MEMORANDUM

TO: Russell Guerry (Orcas Power and Light)

FROM: Nerissa Zahora (Wisewood Energy)

CC: Andrew Haden (Wisewood Energy)

DATE: November 21, 2022

RE: Orcas Island resilience with biomass electric generation preliminary design summary

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Wisewood Energy was retained by the Orcas Power and Light Cooperative (OPALCO) to provide the preliminary design of a biomass combined heat-and-power (CHP) plant that can utilize locally available woody biomass material as fuel. The project builds upon longstanding efforts in land management and forest health, waste disposal, and exploration of biomass utilization in the San Juan Islands, including by OPALCO, San Juan Island Conservation District (SJICD), Rainshadow Consulting, Northwest Natural Resource Group (NNRG), and others. Previous work includes Wisewood's "Microgrid CHP Technology Assessment", completed for SJICD in September 2021, which laid the groundwork for many of the decisions made in the current scope of work.

The biomass system has been designed to support emergency preparedness on Orcas Island, provide an outlet for residual woody material generated from forest restoration treatments and utility line clearance, and establish an on-island energy asset that can supply power to critical infrastructure during outages. Utilizing locally available residual biomass as a reliable, renewable energy resource incentivizes forest management, provides a controllable energy asset for the community, supports island energy independence, and helps to improve regional air quality. This summary memo and supporting documentation constitutes the preliminary design package, and includes:

1. Preliminary site plan (Appendix A);
2. Preliminary mechanical design (Appendix B);
3. San Juan County pre-permitting application response (Appendix C);
4. OPALCO interconnection summary (Appendix D);
5. Capital cost opinion (Appendix E);
6. Operating cost opinion (F);
7. Financial pro forma (G); and
8. Emissions data summary (Appendix H).

CHP System Design

SYSTEM SIZING

The system designed includes 1 MW of electrical generation capacity, made up of eight individual 125-kW gasifiers. Biomass gasification systems are unique among renewable energy technologies because they offer always-on, 24/7 generation. This attribute makes wood energy attractive as a load-balancing, firm resource, and as a local generation asset that can be designed as a microgrid to enable critical facilities to continue operating in the event of mainland grid outages. For example, the 1 MW system is estimated to generate nearly 8,000 MWh per year, compared to just over 1,000 MWh per year that might be expected from a 1 MW solar array on Orcas Island[1]. With these benefits in mind, Wisewood worked with OPALCO to determine that 1 MW would be the optimal system capacity, balancing a variety of factors:

- **Grid needs:** In terms of providing reliability to the grid and mitigating peak electricity demand, the larger the system, the better. For example, OPALCO's perennial "winter problem" occurs when electricity demand spikes to two times the summer demand in the winter, while solar output is low. Other on-island resources are needed to meet winter loads if the community wishes to reduce its dependence on mainland energy.
- **Emergency preparedness**: The 2021 technology assessment completed for SJICD estimated the annual energy demand of several critical facilities, including the sheriff's office and public works building, fire and rescue, senior center, and Orcas ferry landing, to be under 200,000 kWh, suggesting that 1 MW would generate more than sufficient energy to serve as a microgrid for critical infrastructure on the island.
- **Available wood fuel**: The 1 MW system is estimated to require just under 6,000 bone dry tons (BDT) of wood fuel per year. The 2021 technology assessment estimated approximately 3,700 BDT to be available across seven types of sources each year, increasing to over 5,300 BDT in the near future. While it is expected that a larger volume of residual woody material would become available once an energy system is installed – for example, through incentivizing additional pre-commercial thinning and line clearing – OPALCO and Wisewood opted for a conservative approach to wood fuel demand. This strategy is more likely to keep wood fuel costs from becoming prohibitively expensive, while mitigating any risk to available fuel supply.
- **Cost:** While economies of scale typically lend themselves to installing larger energy facilities, due to the unique nature of this project and its appeal as a demonstration site, OPALCO suggested a modestly-sized project would be more readily deployable.

[1]National Renewable Energy Laboratory's PVWatts Calculator using the same project site with standard solar parameter assumptions. https://pvwatts.nrel.gov/index.php

PROJECT SITE

Several potential sites were considered for the project in an earlier scope of work, including the Eastsound OPALCO substation and a parcel north of the landfill. While the substation was the first site considered, it is presumed to be a harder site to permit due to current zoning restrictions. A site north of the landfill and west of the gravel pit, at the end of Gravel Pit Road, was identified as a more suitable site (see Appendix A). The undeveloped parcel has a well at the northwest corner and is owned by San Juan County. There are several benefits to this location, such as the existing road access in close proximity, the fact that it is already zoned for industrial use, energy generation is an allowable use on rural industrial land, and its location could feed into both the Eastsound substation and the Orcas substation.

Through the pre-permitting application process, Wisewood and OPALCO held a meeting with County representatives from various departments. The project was well-received, and during the productive meeting it was determined that Gravel Pit Road would have to be extended in order to utilize the site, including a likely buffer around the landfill in consideration for the existing landfill monitoring infrastructure. In addition, a large stormwater plan would need to be developed and an on-site sewage permit would be required. Uncovered wood storage is allowed, but any volume over 2,000 cubic yards would have to be registered under solid waste rules and pile standards. It was indicated that a conditional use permit, rather than a provisional permit, would be applicable. A response from the County summarizing their input is included as Appendix C.

In follow up conversations, one concern was raised by a representative from the Environmental Stewardship Department: the well on the parcel is considered critical water infrastructure and has a 1,000-foot buffer zone around it. This buffer covers almost the entire parcel; as such, if the critical designation disallows development on the parcel, the alternative site at the substation would need to be reconsidered.

