add value to each of our client's projects and to achieve and share success.

Listed below are Dyer's city and district engineering clients who currently use our services for planning, design, and construction management of their municipal projects. This list contains names of a contact person, telephone number, and address. We encourage the City to reach out to these individuals to get a better feel for the level of service Dyer will provide. Dyer looks forward to providing engineering services for the City of John Day. Relevant Wastewater Treatment Plant (WWTP) work performed has been provided in this section for the cities in green.

CITY OF BANDON
Torrey Contreras, City Manager
555 Highway 101, PO Box 67
Bandon, Oregon 97411 (541) 347-2437

CITY OF BROOKINGS
Anthony "Tony" Baron, Public Works Director
898 Elk Drive
Brookings, Oregon 97415 (541) 469-2163

CITY OF BROWNSVILLE
S. Scott McDowell, City Administrator
255 N Main ST, PO Box 188
Brownsville, Oregon 97327 (541) 466-5880

BUNKER HILL SANITARY DISTRICT
Dan Hinrichs, District Attorney
93685 E Howard Lane
Coos Bay, Oregon 97420 (541) 267-0229

CITY OF CANYONVILLE **WWTP**
Dawn Bennett, City Administrator
250 N Main Street, PO Box 765
Canyonville, Oregon 97417 (541) 839-4258

CHARLESTON SANITARY DISTRICT
Deren Dibble, District Manager
63365 Boat Basin Road, PO Box 5522
Charleston, Oregon 97420 (541) 888-3911

COLTON WATER DISTRICT
Betty Hodges, District Manager
20987 S Highway 211
Colton, Oregon 97017 (503) 824-2500

CITY OF COOS BAY
Jim Hossley, Public Works Director
500 Central Avenue
Coos Bay, Oregon 97420 (541) 269-8918

COOS BAY-NORTH BEND WATER BOARD
Ivan Thomas, General Manager
2305 Ocean BLVD, PO Box 539
Coos Bay, Oregon 97420 (541) 267-3128

CITY OF COQUILLE **WWTP**
Forrest Neuerburg, City Manager
851 N Central BLVD
Coquille, Oregon 97423 (541) 396-2114

CITY OF DRAIN **WWTP**
Harold Burris, Public Works Superintendent
129 West "C" Street, PO Box 158
Drain, Oregon 97435 (541) 836-2417

CITY OF GOLD BEACH **WWTP**
Anthony Pagano, City Administrator
29592 Ellensburg Avenue
Gold Beach, Oregon 97444 (541) 247-7029

HECETA WATER PEOPLE'S UTILITY DISTRICT
Carl Neville, General Manager
87845 Highway 101
Florence, Oregon 97439 (541) 997-2446

CITY OF MOLALLA **WWTP**
Dan Huff, City Manager
315 Kennel Avenue, PO Box 248
Molalla, Oregon 97038 (503) 829-6855

CITY OF REEDSPORT
Deanna Schafer, City Manager
451 Winchester Avenue
Reedsport, Oregon 97467 (541) 271-1989

CITY OF SCIO
Ginger Allen, City Manager
38957 NW 1st Avenue
Scio, Oregon 97374 (503) 394-3342

CITY OF SUTHERLIN **WWTP**
Kristi Gilbert, Community Development Director
126 E Central Avenue
Sutherlin, Oregon 97479 (541) 459-2856

UMPQUA BASIN WATER ASSOCIATION
Brad Johnson, General Manager
4972 Garden Valley Road
Roseburg, Oregon 97471 (541) 672-5559

CITY OF YONCALLA
Jennifer Bragg, City Administrator
2640 Eagle Valley Road, PO Box 508
Yoncalla, Oregon 97499 (541) 849-2152

CITY OF LAKESIDE **WWTP**
Rick Hohnbaum, City Recorder / Manager
915 North Lake Road, PO Box L
Lakeside, Oregon 97449 (541) 759-3011

CITY OF MYRTLE CREEK
Lonnie Rainville, City Administrator
207 NW Pleasant, PO Box 940
Myrtle Creek, Oregon 97457 (541) 863-3171

SALMON HARBOR MARINA
Jim Zimmer, Harbor Manager
100 Ork Rock Road
Winchester Bay, Oregon 97467 (541) 271-3407

CITY OF SILETZ **WWTP**
Barbara Chestler, City Recorder
215 W Buford Avenue, PO Box 318
Siletz, Oregon 97380 (541) 444-2521

CITY OF TANGENT
Joe Samaniego, City Manager
32166 Old Oak Drive, PO Box 251
Tangent, Oregon 97389 (541) 928-1020

WINSTON-DILLARD WATER DISTRICT
Tanner Pence, District Manager
121 NW Douglas Blvd.
Winston, Oregon 97496 (541) 679-8467

Photo Above: City of Coquille SBR with architectural windows and concrete artwork.

8 APPENDIX

APPENDIX

Attachment C

Certificate of Non-Discrimination

Pursuant to ORS 279A.110, discrimination in subcontracting is prohibited. Any contractor who contracts with a public contracting agency shall not discriminate against a subcontractor in awarding a subcontract because the subcontractor is a disadvantaged business enterprise, a minority-owned business, a woman-owned business, a veteran-owned business, or an emerging small business that is certified under ORS 200.055.

By signature of the authorized representative of the proposer, the proposer hereby certifies to City of John Day that this proposer has not discriminated, and will not discriminate, against a disadvantaged business enterprise, a minority-owned business, a woman-owned business, a veteran-owned business, or an emerging small business in awarding a subcontract, and, further, that if awarded the contract for which this bid or proposal is submitted, will not so discriminate.

Date: 5/29/2024

Signature: [signature]

Printed or Typed Name: AARON SPEAKMAN

Name of Firm: The Dyer Partnership Engineers + Planners, Inc.

May 23, 2024

John Day City Hall
450 E Main ST
John Day, OR 97845

RE: Wastewater System Improvements – Final Design & Construction Engineering Project

To Whom it May Concern,

On behalf of The Dyer Partnership Engineers & Planners Inc we would like to confirm that we have secured bindable terms to increase their Professional Liability Limit to $3,000,000 per Occurrence / $5,000,000 Aggregate as per contract requirements. At the time that Dyer is awarded the contract, coverage will be bound, and proof of increased limits will be provided in an updated Certificate of Insurance.

Please let us know if you have any questions or need any additional information.

Sincerely,

Blake Backlund

Blake Backlund
IMA – Oregon

AARON SPEAKMAN, PE

PRINCIPAL MANAGER

REGISTRATION

- STATE OF OREGON PROFESSIONAL ENGINEER NO. 70769

EDUCATION

- BS CIVIL ENGINEERING OREGON STATE UNIVERSITY, 2002

Aaron is the President of The Dyer Partnership and a registered Civil Engineer with over twenty-two years of experience in Wastewater Treatment Plant (WWTP) design and construction projects. Aaron designed and constructed his first Sequencing Batch Reactor (SBR) Wastewater treatment plant in 2006, and has since been the lead engineer on five other SBR plants in Oregon. His specialties include SBR wastewater treatment, headworks design, biosolids dewatering, disinfection, effluent reuse and disposal, funding administration, and regulatory compliance. He has significant experience managing wastewater plant projects from planning through construction. He has decades of experience working with all funding and regulatory agencies associated with wastewater plants in Oregon. He has demonstrated excellent design, estimating, construction management and writing skills; while possessing the ability to bring new ideas and approaches to projects. He has proven to be an asset on projects and strives to assure all project participants obtain satisfaction and value.

SELECT EXPERIENCE

WASTEWATER TREATMENT PLANT IMPROVEMENTS
City of Sutherlin, Oregon
Aaron was the Engineer of Record and Project Manager for the City of Sutherlin SBR Facility. This project included the design of a new 4-basin SBR WWTP. The facilities include the design of a 7 Million Gallons per Day (MGD) SBR, tertiary filters, Ultraviolet (UV) disinfection system, aerobic digesters, screw press dewatering facility, new operations building, and laboratory. The WWTP produces Class A effluent. The project was completed in May 2021. The construction cost was approximately seventeen million five hundred thousand dollars.

WASTEWATER SYSTEM IMPROVEMENTS
City of Molalla, Oregon
This project included the design of a new 4-basin SBR WWTP. The facilities include the design of an 8.8 MGD SBR, tertiary filtration, UV disinfection system, new digesters, biosolids dewatering facility with screw press, and new operations building and laboratory. Aaron was the Principal Manager and lead engineer overseeing all aspects of the project. The project is fully designed and anticipated to bid in the summer of 2024.

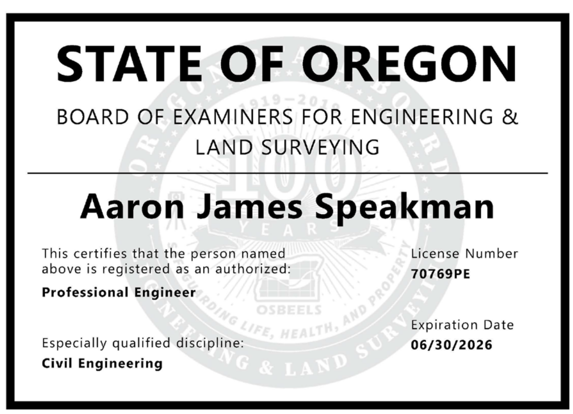
WASTEWATER SYSTEM IMPROVEMENTS
City of Drain, Oregon
Aaron was the Engineer of Record for the City of Drain SBR Facility. This project included the design of a new SBR WWTP. The facilities include the design of a 2.4 MGD SBR, UV disinfection system, irrigation pump station, facultative sludge lagoon, and new operations building and laboratory. Aaron was the Project Manager and lead engineer and managed all aspects of the project. The project was

completed in 2019 and construction costs were approximately seven million dollars.

WASTEWATER SYSTEM IMPROVEMENTS PHASES II & III
City of Gold Beach, Oregon
Facility. These projects included a new 2.4 MGD SBR WWTP, UV disinfection, 240,000 square foot ground filtration drain field, 3.4 MGD pump station, two 200,000 gallon glass-fused steel digesters, two new collection system pump stations, and general site improvements including new laboratory. Aaron, as Project Manager and lead engineer, was responsible for design and construction management. Project costs were nine million dollars.

WASTEWATER TREATMENT PLANT IMPROVEMENTS
City of Lakeside, Oregon
The City of Lakeside is currently replacing their existing WWTP with a new 1.9 MGD Membrane Bioreactor (MBR). The project is approximately 80-perent designed and anticipated to start construction in the fall of 2024. This project included significant studies, and evaluation of SBR versus membrane treatment technologies, disinfection, and biosolids management. This will be a Class A WWTP, with recycled water reuse. Pre-procurement of the MBR equipment was conducted through public bid, and incorporated into final design. The project is on budget and on schedule and anticipated to bid final construction in the fall of 2024. Please I construction cost is estimated at approximately fifteen million dollars.

WASTEWATER TREATMENT PLANT IMPROVEMENTS
City of Yachats, Oregon
This project included the construction of a new SBR WWTP with a capacity of 0.33 MGD, UV disinfection, screw press for biosolids dewatering, replacement of four wastewater pump stations, and construction of a new 6,000-foot public works building with laboratory that shared a wall with the SBR facility. The project included major rehabilitation of most of the City's wastewater infrastructure. Coordination with the City's advisory committees played a large role in design of the new public works building. The project costs were approximately eight million dollars. Aaron was the Engineer of Record for this plant, and oversaw design, bidding, and construction management of the facility.