DESIGN

For this project, gasification was selected in a previous scope of work as the best technology to suit the needs of the Orcas grid, and Wisewood has modeled gasifiers from Bioenergie Wegscheid ("Bioenergie", formerly "Holz"). As noted in the previous technology assessment for SJICD, Bioenergie has over 120 units operating consistently worldwide, producing roughly 15 MW of power. Bioenergie's relatively smaller unit size (125 kW) makes it more adaptable to small projects, such as the 1 MW power plant proposed here, and allows it to be shipped in containers for quick installation in even smaller, net metered applications.

The system design includes eight gasifiers and the infrastructure needed to support them, including a wood fuel yard for unprocessed wood fuel (e.g., logs, stumps, etc.), fuel drying and storage bays, processing space for debarking and chipping the wood into the drying bays, and mobile equipment for debarking, chipping, and moving the wood fuels. A large building houses most of the equipment and has space for a small office, bathroom, and small mechanical systems. This design is shown in Appendix B.

The combined heat-and-power system uses wood fuel that is heated to create syngas, which is then combusted in an engine to produce power. Heat from the gasification systems will be captured and distributed to the dryer bays via insulated PEX piping, as well as stored in a large buffer tank to provide a steady supply of heat even when the gasifiers may be in low production mode. In the event that heat production outstrips demand and storage capacity, a liquid loop radiator cooling system will dissipate heat to the atmosphere.

BIOCHAR

There is an opportunity to include a biochar production element into the overall project. While this option is not included in the preliminary designs shown, it could be incorporated into the wood log yard via a small system that could be put into production as needed without affecting the operations of the CHP system. A portion of woody material collected and processed at the power plant site can be diverted to biochar production for use in soil amendment and/or remediation activities. Biochar would be produced by a standalone piece of equipment that may be co-located at the CHP site or at a nearby partner site, such as Rainshadow Consulting or the Orcas Exchange. Biochar complements the biomass power plant by contributing a value-added product that stores carbon and can be applied in land management uses, rather than gasifying for the production of renewable energy.

GRID INTERCONNECTION

Electric power from the CHP plant switchgear will interconnect with the OPALCO distribution system according to OPALCO's engineered specifications. The design of this interconnection has not yet been completed, but it can include provision for the CHP system to continue operating even in the event of a grid-wide power outage. In this case, any critical infrastructure intended to remain connected to the backup power being provided by the CHP system would require equipment specifically designed to allow the safe transfer of electricity while the balance of the grid is being repaired, and a central controller to manage those variations in power distribution. OPALCO has provided their estimate of basic interconnection costs and requirements (Appendix D), which has been incorporated into the capital cost opinion generated by Wisewood and discussed below. Microgrid controls engineering should be completed in the subsequent design phase to ensure safe operations.

Air Quality Permitting

The gasification technology selected for this project has a relatively low emissions profile; primary emissions include CO, NOx, and a small amount of particulates. To proactively reduce the relatively low emissions from the system, each gasifier will have a selective catalytic reducer (SCR) using urea injection installed to address the NOx emissions. A summary of the expected emissions is included in Appendix H showing calculated emissions both with and without mitigation technology (SCR).

Wisewood has reached out to several agencies to inquire about the specific air quality permitting likely required for the proposed project. While detailed conversations have not yet taken place, we presume that the Washington Department of Ecology's Air Quality program will have

jurisdiction. Likely requirements include air dispersion modeling and data submittals. Note that permitting agencies often wish to review untreated emissions to make their determinations.

Additional outputs of the CHP system include nominal amounts of ash (198 tons per year) and tar (7,500 liters per year). Ash can be disposed of either in a landfill or can be used as a soil amendment in certain applications (which is a potential source of revenue if a local market exists). Tar is typically treated like used engine oil and must be disposed of accordingly.

Operations

WOOD FUEL

Assessing the volume and type of available wood fuel supply was one of the focal points of the September 2021 technology assessment. Based on consultation with local land managers and waste handlers, seven categories of potential wood fuel sources were identified for Orcas Island: residential and commercial tree services; forestry, pre-commercial thinning and fuel reduction; logging slash; sawmill overs; land clearing and development; utility line clearing; and community waste wood. The preliminary design includes a wood storage and processing yard (see Appendix A for Site Plan), where anything from whole logs to residential wood waste may be brought. Chipped wood meeting system specifications can be brought directly into the building and dumped before it's loaded into the dryer bays with a front-end loader, while wood requiring further processing can be chipped directly into the dryer bays using mobile equipment.

PERSONNEL

Operators will be needed full time during daily operations to manage the wood processing, drying, and gasifier fuel feeding. Because the gasifiers are automated systems, they require little by way of day-to-day operations activities beyond visual and audio checks to ensure safe and reliable energy production; however, across eight gasifier systems, this adds up to approximately one full time employee (FTE). This primary position would be suited to an engine mechanic familiar with tasks such as routine inspections, replacement of parts, monitoring engine performance, and work with vendors as needed to diagnose and fix any maintenance issues that come up.

OPALCO selected a manual fuel feeding operation, rather than a fully automated system utilizing extensive conveyors and metering. A wood fuel handler, estimated to be approximately an 0.8 FTE role, will manipulate fuel storage in the wood yard, chip fuel into the dryer bays, monitor and manage fuel drying, and feed the gasifiers wood fuel with mobile equipment, including a front-end loader, chipper/grinder, and log grapple. This heavy equipment operator should be certified and have a basic understanding of forestry operations, as they will coordinate directly with fuel providers – including the general public – to facilitate procurement.

Depending on the final ownership structure, an administrative role may be needed to address the business needs of the system, unless the system owner can incorporate those activities into existing operations.