STATE OF OREGON
BOARD OF EXAMINERS FOR ENGINEERING & LAND SURVEYING
Aaron James Speakman
This certifies that the person named above is registered as an authorized:
Professional Engineer
License Number
70769PE
Expiration Date
06/30/2026
Especially qualified discipline:
Civil Engineering

REGISTRATION
- STATE OF OREGON PROFESSIONAL ENGINEER NO. 70717

EDUCATION
- BS MECHANICAL ENGINEERING OREGON STATE UNIVERSITY, 2002

AFFILIATIONS
- WATER ENVIRONMENT FEDERATION (WEF)

TYLER MOLATORE, PE

PROJECT MANAGER

Tyler Molatore, PE is the Vice President of The Dyer Partnership. He joined Dyer in 2017, after fifteen years of employment with a wastewater collection and treatment system manufacturer. Tyler understands small community challenges, and has assisted dozens of communities evaluate wastewater management deficiencies, assess improvement alternatives, develop comprehensive plans, and manage projects from construction to startup. Tyler has the necessary municipal engineering experience to provide hands-on service to complete projects on time, from conception to commissioning.

SELECT EXPERIENCE

WASTEWATER TREATMENT PLANT IMPROVEMENTS – PHASE II
City of Canyonville, Oregon

Tyler provided predesign, design, bidding, and construction management for the City of Canyonville's Wastewater Treatment Plant (WWTP) Improvements – Phase II project. The ten-million-dollar improvement project included: secondary screen, washer/compactor unit, Membrane Bioreactor (MBR), ultraviolet disinfection system, not-potable water pump station, plant drain pump station, conversion of existing treatment unit to aerobic digester and Membrane Bioreactor Thickener (MBT), biosolids dewatering facility, new Supervisory Control and Data Acquisition (SCADA) control system, and several new and renovated buildings. The project was completed in the winter of 2021.

WASTEWATER FACILITY AND COLLECTION SYSTEM MASTER PLAN
City of Molalla, Oregon

Tyler prepared the Wastewater Facility and Collection System Master Plan for the City of Molalla, Oregon. The scope of the project included an evaluation of the City's collection, treatment, disposal systems, assessment of improvement alternatives, and recommended improvement plan. The City's existing collection system is plagued with Inflow and Infiltration (I/I), and the secondary treatment facility consistently performs out of compliance with NPDES permit requirements. The recommended improvement plan included collection system improvement projects, fine screen expansion, grit removal, equalization basin, transfer pump station improvements, Sequencing Batch Reactor (SBR), disinfection system, recycled water storage improvements, discharge monitoring station improvements, and site structures. The projected total project cost estimate, in 2021 dollars, is forty-six million dollars.

VALUE ANALYSIS – WASTEWATER TREATMENT PLANT NO. 1
City of Coos Bay, Oregon

Tyler prepared the Value Analysis (VA) Study Report for the City of Coos Bay's WWTP No. 1. The VA Study was a planning level study aimed to ensure an efficient investment, improve the reliability and performance of the WWTP, reduce costs, and improve the project schedule. The VA Study Report was a culmination of pre-workshop activities, workshop, and post-workshop activities. Seven VA proposals were presented in the Report. The VA proposals, provided several benefits to the WWTP.

WASTEWATER TREATMENT PLANT UPGRADES
EQUIPMENT PRE-SELECTION
City of Lakeside, Oregon
Tyler contributed to the equipment pre-selection and procurement phase of the City of Lakeside's MBR project. The equipment pre-selection process established the basis of design for the MBR manufacturer for the WWTP upgrade project.

PRELIMINARY ENGINEERING REPORT
City of Brookings, Oregon
Tyler contributed to the Preliminary Engineering Report (PER) for the City of Brookings wastewater collection and treatment system. The report evaluated collection system deficiencies, and recommended a sensible and prioritized approach for addressing excessive I/I. The report also evaluated the wastewater treatment facility, which included recommendations for the headworks, primary clarifier, trickling filter, secondary clarifier, UV system, and anaerobic digester.

WASTEWATER TREATMENT PLANT UPGRADES
City of Molalla, Oregon
Tyler participated in creating the Wastewater Facility and Collection System Master Plan, Predesign Report, and design documents for the City of Molalla, Oregon. The facilities plan included an evaluation of the City's collection, treatment, disposal systems, assessment of improvement alternatives, and recommended improvement plan. The WWTP Upgrade project is expected to bid summer of 2024, and includes Transfer Pump Station upgrades, new equalization basin, new grit removal system, new SBR, effluent filtration system, new disinfection system, recycled water storage improvements, and other appurtenances. The projected total project cost estimate is between thirty-eight and forty-six million dollars.

RECYCLED WATER USE PLAN
City of Molalla, Oregon
Tyler prepared the Recycled Water Use Plan (RWUP) for the City of Molalla. The City of Molalla is prohibited from discharging to waters of the state from May 1st through Oct 31st annually. Recycled water is land applied to approximately 445 acres. The RWUP was amended to reclassify land application sites from Class A to Class C, in accordance with the Oregon Department of Environmental Quality's (DEQ's) Internal Management Directive. The total capacity of recycled water land application sites is approximately 200 million gallons.

REGISTRATION

- STATE OF OREGON PROFESSIONAL ENGINEER OR PE NO. 83982
- STATE OF CALIFORNIA PROFESSIONAL ENGINEER CA PE NO. C 84427

EDUCATION

- BS CIVIL ENGINEERING OREGON INSTITUTE OF TECHNOLOGY, 2010

AFFILIATIONS

- UBOS
- O2WA

JESTEN BRENNER, PE

PROJECT ENGINEER

Jesten Brenner is a registered Civil Engineer in California and Oregon who joined The Dyer Partnership in 2019. Jesten gained experience in both private and municipal engineering, after employment with a wastewater collection and treatment system manufacturer. Jesten has provided modeling, design, planning, permitting, project management, and construction management on a wide range of projects with varying degrees of scope, size and complexity. Projects include small road designs, subdivision developments, municipal water and wastewater treatment, and conveyance systems.

SELECT EXPERIENCE

WASTEWATER TREATMENT PLANT IMPROVEMENTS – PHASE II

City of Canyonville, Oregon

Jesten provided design and drafted for the City of Canyonville's Wastewater Treatment Plant Improvements. Improvements included: secondary screen and Membrane Bioreactor (MBR), ultraviolet disinfection system, not-potable water pump station, plant drain pump station, conversion of treatment to aerobic digester and Membrane Bioreactor Thickener (MBT), biosolids dewatering facility, and several new and renovated buildings.

RIVERSIDE PUMP STATION IMPROVEMENTS

City of Myrtle Creek, Oregon

Planning, design, and construction management of the new wastewater pump station for the City of Myrtle Creek was completed by Jesten. The new pump station replaced an antiquated and unreliable pump station. The project included new pumps, controls, flow meter, piping, valves, and other appurtenances.

HWY 99 STEP SEWER EXTENSION

City of Sutherlin, Oregon

Jesten was responsible for planning, design, drafting, and construction observation for the Septic Tank Effluent Pump (STEP) sewer extension. The work performed included furnishing labor, materials and equipment for construction of roughly 2,000 lineal feet of sewer pressure main line with service taps for future STEP connections.

6TH AND OAK BOOSTER PUMP STATION AND SCHOON MOUNTAIN STORAGE TANK IMPROVEMENTS

City of Sutherlin, Oregon

Planning, design, drafting, and construction observation was provided by Jesten. The work performed included furnishing labor, materials and equipment for construction of a new 6th Avenue and Oak Street Booster Pump Station. The second part of the project included furnishing labor, materials, and equipment for construction of the Schoon Mountain Storage Reservoir.

MOLALLA WASTEWATER TREATMENT PLANT IMPROVEMENTS
City of Molalla, Oregon
Jesten provided design and drafting for the City of Molalla's Wastewater Treatment Plant Improvements Predesign Report and Final Design. Focus areas included: equalization basin, transfer pump station, and force main hydraulics.

DEXTER WASTEWATER TREATMENT PLANT IMPROVEMENTS FACILITIES PLAN
Dexter Sanitary District, Oregon
Design and drafting for Dexter Sanitary District's Wastewater Treatment Plant Improvements Facilities Plan were completed by Jesten. Focus areas included: treatment system options, post treatment equalization basin design, discharge pump station configuration, drain field modifications, site design, and collection system hydraulics and analysis.

Registration

- State of Oregon Professional Engineer Oregon No. 83917PE
- Certified Water Rights Examiner Oregon No. 83917CWRE
- State of Oregon Distribution Operator II No. D-25732
- State of Oregon Collection Operator II No. 14794
- Project Management Institute Project Management Professional No. 3235429

Education

- BS Civil Engineering Oregon State University, 2010

Affiliations

- Water Environment Federation (WEF)

Trish Rice, PE, CWRE

Project Engineer

Trish Rice recently joined the Dyer staff after working for the City of Sweet Home for thirteen years. Trish has provided permitting, construction observation, funding acquisition, operations support, and GIS support on numerous municipal projects.

Select Experience

Section Street Reconstruction

City of Molalla, Oregon

Trish is currently working on this reconstruction project. The project includes a new road section, curb and gutter, sidewalks, Americans with Disabilities Act (ADA) accessible curb ramps, storm drainage improvements, and water and sewer line replacement on Section Street, from S. Molalla Avenue to Shaver Avenue.

I/I Abatement

Sweet Home, Oregon

While at the City of Sweet Home, Trish provided planning and observation of in-house Inflow and Infiltration (I/I) abatement projects including sewer lateral replacements, lateral and manhole grouting, field investigation, and CCTV inspections.

GIS Development

Sweet Home, Oregon

Trish developed the Public Works elements of Sweet Home's GIS. She performed geodatabase design, field data collection, ongoing records maintenance, ArcGIS Online maps creation for field crew use. She has also produced map products for a variety of uses including utilities, zoning code updates, business development, and emergency response.

Mahler Water Reclamation Facility Improvements

Sweet Home, Oregon

Trish managed over eight million dollars in contracts through the design phase of a sixty million dollar activated sludge facility upgrade and the construction of the two million dollar interim improvements. The design included every unit process on both liquid and solid streams. Trish performed coordination with operators, consultant engineers, integrators, contractors, regulators, and funding agencies. She also performed equipment selection, design and specification reviews, completed funding applications, and construction oversight of the interim improvements. This project included a 100,000 gallon sludge blend tank, dewatering screw press, and conveyor system.

9th Avenue Water Line Replacement

Sweet Home, Oregon

Planning, contract administration, and construction observation for replacement of 1,700 feet of small diameter water mains was performed by Trish. The project included installation of 8-inch water mains and services, ADA ramps, and street overlay.

REGISTRATION

- STATE OF OREGON
- PROFESSIONAL ENGINEER NO. 102491PE

EDUCATION

- BS BIOSYSTEMS ENGINEERING AUBURN UNIVERSITY, 2017

BLAIR HOPWOOD, PE

PROJECT ENGINEER

Ms. Hopwood began her career in Alpharetta, Georgia with Kimley-Horn and Associates. While in Georgia she worked in the Land Development group working on site design and permitting of medical facilities. She has seven years of experience in Civil Engineering. Blair moved to Oregon and took her current position with The Dyer Partnership where she has been involved with wastewater infrastructure projects and planning. Blair has assisted with the development of several master plans.

SELECT EXPERIENCE

FOREST HILLS PUMP STATION & FORCE MAIN REPLACEMENT
Reedsport, Oregon
This project includes the installation of 425 lineal feet of 6-inch diameter force main. The new pump station includes two non-clog submersible sewage pumps, pump guide rails, bases, diesel backup generator and canopy, a new electrical building, instrumentation, electrical power, controls, lighting, security cameras, and other ancillary items. The project is currently under construction. Blair is responsible for the construction management.

2021 WATER TREATMENT PLANT IMPROVEMENTS
Gold Beach, Oregon
The project included two 700 gallons per minute (gpm) treatment units, structural, seismic, chemical storage tank, filter system, Supervisory Control and Data Acquisition (SCADA), instrumentation, chemical feed system modifications, and a raw water intake building. The project is in the final stages of construction. Blair was responsible for the construction management of the water treatment plant improvements.

MORRILL BRIDGE REPLACEMENT
Curry County, Oregon
This project replaces the existing Morrill Bridge with a new 100-foot concrete precast bridge. Coordination with County and ODOT staff to deliver the project through the State Funded Local Bridge Project funding was provided. The new bridge was completed in the Spring of 2024. Significant cultural resource and permit coordination was provided for this project. Blair was responsible for the construction management.

JEFFERSON SCHOOL AND COQUILLE THEATER DEMOLITION
City of Coquille, Oregon
This demolition project included the removal of Jefferson School and Coquille Valley Theater. The school was approximately 25,000 square feet and theater 4,000 square feet. An asbestos abatement phase was required on the school structure prior to removal of the building. Blair has assisted in design, construction management, and onsite observation.

GREEN PARKING LOTS
City of Coos Bay, Oregon
The green infrastructure developments are in the design phase and will use low impact development technology with an emphasis on stormwater treatment, pervious pavements, public outreach, public education, electric car charging, event accommodations, and public usability. The Oregon Department of Environmental Quality (DEQ) coordinated with Dyer for the brownfield cleanup of contaminated soils procedures. The Dyer Partnership has coordinated several community outreach meetings and meetings with various stakeholders.

HOSPITAL SUPPORT BUILDING I AND II
Children's Healthcare of Atlanta
This project was located in Atlanta Georgia. The first phase of a 45-acre medical development that emphasized green spaces for patient healing. The project included coordination with a Professional Landscape Architect (PLA) to integrate stormwater management features with the landscaping as well as walking paths and seating areas for building staff to utilize. Planning for additional medical buildings with landscaping was integrated into the water service and walkway planning.

HOTEL PATIO AND SKY BRIDGE
Hyatt Place Atlanta Perimeter Center and Twelve24 Office Building
This project entailed the development and utilization of greenspaces on both a ground level patio for the hotel and a shared sky bridge for hotel guests and office employees. The project was located in Atlanta, Georgia. This involved the coordinated planning from PLA and Civil Engineers to deliver water service for irrigation and water features as well as a stormwater collection system that was aesthetically pleasing and complemented the overall design.

CERTIFICATIONS

- AMERICAN CONCRETE INSTITUTE CONCRETE QUALITY CONTROL CERTIFICATION
- INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS CERTIFIED SPECIAL INSPECTOR
  - REINFORCED CONCRETE
  - STRUCTURAL MASONRY
- OREGON DEPARTMENT OF TRANSPORTATION CONCRETE QUALITY CONTROL TECHNICIAN
- OREGON DEPARTMENT OF TRANSPORTATION CERTIFIED GENERAL CONSTRUCTION INSPECTOR NO. 43236

EDUCATION

- AS CIVIL ENGINEERING TECHNOLOGY UMPQUA COMMUNITY COLLEGE

DAVID SCHMIDT

DESIGNER / OBSERVER

Dave Schmidt has been with The Dyer Partnership for approximately nineteen years. He has had certifications in both the American Concrete Institute and the Oregon Department of Transportation to perform concrete quality control inspections. An additional certification is from the International Conference of Building Officials as a Special Inspector to inspect reinforced concrete and structural masonry structures. Dave is very experienced with the construction atmosphere performing onsite Observer duties during the construction of various water and wastewater treatment facilities, distribution systems, collection systems, and other infrastructure projects. Some observation and design work projects are listed below.

SELECT EXPERIENCE

WASTEWATER SYSTEM IMPROVEMENTS
City of Drain, Oregon
David was the Onsite Project Observer for the new SBR wastewater facility in Drain. This seven million dollar facility consisted of a new pump station, new headworks, new Sequence Batch Reactor (SBR), an ultraviolet disinfection facility, a new facultative sludge lagoon, and a new control building.

WASTEWATER SYSTEM IMPROVEMENTS
City of Gold Beach, Oregon
David was the Onsite Project Observer for the new SBR wastewater facility in Gold Beach. This nine million dollar facility consisted of two new pump stations, new headworks, new SBR with an equalization basin, an ultraviolet disinfection facility, a drain field pump station with drain field, a new control building with a biosolids dewatering room that included a sludge screw press, and two new digester tanks.

WASTEWATER SYSTEM IMPROVEMENTS
City of Yachats, Oregon
David was the Onsite Project Observer for the new SBR wastewater facility in Yachats. This eight million dollar facility consisted of five new pump stations, new headworks, new SBR with an equalization basin, an ultraviolet disinfection facility, a non-potable water system, a new public works building, improvements to the existing control building, a biosolids dewatering building including biosolids screw press and retrofit of the existing plant to sludge and digestion storage.

WASTEWATER SYSTEM IMPROVEMENTS
City of Canyonville, Oregon
David the Onsite Project Observer for the new Membrane Bioreactor (MBR) wastewater facility in Canyonville. This ten and a half million dollar facility consisted of a new control building, new operations building, and new biosolids dewatering. The facility including a sludge

screw press, new MBR, and ultraviolet disinfection system, non-potable water system, and retrofit of the existing plant to a digester.

SILETZ RAW WATER RESERVOIR
City of Siletz, Oregon
Dave Schmidt performed all field observation as well as special inspection of the concrete, reinforcing and masonry for the construction of a new 1.5 million gallon glass-fused, bolted steel raw water reservoir tank and pump station.

WASTEWATER TREATMENT PLANT
City of Myrtle Creek, Oregon
Dave Schmidt performed all special inspection of reinforced concrete, structural masonry, fiber-reinforced epoxy, and density testing of new facilities. Components of this facility include an influent pump station, oxidation ditch with biological nutrient removal, two secondary clarifiers, ultraviolet disinfection, dewatering building and sludge dryer. Total project cost twelve million dollars.

CO2 TO CO8 SEWER LINE REPLACEMENT
City of Riddle, Oregon
David performed all field observations on the 300 feet of sewer line replacement located in the easement between 2nd and 3rd Avenues.

RAW WATER INTAKE SYSTEM
Winston- Dillard Water District
David performed field observations on the new raw water intake system in Winston. This three million dollar facility consisted of a new raw water intake structure, screen booster pump station, chemical feed system, and multiple improvements to existing structures and systems.

2022 WATER SYSTEM IMPARTMENTS
City of Riddle, Oregon
David performed all field observations on the new water line along 3rd Avenue and 4th Avenue. This four hundred thousand dollar project consisted of installing 1,160 feet of 8-inch diameter water line along Third Street and 360 feet of 6-inch diameter water line along 4th Avenue.

RIVERSIDE PUMP STATION
City of Myrtle Creek, Oregon
David performed field observations on the new pump station in Myrtle Creek. This one and a half million dollar facility consisted of a new gravity sewer line to divert flow to the new pump station, a new force main, a new pump station consisting of a twenty feet deep wet well, a triplex submersible pump system, a generator, a chemical feed system, and a canopy covering the entire pump station.

REYNOLD D. "DALE" RICHWINE, P.E.

EDUCATION: Master Business Administration, Portland State University, 1995
M.S. Engineering Management, Portland State University, 1992
B.S. Civil-Structural Engineering, Portland State University, 1980
A.A.S. Wastewater Technology, Linn-Benton Community College, 1974

REGISTRATION: Professional Engineer - Civil: Oregon, Washington
Professional Engineer – Environmental: Oregon
Grade IV Wastewater Operator: Oregon, Washington

SUMMARY

Dale Richwine is an environmental engineer with over 50-years experience in the planning, permitting, design, start-up, operation, and management of water and wastewater treatment facilities. Dale has a broad background in the operation and management of treatment plants, including biosolids and recycled wastewater utilization programs. Dale brings this management experience to his projects by applying an appropriate decision process utilizing members of the public, key decision makers and operations and maintenance staff.

PLANNING

Dale wrote the 2021 Facility Master Plan for Oregon Water Utilities to upgrade a newly purchased septage management facility located east of Bend Oregon. This planning effort required extensive permitting approvals with the Oregon DEQ and Deschutes County to site the facilities and apply the filtrate and dewatered cake to air land zoned Exclusive Farm Use as a Class B biosolids. Dewatering is performed itilizing a screw press.

Dale wrote the 2018 Facilities Plan for the City of Powers, Oregon. Powers is a small town in Southwest Oregon. The existing treatment facilities are old and will not meet the new stringent permit requirements mandated by a TMDL on the South Coquille River. Previous planning efforts resulted in projects that did not obtain community support and did not move forward. The 2018 Faciities Plan received unanimous support from the City Council and the City is moving forward with implementation of the plan.

PROJECT MANAGEMENT/DESIGN

Dale was the client representative for the design and construction of the new Government Camp SBR treatment plant. The project was designed and constructed under a design/build contract. Dale represented the client to ensure the design and construction of the facility met the requirements of DEQ as well as the performance requirements provided in the specifications and contract.

Dale was the Program Manager for Kitsap Public Utility District to plan, permit and design a new 100,000-gpd MBR treatment facility that discharges to a drainfield as a replacement for the existing aging treatment facilty discharging to Hood Canal in Puget Sound. This project resulted in opening 90-acres of goeduck beds to the three local tribes and local residents. This is the largest treatment facility permitted under the Department of Health Large On-Site Sewage Systems (LOSS) rules. Permitting required extensive coordination with the local tribes, county, Department of Health, Department of Ecology and state land use and historical entities.

Dale was the Project Manager for the Phase I Liquid Expansion of the Tri-City WPCP. This expansion provides an additional 4-mgd of dry weather capacity and 10-mgd of wet weather capacity. This expansion utilizes membrane bioreactor secondary treatment and UV disinfection technologies. The design was done in a manner to implement construction using a Construction Management/General Contractor (CM-GC) approach. The project was designed to incorporate sustainable concepts for public education and outreach, energy efficiency and stormwater management.

Dale was the Project Manager for the design of the Lower Tualatin Pump Station. The new station was constructed in Tualatin Park at the intersection of an elevated railroad trestle and the new commuter rail to the City of Tualatin. The 28-mgd station is a 60-foot deep caisson with a second story entry to provide protection from flooding. Due to the confined and sensitive area that the station was constructed in, the architecture was carefully considered to provide the look of a historic railroad station. In addition, improvements to public facilities in Tualatin Park were incorporated into the project that include: a new pedestrian bridge crossing the Tualatin River that connects the park to the extensive trail system on the north side of the river, upgrades to existing soccer fields, a dog park, an expanded pervious pavement parking lot and a picnic structure. The station was designed to incorporate many sustainable features that meet a LEED Silver rating.