Financial Analysis

HOST OWNERSHIP VERSUS THIRD PARTY OWNERSHIP

Wisewood modeled implementation of the wood energy power plant through both a host ownership and third party ownership approach. Under host ownership, OPALCO would invest its own equity alongside a tax credit investor, source the remaining capital from loans and potentially grants, and be responsible for owning and operating the system. Generated energy would be sold to customers following OPALCO's standard pricing methods. A third party ownership approach would be similar in leveraging tax investor equity to secure loans and potential grants, but third party equity would be substituted for OPALCO's equity. The third party would be responsible for operations and would execute a power purchase agreement with OPALCO to sell generated electricity, which OPALCO would then sell to its customer base.

Both approaches are modeled using the same base capital and operating costs described below, with some additional fees in the third party scenario (e.g., accounting for a development fee in the capital cost and maintenance fee in the operating cost). In general, third party financing will result in a higher cost of electricity to OPALCO, but has the benefit of keeping the upfront capital cost off OPALCO's balance sheet, as well as the responsibilties of operating and maintaining the system. Under host ownership, OPALCO would need to invest capital but would have an incentive to reduce operating costs; for example, by streamlining wood fuel procurement once supply chains are established. Assumptions and variables used in cost estimates are described in more detail below.

CAPITAL COST OPINION

Wisewood has compiled a preliminary capital cost opinion based on the preliminary design and current assumptions. Detailed design and engineering are needed to hone the budget, as well as further investigation into funding opportunities (discussed below). For complete buildout of the eight-gasifier design at the County parcel identified, direct capital costs are estimated to be $13.83 million and indirect costs are estimated to be $7.07 million, for a total of $20.9 million. This includes site preparation and land clearing, a large metal prefabricated building, dryer/fuel storage bays, CHP systems, mechanical, electrical, and plumbing installation, and indirect costs such as general contractor expenses, project management, commissioning, and taxes. Items excluded from this preliminary cost opinion are mobile equipment for fuel processing (chipper/grinder, front end loader, etc.); civil, structural, electrical, geotechnical, and microgrid controls engineering; architecture; and Gravel Pit Road extension. Although these are excluded because they are outside of Wisewood's scope of work, the contingency line item shown in Table 1 can cover most items, among other "unknowns". The major cost categories are summarized below and detailed further in Appendix E. Note that should the project owner(s) be considered tax-exempt, the significant tax line item could be reduced or even eliminated.

TABLE 1 Summary of estimated capital costs for the proposed system

DIRECT COSTS		INDIRECT COSTS	
Design & Engineering	$123,000	General Contractor O&P	$1,728,000
Permits & Mobilization	$40,000	Project Management, RFIs & Commissioning	$265,000
Civil (land clearing)	$211,000	Taxes	$1,778,000
Structural	$2,076,000	Contingency	$3,301,000
Fuel Storage & Drying	$407,000		
CHP Gasifiers	$7,833,000		
Hydronic Equipment & Piping	$714,000		
Fire Protection	$79,000		
Insulation	$222,000		
Other Mechanical & Plumbing	$205,000		
Electrical	$990,000		
Unlisted Items & Punchlist	$418,000		
Freight, Insurance & Per Diems	$498,000		
SUBTOTAL	$13,830,000	SUBTOTAL	$7,070,000
	TOTAL	**$20,900,000**	

While this projected cost is significant, there are some mitigating factors to consider, such as the deferred cost of replacing the aging submarine electric cable, which can cost up to $5 million per mile to install between islands. The CHP system could also provide centralized backup power in the event of a grid failure, allowing critical infrastructure to operate without interruption, or at a reduced but critical capacity. It also contributes to local forest health and reduces catastrophic wildfire risk by utilizing existing wood fuels that may otherwise be openly burned and funneling thinning byproduct into a renewable system.

Additionally, it is illustrative to compare the output of a 1 MW biomass system to alternative sources of renewable energy. For example, a 1 MW-capacity solar array at the same site would produce less than 15% of electricity per year than the CHP system due to fluctuating solar resources, versus the steady 24/7 output of the biomass system. To match the annual production of the CHP system, Wisewood estimates a solar array of 7 MW would be required at a cost of

approximately $14 million[2], plus another roughly $5.3 million for a battery energy storage system (BESS)[3] for a total closer to $20 million, not including additional microgrid, interconnection, and site prep costs. A solar array of this size would require around 18 acres of open land, compared to around 2.5 acres for the proposed biomass CHP system; the economic and environmental costs of clearing that much land on Orcas would be significant. Such a consideration of how biomass compares to other generation options provides a clearer picture of relative tradeoffs.

OPERATING COST OPINION

Wisewood has estimated the resources required to operate a gasifier CHP system in an operating cost opinion (Appendix F) across two ownership scenarios (host and third-party) and summarized them below. Some assumptions made include: two main fuel sources (further described in the next section); no taxes are estimated at this time (sales or property); and third-party ownership will include an annual maintenance fee. The largest costs are wood fuel (including processing) and labor (engine mechanic, heavy equipment operator, and administration). Third-party services may include specialties such as electricians, vendor assistance, etc. Waste disposal includes the removal of two primary waste products, ash and tar.