Dale is the Program Manager for the design of a new treatment facility for the Town of Port Gamble, Washington. The new 100,000-gpd facility replaces the existing aging treatment facility discharging to Hood Canal in Puget Sound. The project was designed by by three separate engineering firms, each designing an element of the project: force mains, influent pump station, MBR treatment facility and drainfield.

PERMITTING ASSISTANCE

Dale assisted the City of Astoria, Oregon in the renewal of the Astoria WWTP NPDES permit. The pemit renewal includes specific language to incorporate the unique requirements of the City's lagoon treatment system and combined sewer collection system. Negotiations required incorporation of phased upgrades to meet new disinfection critieria, percent removal criteria and pH limitations for discharge into the Lower Columbia River Esturary.

Dale was project manager and technical lead for the development of the mixing zone study for the City of Astoria, Oregon. The existing treatment plant discharges to the Lower Columbia River Esturary, which is a unique tidally influenced system. The mixing zone study was one of the first adopted by the Oregon Department of Environmental Quality under the new mixing zone guidance. The modeling of this highly stratified system was done using Cormix.

Dale was one of the original members of the Oregon Department of Environmental Quality Biosolids Task Force. The task force was commissioned to develop a set of rules that would allow the EPA 503 Regulations to be incorporated into the Oregon Administrative Rules so the State of Oregon could take primacy of the program. Dale was the author of the White Papers on Volatile Solids Reduction and Biosolids Management Plans for the task force.

Dale was the project manager for Clackamas County Water Environment Services in the development of a new water quality model of the Lower Willamette River. The project was done in cooperation with the Oregon Department of Environmental Quality with the final model used for the analysis of water quality issues in the Lower Willamette River. Portland State University developed the model as a two-dimensional tidal model using CE-QUAL-W2.

UTILITY MANAGEMENT

As the Operations Division Manager for the Unified Sewerage Agency of Washington County (now Clean Water Services), Dale was responsible for the operation of the four treatment facilities and associated programs. The facilities included the Rock Creek Facility (22-mgd), Durham Facility (22-mgd), Forest Grove Facility (3-mgd), and the Hillsboro Facility (2.5-mgd). Associated with the operation of the treatment plants was the management of the biosolids program, effluent reuse program, two wetlands systems and the technical services group. Liquid treatment processes included nitrifying activated sludge, phosphorus removal to meet a 0.07 mg/L T-PO_4 limit. Effluent is discharged to the Tualatin River as high-quality effluent during the dry season (5 BOD/5 TSS), through effluent reuse as Class IV water or application in the Jackson Bottom and Fernhills wetlands. Solids were processed through incineration and anaerobic digestion. Biosolids were utilized through a diversified program including local cake application, static pile composting and application on arid lands.

Name:	Reynold Dale Richwine, P.E., WEF Fellow President, Principal Engineer
Education:	Master Business Administration, Portland State University, 1995 M.S. Engineering Management, Portland State University, 1992 B.S. Civil-Structural Engineering, Portland State University, 1980 A.A.S. Wastewater Technology, Linn-Benton Community College, 1974 Oregon State University, 1971 - 1972
Professional Experience:	Service Representative, Neptune MicroFloc, Corvallis, OR, 1974 - 1976 Plant Operator, Unified Sewerage Agency (USA), Hillsboro, OR, 1976 - 1980 Project Manager/Engineer, CH2M HILL, Portland, OR, 1980 - 1990 Operations Division Manager, USA, Hillsboro, OR, 1990 - 1994 Senior Project Manager, CH2M HILL, Portland, OR, 1994 - 1996 NW Wastewater Manager, Montgomery Watson, Portland, OR, 1996 - 1998 President, Richwine Environmental, Inc., Beaverton, OR, 1998 – 2003 North Division Wastewater Director/Portland Office Manager, MWH, Portland, OR, 2003 – 2009 President, Richwine Environmental, Inc., Beaverton, OR, 2009 - Present
Adjunct Professor:	Portland State University School of Engineering 1994 - 1999
States in Which Registered:	Oregon, Washington – Civil Engineering Oregon – Environmental Engineering Oregon, Washington – Group IV Wastewater Treatment Plant Operator
Scientific and Professional Societies:	Water Environment Federation Pacific Northwest Clean Water Association
Awards and Honors	PNCWA – President's Award – 2021 WEF Fellow - 2018 WEF Life Member – 2018 PNCWA – President's Award – 2012 PNCWA – Individual Distinguished Achievement Award – 2011 WEF Water Hero – 2008 WEF Quarter Century Operator – 2003 WEF Arthur Sidney Bedell Award – 2000 PSU Chapter Tau Beta Pi Honor Society – 2000 PSU School of Engineering Academy of Distinguished Alumni – 1997 Boy Scouts District Award of Merit - 2001
Professional Activities:	Pacific Northwest Clean Water Association President, 2006 - 2007

Secretary-Treasurer, 2001 - 2004
SSSSS Committee Chairman, 2001
Program Committee Chairman, 1997
Technical Program Committee, 1993
Training Opportunities Committee Chairman, 1998 - 2001
Students & Young Professional Committee Chairman, 2001 - 2005

Water Environment Federation
WEF Board of Directors, 1998 – 2001
WEF Student and Young Professionals Committee – Chairman – 2003 to 2006
WEF Student and Young Professionals Committee – Vice Chairman – 2001 to 2003
Student Design Competition Task Force Chairman, 2001 - 2003
Student & Young Professionals Committee, 2000 – Present
Public Education Committee, 1999 – Present
National Boy Scout Jamboree Subcommittee, 1999 - 2001
National Boy Scout Jamboree, 1997, 2001

Portland State University School of Engineering
Civil Engineering Advisory Council, 1999 - 2006

Association of Clean Water Agencies
Biosolids Management Committee, 1990 – 2018
Water Quality Committee, 1992 - 2018

Oregon Department of Environmental Quality
Biosolids Advisory Committee, 1991 - 2002

A TRADITION OF SUCCESSFUL SOLUTIONS

For over fifty years, VLMK Engineering + Design has provided high-quality consulting engineering services to the building industry. Our reliable and efficient designs have contributed to the success of thousands of projects of all sizes and types throughout the Northwest and beyond. Our solutions offer a blend of dynamic thinking and the practical confidence that comes with a long history of success and honorable work.

VLMK was founded in 1971 as a structural engineering firm. Building on that foundation, today we also provide prime project management, building design and structural and civil engineering services to a broad range of clientele in the light industrial/commercial market sectors. As the lead consultant on a project VLMK works as a trusted partner, assisting clients from the beginning conceptual phase, through design and permitting, to construction and final occupancy. Our focus on providing creative design solutions with an attention to detail and critical timelines has made our staff one of the best in the industry.

PHILOSOPHY

We take our responsibility to provide safe, economical, and functional designs very seriously. We are constantly striving to meet the highest professional standards, while providing the best possible service to our clients. We offer Principal involvement on every project.

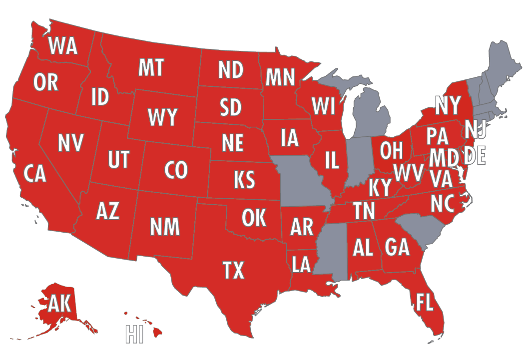
SERVICES

- Structural Engineering
- Civil Engineering
- Planning
- Studies
- Evaluations
- Entitlements
- Permit Assistance
- Special Projects

PRINCIPALS

- Chris Palmateer, PE
- Greg Blefgen, PE, SE
- Kevin Kaplan, PE, SE
- Havlin Kemp, PE
- Jason Sahlin, PE, SE
- Trent Nagele, PE, SE
- Justin Elliott, PE, SE
- Brian Dubal, PE
- Ken Rust, PE
- Mike Lundervold, PE
- Tony Jenkins, PE

LICENSED IN 39 STATES



VLMK MARKET SECTORS

As an engineering consultant, VLMK provides structural design services for a large range of market sectors including commercial, manufacturing, industrial, institutional, hospitality, multi-family, and retail with significant use of wood, steel, masonry, concrete, tilt-up and light-gauge construction types. Our civil engineering projects are largely focused on the needs of building construction, including site design, storm water management and treatment, and street improvements.

TODAY

VLMK's team includes forty-seven employees with registered Professional Engineers in both Civil and Structural disciplines, and Architecture. We have offices in three states: Oregon, Washington, and Arizona. We are currently licensed to provide consulting engineering services in thirty–nine states. With a long history of successful projects, the firm continues to grow and look to the future.

Greg Scherer, PE, SE

Associate

Greg is a Senior Project Engineer with an acute attention to detail. He has spent the last 30 years providing clients with structural engineering designs and project management for a wide variety of buildings and developments. His experience ranges from being the Project Engineer and designer on industrial and commercial facilities to water and wastewater treatment plants, several of which are listed below.

Greg designs and analyzes structures composed of reinforced concrete and masonry, structural and light-gauge steel, and wood. In addition, his experience includes the structural evaluation and analysis of existing buildings, as well as seismic upgrade and retrofit projects. Greg was the Project Engineer on the following selected projects:

CITY & COUNTY - PUBLIC WORKS PROJECTS

2024	City of Lakeside	Wastewater Treatment Plant Improvements – Phase I
2024	City of Molalla	Wastewater Treatment Plant Upgrades
2023	City of Coquille	Sedimentation Bason Investigation
2023	City of Reedsport	Forest Hills Pump Station
2023	City of Sutherland	Ford's Pond Community Park – Phase II
2022	Kitsap County, WA	North Kitsap Service Center
2021	City of Sutherlin	New City Park Event Stage
2021	City of Coos Bay	Pump Station #6 and #9 Improvements
2021	City of Myrtle Creek	New Riverside Pump Station
2020	City of Molalla	New Molalla Pedestrian Bridge
2020	City of Myrtle Creek	Johnson Street Bridge Waterline Replacement Project
2019	Charleston, OR	Charleston Sanitary District Pump Station 7 Improvements
2019	City of Gold Beach	Gold Beach WTP Improvements
2019	City of Molalla	WWTP Improvements – New Stop-gate Winch Support
2019	City of Sutherlin	Nonpareil WTP Improvements
2019	City of Sutherlin	Pump Station Improvements
2019	Winston-Dillard W.D	Raw Water Intake System
2018	City of Coos Bay	Pump Station #17
2018	City of Gold Beach	Docia Sweet Event Center Reroof Project
2018	Heceta Water District	Existing Metal Building Treatment Plant Improvements
2017	City of Canyonville	Canyonville WWTP Phase II Improvements
2017	City of Molalla	WWTP Improvements
2017	Winchester Bay	Winchester Bay Biosolids Hoist Structure
2016	City of Sutherlin	WWTP Improvements
2015	City of Coos Bay	6th Avenue Culvert Repair
2015	City of Drain	WWTP Improvements
2014	City of Bandon	New Biosolids Facility
2014	City of Coos Bay	Pump Station #1 Improvements

EDUCATION
Oregon State University, BS Engineering

REGISTRATIONS
Oregon PE, SE
California PE
Washington PE

ORGANIZATIONS
Structural Engineers Association of Oregon

State of Oregon Post Earthquake Evaluation Inspector

American Concrete Institute, Oregon Chapter

Ken Rust, PE
Principal

Ken Rust is a Principal with a focus on commercial and retail development at VLMK. He has been with the firm since 2001, working on projects in Oregon, Nevada, Washington, California, and Texas. Ken is particularly adept at construction involving steel-frame, reinforced masonry, wood-framing and cold-formed steel framing. He is effective in developing and maintaining clear project communications that provide quick responses to challenges as they surface resulting in successful projects.

Ken provided Principal-in-Charge, Engineer of Record, Project Management, and/or Structural Engineering services on the following significant projects:

CITY OF MOLALLA WASTEWATER TREATMENT PLANT
Molalla, OR

New concrete grit removal headworks structure for the expansion of the existing City of Molalla wastewater treatment plant facility. Headworks structure consisted of special reinforced concrete shear walls supporting elevated open concrete channels for wastewater circulation through suspended grit removal equipment and distribution into surrounding facility basins.

CITY OF LAKESIDE WASTEWATER TREATMENT PLANT
Lakeside, OR

New concrete grit removal headworks structure for the expansion of the existing City of Lakeside wastewater treatment plant facility. Headworks structure consisted of special reinforced concrete shear walls supporting dual elevated open concrete channels with rotary drum equipment for wastewater circulation through suspended grit removal equipment and distribution into surrounding facility basins.

LEVETON
Tualatin, OR

VLMK provided structural engineering for two new building "shells" intended for the high-tech market on undeveloped land. The buildings are known as North Wing 31,720 Sq. Ft. and South Wing 52,660 Sq. Ft., and both are two story concrete and steel structures complete with utilities, parking, sidewalks, and exterior lighting.

LONGACRES BUSINESS CENTER
Renton, WA

VLMK provided structural engineering for four spaces for the Longacres Business Center. Phase I featured two state-of-the-art spaces totaling approximately 240,000 Sq. Ft. for administrative, lab, pharmacy fulfillment and warehouse operations. Building A is a three-story general office use building and Building B is a two-story general office, laboratory, and warehouse space building. Phase II consisted of two additional three-story standalone buildings totaling 300,000 Sq. Ft. The buildings from both phases incorporate tilt-up concrete panels in conjunction with steel framing and light gauge metal construction with heights at roughly 46 feet and 36 feet.

EDUCATION
Oregon State University,
BS Civil Engineering, 2001
Emphasis in Structures

REGISTRATIONS
Oregon PE
Washington PE

ORGANIZATIONS
Structural Engineers Association of Oregon (SEAO)

American Institute of Steel Construction (AISC)

VLMK ENGINEERING + DESIGN

Eric Alexander Esqueda, PE

Project Engineer

Eric is a Project Engineer with experience in the design, analysis, and project management of structural engineered designs in a wide variety of disciplines utilizing a broad range of structural systems for both new and existing construction. From the design and detailing of special seismically-resistant steel, concrete, and wood-framed buildings; to the rehabilitation of structurally-obsolete or historic structures, Eric draws upon his breadth and depth of structural expertise in working with his clients to develop elegant and efficient structural solutions.

Eric has provided project engineer and project management services on the following significant projects:

CITY OF MOLALLA WASTEWATER TREATMENT PLANT

Molalla, OR

New concrete grit removal headworks structure for the expansion of the existing City of Molalla wastewater treatment plant facility. Headworks structure consisted of special reinforced concrete shear walls supporting elevated open concrete channels for wastewater circulation through suspended grit removal equipment and distribution into surrounding facility basins.

CITY OF LAKESIDE WASTEWATER TREATMENT PLANT

Lakeside, OR

New concrete grit removal headworks structure for the expansion of the existing City of Lakeside wastewater treatment plant facility. Headworks structure consisted of special reinforced concrete shear walls supporting dual elevated open concrete channels with rotary drum equipment for wastewater circulation through suspended grit removal equipment and distribution into surrounding facility basins.

VANCOUVER INNOVATION CENTER

Vancouver, WA

The expansion of the Vancouver Innovation Center campus consisted of a new 201,000 sq. ft. warehouse and office facility. The building featured a 41,000 sq. ft. concrete metal deck mezzanine, recessed sawtooth loading docks, and a polycarbonate and glulam-framed glazing system which cantilevers over the front entry elevation. Construction consisted of special reinforced concrete tilt-up walls on both the interior and exterior walls, hybrid panelized roof system, and pilaster-supported concrete spandrels over the recessed sawtooth loading docks.

ARCTIC BUILDING SHELL RETROFIT

Beaverton, OR

Conversion of existing 15,000 sq. ft. TV broadcast studio built in 1983 into leasable office and warehouse space with new full-height glazing systems and entry façade renovations. Building structure consisted of existing concrete masonry walls with wood-framed roof and floor systems which required a full building system seismic retrofit to upgrade the structure to current code using new floor sheathing and new plywood shear walls.

EDUCATION

Clemson University, BS Civil Engineering, 2016, Emphasis in Structural Engineering

REGISTRATIONS

Oregon PE
California PE

ORGANIZATIONS

Structural Engineers Association of Oregon (SEAO), Young Members Forum Chair

VLMK
ENGINEERING + DESIGN

The Dyer Partnership Engineers & Planners, Inc.

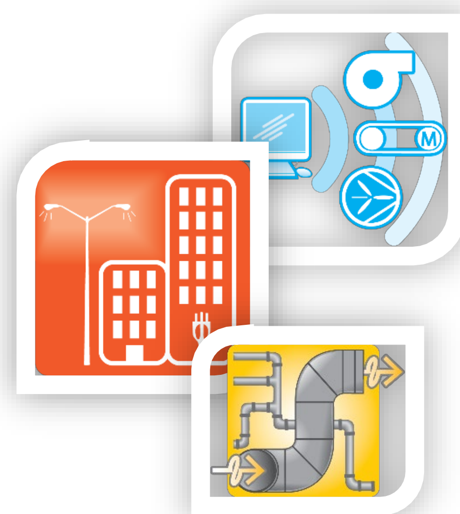
JOHN DAY
Oregon

REQUEST FOR PROPOSALS

JOHN DAY WASTEWATER TREATMENT PLANT

Response Date: May 20, 2024

R&W ENGINEERING, INC.



Contact Person:
Sam Russum, PE
R&W Engineering, Inc.
9615 SW Allen Boulevard, Suite 107
Beaverton, OR 97005
Office: (503) 292-6000 / Direct Dial: (503)726-33
srussum@rweng.com

R&W Engineering provides Electrical, Mechanical and Automation engineering services for municipal, industrial, commercial, institutional, and governmental clients. R&W has been involved in the design of municipal pump stations and treatment plants for water and wastewater applications and analysis since opening our doors in 1978. This includes plant projects designs, construction observation, start-up, and programming. Our engineering staff is very familiar with the electrical requirements for water pumping and control.

R&W and The Dyer Partnership have worked on multiple successful wastewater processing facility and pump station projects together. R&W has completed many projects through the City of John Day and surrounding areas with relevant scope type since 1978. We are experienced and familiar with the various details related to electrical, mechanical, and control system needs as well as all requirements for local codes and utilities.

Samuel M. Russum, PE, LEED® AP
Associate, Electrical Engineer, Project Manager

Mr. Russum is an Electrical Engineer and has been in the engineering field since 2006. He is also an associate at R&W and has been a project manager since 2015. His experience encompasses design and integration of electrical and automated systems for commercial, municipal, and industrial projects. These include water and wastewater treatment facilities, lift and booster stations, cellular tower sites, office buildings, retail spaces, airport lighting and control, and manufacturing facilities. He has extensive experience with PLC, HMI, and SCADA system programming, as well as power coordination and system analysis. He is also a LEED accredited professional who has been involved in LEED (USGBC) projects. Mr. Russum has also been involved in recreational park designs that have incorporated lighting, power and control needs depending on the level of intricacy required by the individual projects. They have ranged from small improvement pieces to complete park renovations.

Relevant Project Experience

City of Brownsville, Wastewater Treatment Plant, Brownsville, OR
City of Canyonville, Wastewater Treatment Plant, Canyonville, OR
City of Aumsville, WWTP Headworks & Lift Station, Aumsville, OR
City of Enterprise, WWTP, Enterprise, OR
City of Hood River, Pump Station, Hood River, OR
City of Portland, Hayden Island Pump Station, Portland, OR
City of Portland, Sellwood Temporary Bypass Pump Station, Portland, OR
City of Portland, Umatilla Pump Station, Portland, OR
City of Salem, Boone Road Pump Station, Salem, OR
City of Seaside, Wastewater Treatment Plant, Seaside, OR
City of Seaside, Water Treatment Plant Upgrades, Seaside, OR
City of Stayton, Wastewater Treatment Plant, Stayton, OR
City of Sweet Home, Water Treatment Plant, Sweet Home, OR
Clean Water Services, River Terrace North and South Pump Stations, Sherwood, OR
Port of Vancouver, Pump Station, Vancouver, WA
Port of Walla Walla, Wallula-Dodd Water System, Walla Walla, WA
Sutherlin Wastewater Treatment Plant – Sutherlin, OR

Education

Bachelor of Science of Electrical Engineering, University of Portland

Professional Memberships

IEEE Member since 2005
LEED Accredited Professional

Professional Engineer (Electrical) Registrations: State of Oregon &Washington

John A. Wells, PE

Electrical Engineer, Automation and Controls, Project Manager

John Wells is an electrical engineer who has worked on electrical design, controls design, programming, and integration for over 25 years. Mr. Wells has extensive experience with servicing or modifying control systems and troubleshooting complicated problems. He uses this experience to follow projects into the field to commission the equipment and train the operators. A sampling of Mr. Wells past projects includes water and wastewater treatment projects, sawmill and plywood equipment controls design, equipment manufacturing, boiler controls, lumber dry kiln controls design, and integration of new equipment with existing facilities. Mr. Wells also has experience with new process research and development, design, and prototyping.

Relevant Project Experience

BDO Wood and Alfalfa Pellet Mill, Burns, OR
City of Boardman, Pump Station, Boardman, OR
City of Cascade Locks, Wastewater Treatment Plant, Cascade Locks, OR
City of La Grande, Wastewater Treatment Plan, La Grande, OR
City of Prineville, OID Lift Stations, Prineville, OR
City of Prineville, Ochoco Pump Station, Prineville, OR
City of Prineville, OID Lift Stations, Prineville, OR
City of Prineville, Ochoco Pump Station, Prineville, OR
City of Reedsport, Stormwater Pump Station, Reedsport, OR
City of Salem, ASR #4, Controls Design, Salem, OR
City of Sisters, Sisters Well #4, Sisters, OR
City of Winlock, Water Wells & Reservoir SCADA System, Winlock, WA
City of White Salmon, Water & Wastewater SCADA System, White Salmon, WA
Clean Water Services, Durham Train Five Substation, Durham, OR
Columbia Irrigation District, Columbia River PS, Boardman, OR
Great Western Malting, Railroad Relocation Electrical & Controls Design, Vancouver, WA
Koch Carbon, Dust Abatement, Controls Design, PLC & HMI, Startup Controls, Chicago, IL
Koch Carbon, Hematite storage yard, electrical/controls, Programming & Startup, Benton, IL
Scoular Fishmeal Processing Facility, Warrenton, OR

Education

US Navy | Nuclear Power Program (submarines) | Electrical Operator, Student Instructor
Bachelor of Science | Electrical Engineering | University of Portland

Professional Engineer (Electrical) Registrations: Oregon

Mark D. Jones, PE, LEED® AP, CCP
Associate, Mechanical Engineer, Project Manager, Energy Analyst, Commissioning Agent

Mark Jones is a Mechanical Engineer who has been in the engineering field since 1996. He is experienced in HVAC, piping and plumbing design, energy audits, life cycle cost analysis, and LEED energy modeling and commissioning. He is up to date in the various mechanical, plumbing, and energy codes. In his well-rounded experience, he has designed commercial, industrial, municipal, educational, and residential mechanical and industrial process systems. Mr. Jones has worked on numerous projects with utility and state agencies including Energy Trust of Oregon, Clark Public Utilities, Bonneville Power Administration, and Oregon Department of Energy to improve energy efficiency for clients while helping to secure rebate incentives. He is a quality team player with excellent communication skills. In his comprehensive background, he has solved complicated design problems, and works well with all members of a building team including owners, contractors, and designers.