TABLE 2 Summary of annual operating costs for the proposed system

COST CATEGORY	ANNUAL COST
Wood Fuel, Delivered	$259,508
Waste Disposal	$55,658
Operations Labor (2.8 FTE)	$252,319
Third-Party Services	$102,699
Biomass Consumables	$179,200
Administration (monitoring, insurance, lease)	$21,147
HOST OWNERSHIP SUBTOTAL	$870,530
Maintenance fee (third-party ownership only)	$72,919
Additional Lease Fee	$6,000
THIRD-PARTY OWNERSHIP TOTAL	$949,449

[2]Basic cost data gathered from Solar Electric Supply for ground-mounted systems https://www.solarelectricsupply.com/commercial-solar-systems/ground-mount
[3]National Renewable Energy Laboratory's publication "Cost Projections for Utility-Scale Battery Storage: 2021 Update" https://www.nrel.gov/docs/fy21osti/79236.pdf

FUELING COSTS

Because of the variety of potential fuel sources, the price for wood fuel is also expected to vary. Some sources are currently disposed of for a fee, suggesting a potential negative cost of wood fuel, while others likely require payment for additional processing and transportation, if not also for the material itself. For example, whole waste wood is currently dropped off at excavation sites for a nominal fee of about $23/ton, where it is burned in piles once or twice per year and generates public nuisance complaints. Waste wood can be dropped off at the Orcas Exchange for about $100/ton, high enough to dissuade most residents from doing so. Material such as pre-commercial thinning and residential tree service residuals can be left where they are generated at no cost, or chipped and hauled elsewhere for the cost of processing and transportation. Of note, previous discussions with the County have suggested that the CHP facility will provide the highest community benefit if waste wood can be dropped off for no fee.

For the purposes of estimating operating costs for the wood energy facility, Wisewood assumed both a low and high-cost fuel option, both with an average of 40% moisture content:

- Low cost (50% of supply): $0/GT ($0/BDT) representing material dropped off for free, but that requires additional handling at the site (captured in fuel handling labor cost);
- High cost (50% of supply): $55/GT ($92/BDT) representing pre-commercial thinning and related forest management residual material that must cover in-woods processing and transportation, but no cost for the biomass material itself.

The cost of wood fuel has a significant impact on operating costs of the system and may warrant additional scenario analysis. In partnership with SJICD, the Terrestrial Management Group (TMG), and others, sourcing fuels for the CHP system can support the long-term goals of vegetation management, forest health and fire risk reduction.

PRO FORMA

Four preliminary financial pro forma are included in this package as Appendix G, including host ownership with and without grants and third-party ownership with and without grants. All cases include debt modeled with 5% interest rates over 25 years, an investment tax credit valued at 30% of the project costs, a bridge loan to account for delayed timing of the tax investor equity, and construction occurring over years 2 and 3, with full operations beginning in year 4. A total of $4M in grants is modeled for the host ownership and third-party ownership scenarios, assumed to be available through Washington State's Clean Energy Fund and the US Forest Service Community Wood Energy and Wood Innovations Program; both programs allow for wood energy applications and have competitive opportunities periodically. A loan of $7M is modeled when grants are included, and $12M without grants.

HOST OWNERSHIP

Under host ownerhsip, OPALCO would determine its method for accounting for wood energy across its customer base pricing; therefore no market price for energy was modeled in those scenarios. Instead, the modeled levelized cost of energy (LCOE) is shown without grants and tax credits ("unlevered") and with grants and tax credits ("levered"). No payback period is provided in the absence of a price paid for power. See Table 3 below.

THIRD-PARTY OWNERSHIP

The third-party ownership pro forma include LCOE calculations and provide additional detail based on an assumed price for energy at $0.240/kWh and a 2% escalator. Given the modeled debt and equity variables, this price is estimated to provide returns sufficient to attract a third-party investor and pay back within ten years. This price would be negotiated between OPALCO and the third-party owner through a power purchase agreement and would depend on the final financing package. For example, larger debt could be attractive to an investor to reduce their upfront capital, but would likely require a higher price for energy. Notably, both the grant and no grant scenarios are modeled to have a similar payback at the same price, which is a result of grant dollars being considered taxable income and affecting project cash flow over the first few years; however, overall returns are slightly higher, and net returns are over two times higher with grants.

TABLE 3 Summary of potential ownership models and funding sources

SCENARIO	UNLEVERED LCOE	LEVERED LCOE	MODELED PPA & ESCALATOR	TOTAL IRR
Host Ownership, no grants	$0.133/kWh	$0.110/kWh	N/A	N/A
Host Ownership, with grants	$0.132/kWh	$0.093/kWh	N/A	N/A
Third-party Ownership, no grants	$0.141/kWh	$0.117/kWh	$0.24/kWh, 2%	13.2%
Third-party Ownership, with grants	$0.140/kWh	$0.100/kWh	$0.24/kWh, 2%	14.2%

Conclusions and Next Steps

CONCLUSIONS

Electric generation from a gasification CHP system is a reliable, sustainable, and practical solution for Orcas Island and OPALCO. Further design is needed to hone the estimates reported here for capital costs, operating costs, financing assumptions, and fueling logistics, and further research is needed to identify the permitting requirements at one or more potential sites. While estimated costs of production before incentives are applied are higher than current electric rates, the related benefits of the project to the island may outweigh this economic discrepancy. It is also comparable to the direct costs of a solar installation that would provide the same annual production rates, while taking up significantly less space. Benefits include grid resiliency, reduced open burning of wood waste, providing an outlet for pre-commercial thinning activities, potentially reducing fire risk insurance premiums, encouraging the community to participate in a

local and environmentally beneficial energy project, and demonstrating to other islanded utilities how biomass can contribute to their energy portfolio.

NEXT STEPS

To continue to move this project toward implementation, several next steps are required. These include, but are not limited to:

- Public outreach in partnership with the San Juan Islands Conservation District to recruit additional project partners and "champions";
- Identify likely owner(s) and reassess most realistic funding structures, including exploring potential third-party partners, should a third-party ownership model be preferred;
- Determine acceptable power purchase agreement price range to assess economic viability of a third-party option and consider valuation of additional external benefits;
- Follow up on remaining permitting questions, specifically around air quality and the well buffer zone identified on the desired parcel;
- Complete detailed design and engineering, including sub-disciplines, sufficient for construction;
- Assess biochar options for possible incorporation into the project at large; and
- Identify and pursue funding opportunities.