Relevant Project Experience

City of Battle Ground, Pump Station, Battle Ground, WA
City of Bend, Westside Pump Station, Bend, OR
City of Brownsville, Wastewater Treatment Plant, Brownsville, OR
City of Chehalis, Regional Wastewater Reclamation Plant, Chehalis, WA
City of Hood River, Chlorination Building, Hood River, OR
City of La Center, Water Reclamation Plant, La Center, OR
City of Longview, Pump Station Replacements– Longview, WA
City of Longview, Hudson & Douglas Pump Station, Longview, WA
City of Netarts, Pump Station, Netarts, OR
City of Oregon City, Mountain View Reservoir, Oregon City, OR
City of Portland, Argyle & 13th Pump Station, Portland, OR
City of Portland, Umatilla Pump Station, Portland, OR
City of Portland, Linnton Pump Station, Portland, OR
City of Redmond, Forked Horn Butte Water Pump Station, Redmond, OR
City of Salem, West Salem Pump Station, Salem, OR
City of Sandy, Rainwater Harvesting, Sandy, OR
City of St. Helens, Wastewater Pump Station, St. Helens, OR
City of Wilsonville, Water Treatment Plant, Wilsonville, OR
City of Winlock, Wastewater Treatment Plant, Winlock, WA
Oak Lodge Water District, Wastewater Treatment Plant, Milwaukie, OR

Education

Bachelor of Arts, Liberal Studies, Azusa Pacific University
Associate Applied Science, Mechanical Engineering Tech., Portland Community College

Professional Memberships

Building Commissioning Association (BCxA)
Leadership in Energy and Environmental Design (LEED)

Professional Engineer (Mechanical) Registrations: Oregon, Washington, California

JOHN DAY WASTEWATER SYSTEM IMPROVEMENTS
JOHN DAY, OREGON
MAY 30, 2024

FIRM PROFILE

Foundation Engineering, Inc. (FE) is an Oregon based geotechnical engineering consulting firm that has been providing expert design and construction monitoring services since 1982. FE has offices in Corvallis and Beaverton. The FE team includes eight professional engineers, a certified engineering geologist, and administrative personnel. FE performs geotechnical investigations for a wide range of projects including investigations for water and wastewater facilities, intake structures, pump stations, and water and wastewater transmission lines.

FE has conducted investigations for numerous projects for wastewater treatment facilities similar to the planned John Day Wastewater System improvements. Additionally, FE has conducted previous geotechnical investigations in John Day for buildings runways and taxiways at the airport, for a bridge replacement on Lamford Drive crossing Canyon Creek, and for the City's greenhouses. FE's extensive experience with similar projects and understanding of the local geology will be beneficial to the project.

EXAMPLE PROJECTS

City of La Pine – Water and Sewer Improvements
The project included constructing a new reservoir, new water and wastewater transmission lines, three new lift stations, a new irrigation pipeline, and a new effluent spray field. The geotechnical work included site reconnaissance, exploratory drilling, and development of geotechnical recommendations. Construction was completed in phases. Construction considerations included moisture-sensitive soil, shallow groundwater, and evaluating the suitability of reusing excavated soil as backfill.

Lebanon Water Treatment Plant, Lebanon, Oregon
The project constructed a new intake structure on the South Santiam River, a pump station, a 0.7-mile long, 24-inch diameter, raw water transmission line, and a new water treatment plant (WTP). The construction of the raw water transmission line included cut-and-cover construction along most of the alignment and an undercrossing of the Santiam-Albany Canal constructed using bore-and-jack methods to install a 42-inch diameter sleeve. An additional undercrossing of the canal was completed upstream using open trenching to install a new 42-inch diameter, steel underdrain pipe for Cheadle Lake. The geotechnical work included exploratory drilling and test pits, field and laboratory testing, and development of geotechnical recommendations. FE also provided construction consultation. Shallow groundwater was a key geotechnical consideration.

David L. Running, Ph.D., P.E., G.E.

Senior Geotechnical Engineer

Dave Running is a Senior Geotechnical Engineer at the Corvallis office of Foundation Engineering, Inc. He has 28 years of geotechnical engineering experience and has completed geotechnical investigations for a wide range of projects including buildings, bridges, culverts, dams, industrial facilities, landslides, levies, pipelines, reservoirs, water and wastewater treatment facilities, and seismic hazard studies. Dave has conducted investigations for numerous water and wastewater transmission line projects throughout Oregon. He has also conducted investigations for projects at the Grant County Airport in John Day. A selected list of his water and wastewater project experience includes:

- LaPine Water and Sewer Improvements, LaPine, Oregon. The project included constructing a new reservoir, new sewer and water transmission lines, three new lift stations, a new irrigation pipeline, and the development of a new effluent spray field. The geotechnical work included site reconnaissance, exploratory drilling, and development of geotechnical recommendations. Construction considerations included moisture-sensitive soil and shallow groundwater. Dave was the geotechnical lead.
- Florence WWTP UV Disinfection Improvements, Florence, Oregon. The project is adding a new UV disinfection channel to the existing WWTP. The UV channel is 7.8 feet wide by 42 feet long and up to 8.1 feet deep. The channel is being constructed immediately adjacent to an existing structure. Maintaining stable cut slopes and mitigating the presence of shallow groundwater were key geotechnical considerations. Dave was the geotechnical lead.
- MWMC Class A Recycled Water Facility, Eugene, Oregon. The project added an electrical building, hydropneumatic tanks, a recycled water pump station, a UV disinfection structure, a rain garden, pavements, and associated transmission lines to the City of Eugene's WWTP. Dave was the geotechnical lead.
- Agate Beach Sewer Improvements, Newport, Oregon. The project added two new pump stations and a ±1.1-mile-long force main. Construction of the new pump stations required ±30 to 37-foot deep excavations. Shoring was required to retain deep cuts and facilitate dewatering. Dave was the geotechnical lead.
- Big Creek Force Main and Pump Station, Newport, Oregon. The project added a new pump station and a ±0.95-mile-long, force main. Pump station construction required a ±25 to 30-feet deep excavation adjacent to a creek with shoring to retain deep cuts in soft soils and facilitate dewatering. A series of force main alignment options were considered. Considerations for the force main included shallow groundwater and liquefiable soils along some of the alignment options. Dave was the geotechnical lead.
- Lebanon Water Treatment Plant, Lebanon, Oregon. The project constructed a new intake structure, a ±0.7-mile long raw water transmission line, canal undercrossings, and a new water treatment facility. The new facility includes buildings, storage tanks, and clarifiers. Dave was the geotechnical lead.
- EWEB Hayden Bridge Filtration Plant Expansion, Springfield, Oregon. The project expanded the Hayden Bridge Filtration Plant. The expansion included additional filters, a contact basin, a pump station, a coagulation building, and a backwash storage tank. The project also included an expansion of the intake facility on the McKenzie River. Dave was the geotechnical lead.

Professional Registration

Oregon - Professional Engineer, Geotechnical Engineer
California - Professional Engineer
Washington - Professional Engineer

Academic

Ph.D.C.E. Washington State University - 1996
M.S.C.E. Washington State University - 1993
B.S.C.E. Washington State University - 1991

Experience Summary

1996 to Present — Foundation Engineering, Inc., Corvallis, Oregon

The Dyer Partnership Engineers & Planners, Inc.

Coos Bay Office (HQ)
1330 Teakwood Avenue
Coos Bay, Oregon 97420
541.269.0732

Sutherlin Office
541.459.4619

Lebanon Office
541.405.4520

www.dyerpart.com

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CITY OF JOHN DAY
REQUEST FOR COUNCIL ACTION

DATE ACTION REQUESTED: June 11, 2024			
Ordinance ☐	Resolution ☐	Motion X	Information
Date Prepared: June 6, 2024		Dept.: City Manager's Office	
SUBJECT: Approve Contract for audit services.		Contact Person for this Item: Melissa Bethel, City Manager, bethelm@grantcounty-or.gov, (541) 575-0028	

SUBJECT: Approval of 3 year contract for audit services by Zwygart John & Associates, PLLC

BACKGROUND: On May 14th the City approved moving forward with a 3 year contract for audit services with Zwygart John & Associates, PLLC. Staff is bringing back the professional services contract for approval. Staff is recommending the Council approve the contract subject to legal council review and revisions.

FINANCIAL IMPACT: The 3 year contract is not to exceed $60,000.

COUNCIL ACTION REQUESTED: Motion to approve and allow the City Manager to sign the contract with Zwgart John & Associates, PLLC for audit services for 3 fiscal years in an amount not to exceed $60,000 subject to legal review.

ATTACHMENTS:

#1 – Professional Services Contract

PROFESSIONAL SERVICES AGREEMENT – CITY REVIEW AND AUDIT

This Professional Services Agreement – URA Review and Audit (this "Agreement") is dated June ___, 2024, but made effective for all purposes as of the Effective Date (as defined below), and is entered into between the City of John Day ("City") an Oregon municipal corporation, whose address is 450 E Main Street, John Day, Oregon 97845, and Zwygart John & Associates CPAs, PLLC ("Consultant"), an Idaho professional limited liability company, whose address is 16130 North Merchant Way, Suite 120, Nampa, Idaho 83687.

RECITALS:

Consultant will perform the Services (as defined below) for and on behalf of City in accordance with, and subject to, the terms and conditions contained in this Agreement.

AGREEMENT:

NOW, THEREFORE, in consideration of the parties' mutual obligations contained in this Agreement, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto hereby agree as follows:

1. Consultant Services.

1.1 Services; Standards. Subject to the terms and conditions contained in this Agreement, Consultant will perform the following audit and review services concerning City and its work on behalf of the City of John Day ("City") (collectively, the "Services"): (a) those audit and review services described in the Scope of Work attached hereto as Schedule 1.1 (the "Scope of Work"); (b) all other necessary or appropriate services customarily provided by Consultant in connection with its performance of those services described in the Scope of Work; and (c) such other audit and review related services requested by City's city manager from time to time. Consultant will (x) consult with and advise City on all matters concerning the Services reasonably requested by City, (y) communicate all matters and information concerning the Services to the city manager and perform the Services under the general direction of the city manager, and (z) devote such time and attention to the performance of the Services as City deems necessary or appropriate. For purposes of this Agreement, the term "city manager" means City's then-appointed city manager and his or her designees.

1.2 Schedule; Condition Precedent. The Services will be completed expeditiously, in a timely manner, and in accordance with the schedule identified in the Scope of Work. Notwithstanding anything contained in this Agreement to the contrary, City's performance of its obligations under this Agreement is conditioned on Consultant's performance of its obligations under this Agreement, including, without limitation, those Consultant obligations identified under Section 4.4.

2. Compensation.

2.1 Compensation. Subject to the terms and conditions contained in this Agreement, in consideration of Consultant's timely performance of the Services in accordance with this Agreement, City will pay Consultant in accordance with the Fee Schedule attached hereto as Schedule 2.1. Consultant will submit monthly invoices to City concerning the Services performed by Consultant during the immediately preceding month (each an "Invoice"). Each Invoice will contain the following information: (a) a summary of the Services performed by Consultant (and by whom); (b) the number of hours (or fraction thereof) each person spent to perform the Services; (c) the applicable fee(s) for performing the Services; and (d) all other information reasonably requested by City. City will pay the amount due under each Invoice within thirty (30) days after City has reviewed and approved the Invoice. No compensation will be paid by City for any portion of the Services not performed. City's payment will be accepted by Consultant as full compensation for performing the Services. Notwithstanding anything contained in this Agreement to the contrary, total compensation payable by City under this Agreement for performance of the Services will not exceed $60,000.00 without first obtaining City's prior written consent.

2.2 No Benefits; No Reimbursement. City will not provide any benefits to Consultant, and Consultant will be solely responsible for obtaining Consultant's own benefits, including, without limitation, insurance, medical reimbursement, and retirement plans. Consultant will provide, at Consultant's cost and expense, all materials, equipment, and supplies necessary or appropriate to perform the Services. City will not reimburse Consultant for any expenses Consultant incurs to perform the Services.

3. Relationship.

3.1 Independent Contractor. Consultant is an independent contractor of City. Consultant is not an employee of City. Consultant will be free from direction and control over the means and manner of performing the Services, subject only to the right of City to specify the desired results. This Agreement does not create an City relationship between City and Consultant and does not establish a joint venture or partnership between City and Consultant. Consultant does not have the authority to bind City or represent to any person that Consultant is an agent of City. Consultant has the authority to hire other persons to assist Consultant in performing the Services (and has the authority to fire such persons).

3.2 Taxes; Licenses. City will not withhold any taxes from any payments made to Consultant, and Consultant will be solely responsible for paying all taxes arising out of or resulting from Consultant's performance of the Services, including, without limitation, income, social security, workers' compensation, and employment insurance taxes. Consultant will be solely responsible for obtaining all licenses, approvals, and certificates necessary or appropriate to perform the Services.

4. Representations; Warranties; Covenants.

In addition to any other Consultant representation, warranty, and/or covenant made in this Agreement, Consultant represents, warrants, and covenants to City as follows:

4.1 Authority; Binding Obligation; Conflicts. Consultant is validly existing and in good standing under applicable Oregon law. Consultant has full power and authority to sign and deliver this Agreement and to perform all Consultant's obligations under this Agreement. This Agreement is the legal, valid, and binding obligation of Consultant, enforceable against Consultant in accordance with its terms. The signing and delivery of this Agreement by Consultant and the performance by Consultant of all Consultant's obligations under this Agreement will not (a) breach any agreement to which Consultant is a party, and/or give any person the right to accelerate any obligation of Consultant, (b) violate any law, judgment, and/or order to which Consultant is subject, and/or (c) require the consent, authorization, and/or approval of any person, including, without limitation, any governmental body.

4.2 Quality of Services. Consultant will perform the Services diligently, in good faith and in a professional manner, free from errors or omissions, and to the best of Consultant's ability. The Services will be performed in accordance with the Laws (as defined below). Consultant will be solely responsible for the Services. Consultant will make all decisions called for promptly and without unreasonable delay. All materials and documents prepared by Consultant will be accurate, complete, unambiguous, prepared properly, and in compliance with the Laws.

4.3 Insurance. During the term of this Agreement, Consultant will obtain and maintain, in addition to any other insurance required under this Agreement, the following minimum levels of insurance: (a) general liability insurance for all losses or claims arising out of or related to Consultant's performance of its obligations under this Agreement (including, without limitation, damages as a result of death or injury to any person or destruction or damage to any property) with limits of no less than $2,000,000 per occurrence, $4,000,000 in the aggregate; (b) comprehensive automobile liability insurance for all owned, non-owned, and hired vehicles that are or may be used by Consultant in connection with Consultant's performance of the Services with limits of no less than $2,000,000 combined single limit; (c) professional liability insurance (errors and omissions insurance) with limits of no less than $2,000,000 per occurrence, $2,000,000 in the aggregate; and (d) workers' compensation insurance in form and amount sufficient to satisfy the requirements of applicable Oregon law. Each liability insurance policy required under this Agreement will be in form and content satisfactory to City, will list City and each City Representative (as defined below) as an additional insured (except for Consultant's professional liability insurance policy), and will contain a severability of interest clause; the workers' compensation insurance will contain a waiver of subrogation in favor of City. The insurance Consultant is required to obtain under this Agreement may not be cancelled without ten (10) days' prior written notice to City. Consultant's insurance will be primary and any insurance carried by City will be excess and noncontributing. Consultant will furnish City with appropriate documentation evidencing the insurance coverage (and provisions) and endorsements Consultant is required to obtain under this Agreement upon Consultant's execution of this Agreement and at any other time requested by City. If Consultant fails to maintain the insurance required under this Agreement, City will have the option, but not the obligation, to obtain such coverage with costs to be reimbursed by Consultant immediately upon City's demand.

4.4 Compliance with Laws. Consultant will comply and perform the Services subject to and in accordance with the Laws. Without otherwise limiting the generality of the immediately preceding sentence, Consultant will comply with each obligation applicable to Consultant and/or this Agreement under ORS 279B.220, 279B.225, 279B.230, and 279B.235, which statutes are incorporated herein by reference. Prior to the Effective Date, Consultant obtained all licenses, approvals, and/or certificates necessary or appropriate to perform the Services, including, without limitation, a business license from City and an unexpired certificate issued by the Oregon Department of Administrative Services under ORS 279A.167. For purposes of this Agreement, the term "Law(s)" means all applicable federal, state, and local laws, regulations, restrictions, orders, codes, rules, and/or ordinances related to or concerning Consultant, this Agreement, and/or the Services, including, without limitation, all applicable City ordinances, resolutions, policies, regulations, orders, restrictions, and guidelines, all as now in force and/or which may hereafter be amended, modified, enacted, and/or promulgated.

4.5 Indemnification. To the fullest extent permitted by the Laws, Consultant releases and will defend, indemnify, and hold City and each present and future City officer, employee, and representative harmless for, from, and against all claims, actions, proceedings, damages, liabilities, injuries, losses, and expenses, including, without limitation, attorney fees and costs, resulting from or arising out of the following: (a) damage, injury, and/or death to person or property caused by Consultant's acts and/or omissions (and/or the acts and/or omissions of Consultant's directors, officers, shareholders, members, managers, partners, employees, agents, representatives, and/or contractors); (b) Consultant's failure to pay any tax arising out of or resulting from performance of the Services; and/or (c) Consultant's breach and/or failure to perform any Consultant representation, warranty, covenant, and/or obligation contained in this Agreement. Consultant's indemnification obligations provided in this Section 4.5 will survive the termination of this Agreement.

4.6 Assignment of Studies and Reports. Consultant will assign all studies, reports, data, documents, and/or materials of any kind produced under this Agreement (collectively, the "Deliverables") to City upon the earlier of City's request or termination of this Agreement. All copies of the materials provided to City will become the property of City who may use them without Consultant's permission for any proper purpose relating to the Services, including, without limitation, additions to or completion of the Services; provided, however, any City modification and/or use of the Deliverables for any non-Project related purpose will be at City's risk and expense. Consultant will defend all suits or claims for infringement of patent, trademark, and/or copyright for which Consultant is responsible (including, without limitation, any claims which may be brought against City), and Consultant will be liable to City for all losses arising therefrom, including costs, expenses, and attorney fees.

4.7 Records. Consultant will maintain complete and accurate records concerning all Services performed, the number of hours each person spent to perform the Services, and all documents produced under this Agreement for a period of three years after termination of this Agreement. Consultant's records will be maintained in accordance with sound accounting practices. Consultant will provide City access to any Consultant books, documents, papers, and/or records which are pertinent to this Agreement and/or the Services. Consultant will maintain all books, documents, papers, and records generated under this Agreement for a period no less than three years commencing on the date of City's final payment to Consultant under this Agreement.

4.8 Confidential Information. During the term of this Agreement, and at all times thereafter, Consultant will maintain all Confidential Information (as defined below) in the strictest confidence and will not directly or indirectly use, communicate, and/or disclose any Confidential Information to any person, or remove or make reproductions of any Confidential Information, except that Consultant may (a) use Confidential Information to perform the Services to the extent necessary, and (b) communicate or disclose Confidential Information in accordance with a judicial or other governmental order or as required by applicable law, but only if Consultant promptly notifies the city manager of the order and complies with any applicable protective or similar order. Consultant will promptly notify the city manager of any unauthorized use, communication, and/or disclosure of any Confidential Information and will assist City in every way to retrieve any Confidential Information that was used, communicated, and/or disclosed by Consultant and will exert Consultant's best efforts to mitigate the harm caused by the unauthorized use, communication, and/or disclosure of any Confidential Information. Upon the earlier of City's request or termination of this Agreement, Consultant will immediately return to City all documents, instruments, and/or materials containing any Confidential Information accessed or received by Consultant, together with all copies and summaries of such Confidential Information. If requested by City, Consultant will execute a written certification satisfactory to City pursuant to which Consultant will represent and warrant that Consultant has returned all Confidential Information to City in accordance with the terms of this Agreement. Notwithstanding anything contained in this Agreement to the contrary, the terms of this Agreement do not operate to transfer any ownership or other rights in or to the Confidential Information to Consultant or any other person. For purposes of this Agreement, the term "Confidential Information" means all documentation, information, and/or materials identified by City as confidential and/or any documentation, information, and/or materials relating to or concerning City's future plans, business affairs, employment, legal, and litigation matters that need to be protected from improper disclosure, in whatever form (e.g., hard and electronic copies, etc.), that is received or accessed by Consultant; provided, however, the term "Confidential Information" does not include City's public records which are non-exempt public records under applicable federal, state, and/or local laws.

5. Term; Termination.

5.1 Term of Agreement. Subject to the terms and conditions contained in this Agreement, the term of this Agreement commenced on the Effective Date and will remain in full force and effect until Consultant's completion of the Services, unless sooner terminated or extended as provided in this Agreement. Notwithstanding anything contained in this Agreement to the contrary, this Agreement may be terminated (a) at any time by the mutual written agreement of City and Consultant, and/or (b) by City for convenience and without cause by giving ten (10) days' prior written notice of such termination to Consultant. Upon receipt of the notice of termination, except as explicitly directed by City, Consultant must immediately discontinue performing any Services.

5.2 Termination for Cause. Notwithstanding anything contained in this Agreement to the contrary, a party may terminate this Agreement immediately upon notice to the other party upon the happening of any of the following events: (a) the other party engages in any form of dishonesty or conduct that reflects adversely on the reputation or operations of the party; (b) the other party fails to comply with any applicable law related to the other party's independent contractor relationship with the party; (c) in the case of City, problems occur in connection with Consultant's performance of the Services; and/or (d) the other party breaches and/or otherwise fails to perform any of the other party's representations, warranties, covenants, and/or obligations contained in this Agreement.