Wisewood Energy is enthusiastic about continuing work on this exciting project as OPALCO and others on Orcas Island pursue sustainable, reliable, and local energy sources. We consider third-party ownership a viable option for this project and could be discussed in greater detail, should this be of interest to OPALCO. We look forward to receiving your feedback on the preliminary design presented here and adjusting assumptions as needed in future revisions.

Attachment A

Preliminary Vicinity & Site Plans

PROJECT VICINITY PLAN
SCALE: 1/128" = 1'-0"

N

OWNER

OPALCO
Co-op Run. Community Powered.

EASTSOUND, WASHINGTON

PROJECT

BIOMASS GENERATION WITH BIOCHAR FOR ISLAND ENERGY RESILIENCE

DESIGN FIRM

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DRAWING TITLE

PROJECT VICINITY PLAN

REVISIONS

REV	DESCRIPTION	DRAW DATE:	APPROVED DATE:

REFERENCE DRAWINGS

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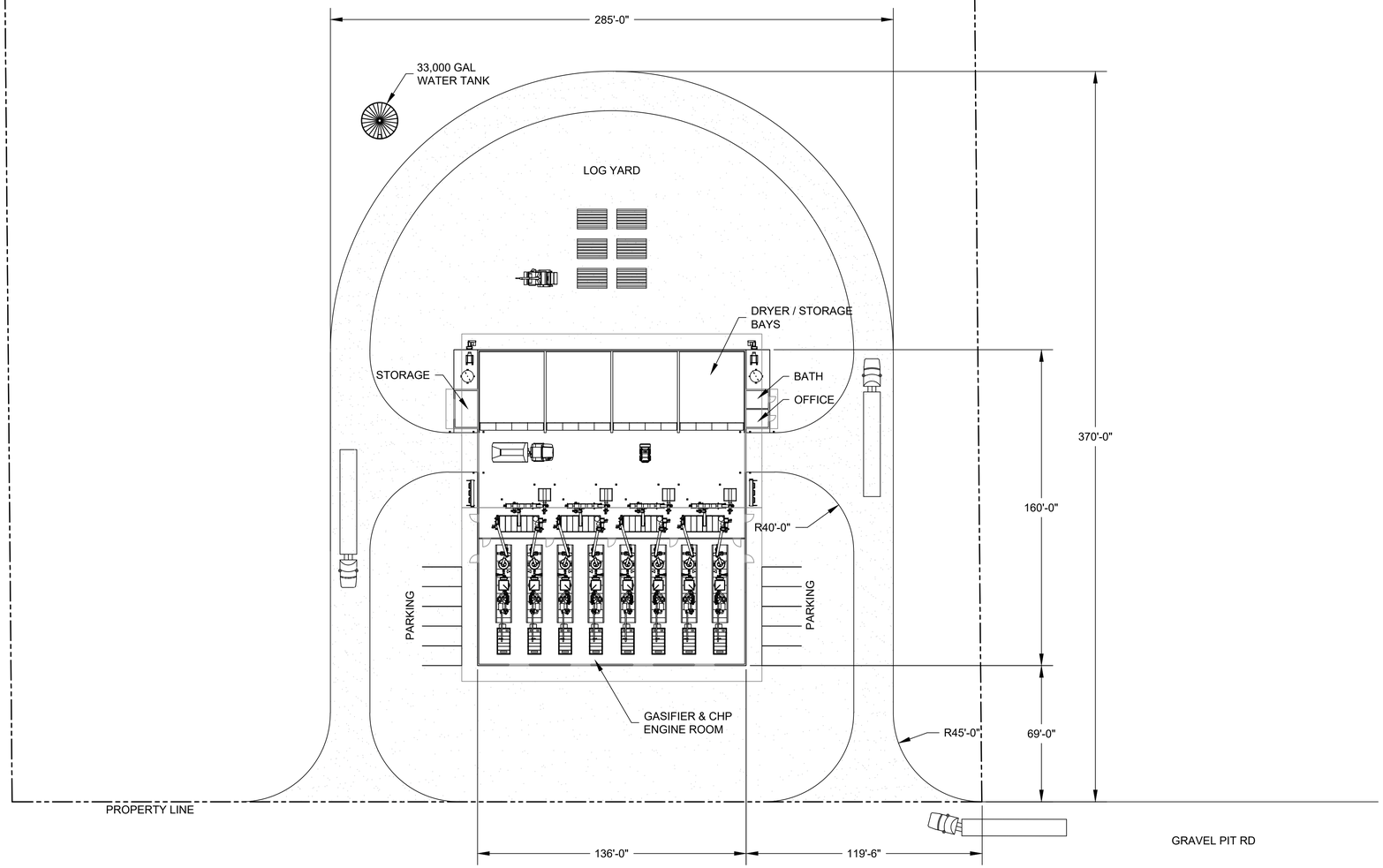

PROJECT SITE PLAN

SCALE: 1/32" = 1'-0"

N

OWNER

OPALCO
Co-op Run. Community Powered.

EASTSOUND, WASHINGTON

PROJECT

BIOMASS GENERATION WITH BIOCHAR FOR ISLAND ENERGY RESILIENCE

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DRAWING TITLE

PROJECT SITE PLAN

REVISIONS

REV	DESCRIPTION	DRAW DATE:	APPROVED DATE:

REFERENCE DRAWINGS

	DWG #	DWG TITLE
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Attachment B

Preliminary Mechanical Design

BIOMASS GASIFIER

TAG	DESCRIPTION	SERVICE	MANUFACTURER	OUTPUT [kW-el]	OUTPUT [kW-th]	MOTOR	POWER [HP]	CURRENT [A]	VOLTAGE [V]	PHASE	VFD	POWER SUPPLY [LOCAL / VENDOR]
GS-01	125kW GASIFICATION SYSTEM	HEATING WATER / POWER	BIOENERGIE	125	238	N/A	N/A	N/A	N/A	N/A	N/A	
GS-01.4	GASIFIER ASH EXTRACTOR	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0058A	0.63	0.8	480	3	YES	VENDOR
GS-01.7	GASIFIER FILTER RECIRCULATION FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MARPO CL 60 HS	4.62		480	3	YES	VENDOR
GS-01.8	GASIFIER ASH BUNKER FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0059C	0.63	0.8	480	3	YES	VENDOR
GS-01.9	GASIFIER ENGINE INLET FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	VKD2000-1	0.20	1.3	230	1	YES	VENDOR
GS-01.10	GASIFIER ASH AUGER	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0060AC	0.63	0.8	480	3	YES	VENDOR
GS-02	125kW GASIFICATION SYSTEM	HEATING WATER / POWER	BIOENERGIE	125	238	N/A	N/A	N/A	N/A	N/A	N/A	
GS-02.4	GASIFIER ASH EXTRACTOR	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0058A	0.63	0.8	480	3	YES	VENDOR
GS-02.7	GASIFIER FILTER RECIRCULATION FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MARPO CL 60 HS	4.62		480	3	YES	VENDOR
GS-02.8	GASIFIER ASH BUNKER FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0059C	0.63	0.8	480	3	YES	VENDOR
GS-02.9	GASIFIER ENGINE INLET FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	VKD2000-1	0.20	1.3	230	1	YES	VENDOR
GS-02.10	GASIFIER ASH AUGER	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0060AC	0.63	0.8	480	3	YES	VENDOR
GS-03	125kW GASIFICATION SYSTEM	HEATING WATER / POWER	BIOENERGIE	125	238	N/A	N/A	N/A	N/A	N/A	N/A	
GS-03.4	GASIFIER ASH EXTRACTOR	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0058A	0.63	0.8	480	3	YES	VENDOR
GS-03.7	GASIFIER FILTER RECIRCULATION FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MARPO CL 60 HS	4.62		480	3	YES	VENDOR
GS-03.8	GASIFIER ASH BUNKER FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0059C	0.63	0.8	480	3	YES	VENDOR
GS-03.9	GASIFIER ENGINE INLET FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	VKD2000-1	0.20	1.3	230	1	YES	VENDOR
GS-03.10	GASIFIER ASH AUGER	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0060AC	0.63	0.8	480	3	YES	VENDOR
GS-04	125kW GASIFICATION SYSTEM	HEATING WATER / POWER	BIOENERGIE	125	238	N/A	N/A	N/A	N/A	N/A	N/A	
GS-04.4	GASIFIER ASH EXTRACTOR	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0058A	0.63	0.8	480	3	YES	VENDOR
GS-04.7	GASIFIER FILTER RECIRCULATION FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MARPO CL 60 HS	4.62		480	3	YES	VENDOR
GS-04.8	GASIFIER ASH BUNKER FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0059C	0.63	0.8	480	3	YES	VENDOR
GS-04.9	GASIFIER ENGINE INLET FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	VKD2000-1	0.20	1.3	230	1	YES	VENDOR
GS-04.10	GASIFIER ASH AUGER	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0060AC	0.63	0.8	480	3	YES	VENDOR
GS-05	125kW GASIFICATION SYSTEM	HEATING WATER / POWER	BIOENERGIE	125	238	N/A	N/A	N/A	N/A	N/A	N/A	
GS-05.4	GASIFIER ASH EXTRACTOR	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0058A	0.63	0.8	480	3	YES	VENDOR
GS-05.7	GASIFIER FILTER RECIRCULATION FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MARPO CL 60 HS	4.62		480	3	YES	VENDOR
GS-05.8	GASIFIER ASH BUNKER FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0059C	0.63	0.8	480	3	YES	VENDOR
GS-05.9	GASIFIER ENGINE INLET FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	VKD2000-1	0.20	1.3	230	1	YES	VENDOR
GS-05.10	GASIFIER ASH AUGER	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0060AC	0.63	0.8	480	3	YES	VENDOR
GS-06	125kW GASIFICATION SYSTEM	HEATING WATER / POWER	BIOENERGIE	125	238	N/A	N/A	N/A	N/A	N/A	N/A	
GS-06.4	GASIFIER ASH EXTRACTOR	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0058A	0.63	0.8	480	3	YES	VENDOR
GS-06.7	GASIFIER FILTER RECIRCULATION FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MARPO CL 60 HS	4.62		480	3	YES	VENDOR
GS-06.8	GASIFIER ASH BUNKER FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0059C	0.63	0.8	480	3	YES	VENDOR
GS-06.9	GASIFIER ENGINE INLET FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	VKD2000-1	0.20	1.3	230	1	YES	VENDOR
GS-06.10	GASIFIER ASH AUGER	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0060AC	0.63	0.8	480	3	YES	VENDOR
GS-07	125kW GASIFICATION SYSTEM	HEATING WATER / POWER	BIOENERGIE	125	238	N/A	N/A	N/A	N/A	N/A	N/A	
GS-07.4	GASIFIER ASH EXTRACTOR	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0058A	0.63	0.8	480	3	YES	VENDOR
GS-07.7	GASIFIER FILTER RECIRCULATION FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MARPO CL 60 HS	4.62		480	3	YES	VENDOR
GS-07.8	GASIFIER ASH BUNKER FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0059C	0.63	0.8	480	3	YES	VENDOR
GS-07.9	GASIFIER ENGINE INLET FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	VKD2000-1	0.20	1.3	230	1	YES	VENDOR
GS-07.10	GASIFIER ASH AUGER	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0060AC	0.63	0.8	480	3	YES	VENDOR
GS-08	125kW GASIFICATION SYSTEM	HEATING WATER / POWER	BIOENERGIE	125	238	N/A	N/A	N/A	N/A	N/A	N/A	
GS-08.4	GASIFIER ASH EXTRACTOR	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0058A	0.63	0.8	480	3	YES	VENDOR
GS-08.7	GASIFIER FILTER RECIRCULATION FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MARPO CL 60 HS	4.62		480	3	YES	VENDOR
GS-08.8	GASIFIER ASH BUNKER FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0059C	0.63	0.8	480	3	YES	VENDOR
GS-08.9	GASIFIER ENGINE INLET FAN	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	VKD2000-1	0.20	1.3	230	1	YES	VENDOR
GS-08.10	GASIFIER ASH AUGER	125kW GASIFICATION SYSTEM	BIOENERGIE	NA	NA	MO-0060AC	0.63	0.8	480	3	YES	VENDOR