5.3 Consequences of Termination. Upon termination of this Agreement, (a) City will not be obligated to reimburse or pay Consultant for any continuing contractual commitments to others or for penalties or damages arising from the cancellation of such contractual commitments, and (b) after receipt of Consultant's final Invoice, City will pay Consultant (in accordance with Section 2.1) for all Services completed by Consultant in accordance with this Agreement through the date of the termination; provided, however, City may withhold payment for an amount approximating the fees for the Services that may be in dispute if City furnishes written notice to

Consultant containing a description of the basis for the dispute and amount withheld. Notwithstanding anything contained in this Agreement to the contrary, termination of this Agreement will not constitute a waiver or termination of any rights, claims, and/or causes of action the party may have against the other party. Within a reasonable period of time after termination of this Agreement (but in no event later than five days after termination), Consultant will deliver to City all materials and documentation, including raw or tabulated data and work in progress, related to or concerning the Services.

5.4 Remedies. If a party breaches and/or otherwise fails to perform any of its representations, warranties, covenants, and/or obligations under this Agreement, the non-defaulting party may, in addition to any other remedy provided to the non-defaulting party under this Agreement, pursue all remedies available to the non-defaulting party at law or in equity. All available remedies are cumulative and may be exercised singularly or concurrently.

6. Miscellaneous.

6.1 Severability; Assignment; Binding Effect. Each provision contained in this Agreement will be treated as a separate and independent provision. The unenforceability of any one provision will in no way impair the enforceability of any other provision contained herein. Any reading of a provision causing unenforceability will yield to a construction permitting enforcement to the maximum extent permitted by applicable law. Consultant will not assign this Agreement to any person without City's prior written consent. Subject to the immediately preceding sentence, this Agreement will be binding on the parties and their respective heirs, personal representatives, successors, and permitted assigns, and will inure to their benefit. This Agreement may be amended only by a written agreement signed by each party.

6.2 Attorney Fees; Dispute Resolution. If any arbitration or litigation is instituted to interpret, enforce, and/rescind this Agreement, including, without limitation, any proceeding brought under the United States Bankruptcy Code, the prevailing party on a claim will be entitled to recover with respect to the claim, in addition to any other relief awarded, the prevailing party's reasonable attorney fees and other fees, costs, and expenses of every kind, including, without limitation, costs and disbursements specified in ORCP 68 A(2), incurred in connection with the arbitration, the litigation, any appeal or petition for review, the collection of any award, or the enforcement of any order, as determined by the arbitrator or court. If any claim, dispute, or controversy arising out of or related to this Agreement occurs (a "Dispute"), City and Consultant will exert their best efforts to seek a fair and prompt negotiated resolution of the Dispute and will meet at least once to discuss and seek a resolution of the Dispute. If the Dispute is not resolved by negotiated resolution, either party may initiate a suit, action, arbitration, or other proceeding to interpret, enforce, and/or rescind this Agreement.

6.3 Governing Law; Venue. This Agreement is governed by the laws of the State of Oregon, without giving effect to any conflict-of-law principle that would result in the laws of any other jurisdiction governing this Agreement. Any action or proceeding arising out of this Agreement will be litigated in courts located in Grant County, Oregon. Each party consents and submits to the jurisdiction of any local, state, or federal court located in Grant County, Oregon.

6.4 Attachments; Further Assurances; Notices. Any exhibits, schedules, instruments, documents, and other attachments referenced in this Agreement are part of this Agreement. The parties will sign other documents and take other actions reasonably necessary to further effect and evidence this Agreement. Time is of the essence with respect to Consultant's performance of its obligations under this Agreement. All notices or other communications required or permitted by this Agreement must be in writing, must be delivered to the parties at the addresses set forth above, or any other address that a party may designate by notice to the other party, and are considered delivered upon actual receipt if delivered personally, by fax or email transmission (with electronic confirmation of delivery), or by a nationally recognized overnight delivery service, or at the end of the third business day after the date of deposit if deposited in the United States mail, postage pre-paid, certified, return receipt requested.

6.5 Waiver; Entire Agreement. No provision of this Agreement may be modified, waived, or discharged unless such waiver, modification, or discharge is agreed to in writing by City and Consultant. No waiver of either party at any time of the breach of, or lack of compliance with, any conditions or provisions of this Agreement will be deemed a waiver of other provisions or conditions hereof. This Agreement contains the entire agreement and understanding between the parties with respect to the subject matter of this Agreement and contains all the terms and conditions of the parties' agreement and supersedes any other oral or written negotiations, discussions, representations, or agreements. Consultant has not relied on any promises, statements, representations, or warranties except as set forth expressly in this Agreement.

6.6 Person; Interpretation; Execution. For purposes of this Agreement, the term "person" means any natural person, corporation, limited liability company, partnership, joint venture, firm, association, trust, unincorporated organization, government or governmental City or political subdivision, or any other entity. All pronouns contained herein and any variations thereof will be deemed to refer to the masculine, feminine, or neutral, singular or plural, as the identity of the parties may require. The singular includes the plural and the plural includes the singular. The word "or" is not exclusive. The words "include," "includes," and "including" are not limiting. The titles, captions, or headings of the sections herein are inserted for convenience of reference only and are not intended to be a part of or to affect the meaning or interpretation of this Agreement. The parties may execute this Agreement in separate counterparts, each of which when executed and delivered will be an original, but all of which together will constitute one and the same instrument. Facsimile or email transmission of any signed original document will be the same as delivery of an original. At the request of either party, the parties will confirm facsimile or email transmitted signatures by signing and delivering an original document.

IN WITNESS WHEREOF, the undersigned have caused this Agreement to be executed and effective for all purposes as of the Effective Date.

CITY:
City of John Day,
an Oregon municipal corporation

____
Melissa Bethel, City Manager

Federal Tax Id. No.: _________________

Consultant:
Zwygart John & Associates CPAs, PLLC
an Idaho professional limited liability company

____
John Russell, Member

Federal Tax Id. No.:_________________

Schedule 1.1

Scope of Work

[attached]

Schedule 2.1
Fee Schedule

Fiscal Year Ending June 30, 2023: $18,000
Fiscal Year Ending June 30, 2024: $18,500
Fiscal Year Ending June 30, 2025: $19,000

If a Single Audit is required (because City has spent over $750,000 in federal funds) there will be an additional $6,000.00 charge added to the total audit cost for each year it is required.

AMENDMENT NO. 1 TO
PROFESSIONAL SERVICES AGREEMENT

This Amendment No. 1 to Professional Services Agreement (this "Amendment") is dated May ___, 2024, but made effective for all purposes as of the Effective Date (as defined below), and is entered into between City of John Day ("City"), an Oregon municipal corporation, whose address is 450 E Main Street, John Day, Oregon 97845, and Gaslin Accounting CPA's, PC ("Corporation"), an Oregon professional corporation, whose address is 2550 Broadway Street, Baker City, Oregon 97814.

RECITALS:

A. City and Corporation are parties to a certain Professional Services Agreement dated effective September 12, 2023 (the "Agreement"). Pursuant to the Agreement, Corporation is providing certain city recorder and professional accounting and related services for and on behalf of City. The term of the Agreement expires on June 30, 2024.

B. Subject to the terms and conditions contained in this Amendment, City and Corporation desire to enter into this Amendment to, among other things, (a) modify the compensation payable under the Agreement, and (b) extend the term of the Agreement for one additional period of one year (or 12 months).

AGREEMENT:

NOW, THEREFORE, in consideration of the parties' mutual obligations contained in this Amendment, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto hereby agree as follows:

1. <u>Extension</u>. Subject to the terms and conditions contained in this Amendment, the term of the Agreement is extended for one additional term of one year (or 12 months), commencing on July 1, 2024 and ending on June 30, 2025 (the "Extension Period"), unless sooner terminated as provided in the Agreement. Subject to the terms and conditions contained in this Amendment, the one-year extension provided under this Amendment is on the same terms and conditions contained in the Agreement.

2. <u>Amendment No. 1 – Contractor Services</u>. Subject to the terms and conditions contained in this Amendment and the Agreement, in addition to the Services identified under the Agreement, City and Contractor acknowledge and agree that Contractor will perform (and has performed) Services concerning or related to City's payroll and accounts payable data entry, financial reporting, and the provision of city recorder related training of certain City personnel.

3. <u>Amendment No. 2 – Compensation</u>. Commencing on July 1, 2024, but subject to the terms and conditions contained in this Amendment and the Agreement, City will pay Contractor $150.00 per hour in consideration of Contractor's timely and faithful performance of the Services. Contractor will submit monthly invoices to City concerning the Services performed by Contractor during the immediately preceding month (each an "Invoice"). Each Invoice will contain the following information: (a) a summary of the Services performed by Contractor (and by whom); (b) the number of hours (or fraction thereof) Contractor spent to perform the Services; (c) the applicable fees for performing the Services; and (d) all other information and documentation City may reasonably request. Subject to the terms and conditions contained in this Amendment and the Agreement, City will pay the amount due under each Invoice within thirty (30) days after City has reviewed and approved the Invoice. No compensation will be paid by City for any portion of the Services not performed. City's payment will be accepted by Contractor as full compensation for performing the subject Services. Notwithstanding anything contained in this Amendment and/or the Agreement providing otherwise, (y) as of July 1, 2024 City will not pay Contractor the Monthly Fee identified under Section 2.1 of the Agreement, and (z) total compensation payable by City for performances of the Services during the Extension Period will not exceed $80,000.00.

4. Miscellaneous.

4.1 Contractor affirms Contractor's representations, warranties, covenants, and agreements contained in the Agreement, except as specifically modified under this Amendment. This Amendment will not be construed as an actual or implied waiver and/or release of any Contractor obligation and/or liability arising out of or under the Agreement. This Amendment is made part of the Agreement. The terms and conditions of the Agreement that are not amended or otherwise modified by this Amendment remain unchanged and in full force and effect. All capitalized terms used in this Amendment not otherwise defined herein have the meanings assigned to them in the Agreement.

4.2 All prior and contemporaneous agreements, discussions, understandings, and negotiations, whether written or oral, express or implied, are merged herein, and to the extent inconsistent herewith, are of no further force and effect. No addition, modification, amendment, or alteration to this Amendment will be effective against the parties unless specifically agreed upon in writing and signed by the parties. This Amendment, and any document referenced in this Amendment, represents the complete, exclusive, and final understanding of the parties with respect to the subject matter of this Amendment. This Amendment may be executed in counterparts, each of which will be deemed an original, but all of which together will constitute one and the same agreement. If any term or provision contained in this Amendment is declared by a court of competent jurisdiction to be illegal or in conflict with any law, the validity of the remaining terms and provisions will not be affected, and the rights and obligations of the parties will be construed and enforced as if this Amendment did not contain the particular term or provision held to be invalid.

IN WITNESS WHEREOF, the parties have caused this Amendment to be executed and effective for all purposes as of the Effective Date.

City:
City of John Day,
an Oregon municipal corporation

____
By: Melissa Bethel, City Manager

Federal Tax Id. No.: 93-6002192

Date: ________________________________

Corporation:
Gaslin Accounting CPA's, PC
an Oregon professional corporation

____
By: Rober Gaslin, President

Federal Tax Id. No.: 84-2096430

Date: ________________________________