OWNER

OPALCO
Co-op Run. Community Powered.

EASTSOUND, WASHINGTON

PROJECT

BIOMASS GENERATION WITH BIOCHAR FOR ISLAND ENERGY RESILIENCE

DESIGN FIRM

WISEWOOD ENERGY
TEL. 503.608.7366
FAX 503.715.0483
INFO@WISEWOODENERGY.COM
WWW.WISEWOODENERGY.COM
6800 NE 59TH PLACE
PORTLAND, OR 97218

DRAWING TITLE

EQUIPMENT LIST

REVISIONS

REV	DESCRIPTION	DRAW DATE:	APPROVED DATE:

REFERENCE DRAWINGS

	DWG #	DWG TITLE
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

ENGINEER'S STAMP

DRAWING TYPE

ISSUED FOR REVIEW

IFR

THIS LINE IS 2 INCHES
AT FULL SCALE
IF IT DOES NOT MEASURE 2 INCHES, SCALE ACCORDINGLY

DRAWN: D. RECORD DATE: 2022-08-04

CHECK:

APPROVED:

PROJECT:

DRAWING NO.

0055-100-002.1

BIOMASS FUEL STORAGE AND CONVEYANCE

TAG	DESCRIPTION	SERVICE	MANUFACTURER	CAPACITY [AS NOTED]	MOTOR	POWER [HP]	CURRENT [A]	VOLTAGE [V]	PHASE	VFD	POWER SUPPLY [LOCAL / VENDOR]
MB-01.1	METERING BIN, DISCHARGE SCREW	WOOD CHIPS	BIOENERGIE		MO-0069A	1.83	2.3 / 2.8	480	3	YES	VENDOR
MB-01.2	METERING BIN, DISCHARGE SCREW	WOOD CHIPS	BIOENERGIE		MO-0069A	1.83	2.3 / 2.8	480	3	YES	VENDOR
MB-01.3	METERING BIN, DISTIBUTION SCREW	WOOD CHIPS	BIOENERGIE		MO-0089C	0.64	0.8 / 1.0	480	3	YES	VENDOR
MB-02.1	METERING BIN, DISCHARGE SCREW	WOOD CHIPS	BIOENERGIE		MO-0069A	1.83	2.3 / 2.8	480	3	YES	VENDOR
MB-02.2	METERING BIN, DISCHARGE SCREW	WOOD CHIPS	BIOENERGIE		MO-0069A	1.83	2.3 / 2.8	480	3	YES	VENDOR
MB-02.3	METERING BIN, DISTIBUTION SCREW	WOOD CHIPS	BIOENERGIE		MO-0089C	0.64	0.8 / 1.0	480	3	YES	VENDOR
MB-03.1	METERING BIN, DISCHARGE SCREW	WOOD CHIPS	BIOENERGIE		MO-0069A	1.83	2.3 / 2.8	480	3	YES	VENDOR
MB-03.2	METERING BIN, DISCHARGE SCREW	WOOD CHIPS	BIOENERGIE		MO-0069A	1.83	2.3 / 2.8	480	3	YES	VENDOR
MB-03.3	METERING BIN, DISTIBUTION SCREW	WOOD CHIPS	BIOENERGIE		MO-0089C	0.64	0.8 / 1.0	480	3	YES	VENDOR
MB-04.1	METERING BIN, DISCHARGE SCREW	WOOD CHIPS	BIOENERGIE		MO-0069A	1.83	2.3 / 2.8	480	3	YES	VENDOR
MB-04.2	METERING BIN, DISCHARGE SCREW	WOOD CHIPS	BIOENERGIE		MO-0069A	1.83	2.3 / 2.8	480	3	YES	VENDOR
MB-04.3	METERING BIN, DISTIBUTION SCREW	WOOD CHIPS	BIOENERGIE		MO-0089C	0.64	0.8 / 1.0	480	3	YES	VENDOR
SA-01.1	SCREENING AUGER	WOOD CHIPS	BIOENERGIE		MO-0089C	1.83	2.3 / 2.8	480	3	YES	VENDOR
SA-01.2	SCREENING AUGER FINES	WOOD FINES	BIOENERGIE		MO-0088A	0.64	0.8 / 1.0	480	3	YES	VENDOR
SA-02.1	SCREENING AUGER	WOOD CHIPS	BIOENERGIE		MO-0089C	1.83	2.3 / 2.8	480	3	YES	VENDOR
SA-02.2	SCREENING AUGER FINES	WOOD FINES	BIOENERGIE		MO-0088A	0.64	0.8 / 1.0	480	3	YES	VENDOR
SA-03.1	SCREENING AUGER	WOOD CHIPS	BIOENERGIE		MO-0089C	1.83	2.3 / 2.8	480	3	YES	VENDOR
SA-03.2	SCREENING AUGER FINES	WOOD FINES	BIOENERGIE		MO-0088A	0.64	0.8 / 1.0	480	3	YES	VENDOR
SA-04.1	SCREENING AUGER	WOOD CHIPS	BIOENERGIE		MO-0089C	1.83	2.3 / 2.8	480	3	YES	VENDOR
SA-04.2	SCREENING AUGER FINES	WOOD FINES	BIOENERGIE		MO-0088A	0.64	0.8 / 1.0	480	3	YES	VENDOR
SC-01	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-02	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-03	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-04	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-05	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-06	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-07	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-08	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-09	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-10	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-11	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-12	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-13	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-14	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-15	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
SC-16	SCREW CONVEYOR	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-01.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-01.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-02.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-02.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-03.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-03.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-04.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-04.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-05.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-05.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-06.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-06.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-07.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-07.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-08.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-08.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-09.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-09.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-10.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-10.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-11.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-11.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-12.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-12.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-13.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-13.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-14.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-14.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-15.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-15.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-16.1	VERTICAL SCREW CONVEYOR LIFT	WOOD CHIPS	BIOENERGIE		MO-0061C	1.83	2.3 / 2.8	480	3	YES	VENDOR
VS-16.2	VERTICAL SCREW CONVEYOR PUSH	WOOD CHIPS	BIOENERGIE		MO-0061AC	1.83	2.3 / 2.8	480	3	YES	VENDOR

OWNER

OPALCO
Co-op Run. Community Powered.

EASTSOUND, WASHINGTON

PROJECT

BIOMASS GENERATION WITH BIOCHAR FOR ISLAND ENERGY RESILIENCE

DESIGN FIRM

WISEWOOD ENERGY
TEL. 503.608.7366
FAX 503.715.0483
INFO@WISEWOODENERGY.COM
WWW.WISEWOODENERGY.COM
6800 NE 59TH PLACE
PORTLAND, OR 97218

DRAWING TITLE

EQUIPMENT LIST

REVISIONS

REV	DESCRIPTION	DRAW DATE:	APPROVED DATE:

REFERENCE DRAWINGS

	DWG #	DWG TITLE
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

ENGINEER'S STAMP

DRAWING TYPE

ISSUED FOR REVIEW

IFR

THIS LINE IS 2 INCHES
AT FULL SCALE
IF IT DOES NOT MEASURE 2 INCHES, SCALE ACCORDINGLY

DRAWN: D. RECORD DATE: 2022-08-04

CHECK:

APPROVED:

PROJECT:

DRAWING NO.

0055-100-002.2

PUMPS

TAG	SYSTEM	SERVICE	MANUFACTURER	MODEL	CONNECTION [INCH]	RATED FLOW / HEAD [GPM] / [PSI]	WEIGHT [LB]	POWER [HP]	VOLTAGE [V]	PHASE	VFD	POWER SUPPLY [LOCAL / VENDOR]
PU-01	HEAT EXCHANGER HX-01	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-02	HEAT EXCHANGER HX-02	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-03	HEAT EXCHANGER HX-03	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-04	HEAT EXCHANGER HX-04	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-05	GAS COOLER GS-01.3	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-06	GAS COOLER GS-02.3	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-07	GAS COOLER GS-03.3	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-08	GAS COOLER GS-04.3	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-09	GAS COOLER GS-05.3	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-10	GAS COOLER GS-06.3	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-11	GAS COOLER GS-07.3	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-12	GAS COOLER GS-08.3	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-13	CHP ENGINE GS-01.5	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-14	CHP ENGINE GS-02.5	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-15	CHP ENGINE GS-03.5	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-16	CHP ENGINE GS-04.5	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-17	CHP ENGINE GS-05.5	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-18	CHP ENGINE GS-06.5	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-19	CHP ENGINE GS-07.5	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-20	CHP ENGINE GS-08.5	HOT WATER	GRUNDFOS	MAGNA3 65-150 F	2 1/2	66 / 20	55	1 3/4	230	1	YES	LOCAL
PU-21	UNIT HEATER UH-01	HOT WATER	GRUNDFOS	UPS 15-58 FC	1	5 / 6	7	0.1	115	1	YES	LOCAL
PU-22	UNIT HEATER UH-02	HOT WATER	GRUNDFOS	UPS 15-58 FC	1	5 / 6	7	0.1	115	1	YES	LOCAL
PU-23	UNIT HEATER UH-03	HOT WATER	GRUNDFOS	UPS 15-58 FC	1	5 / 6	7	0.1	115	1	YES	LOCAL
PU-24	UNIT HEATER UH-04	HOT WATER	GRUNDFOS	UPS 15-58 FC	1	5 / 6	7	0.1	115	1	YES	LOCAL
PU-25	UNIT HEATER UH-05	HOT WATER	GRUNDFOS	UPS 15-58 FC	1	5 / 6	7	0.1	115	1	YES	LOCAL
PU-26	UNIT HEATER UH-06	HOT WATER	GRUNDFOS	UPS 15-58 FC	1	5 / 6	7	0.1	115	1	YES	LOCAL
PU-27	UNIT HEATER UH-07 & UH-08	HOT WATER	GRUNDFOS	UPS 15-58 FC	1	5 / 6	7	0.1	115	1	YES	LOCAL
PU-28	SUMP	WASTE WATER	GOULDS	WEHT0318MP115	2	70 / 12	56	1/3	208	1	NO	LOCAL
PU-29	SUMP	WASTE WATER	GOULDS	WEHT0318MP115	2	70 / 12	56	1/3	208	1	NO	LOCAL
PU-30	SUMP	WASTE WATER	GOULDS	WEHT0318MP115	2	70 / 12	56	1/3	208	1	NO	LOCAL
PU-31	SUMP	WASTE WATER	GOULDS	WEHT0318MP115	2	70 / 12	56	1/3	208	1	NO	LOCAL
PU-32	LIQUID LOOP RADIATOR	HOT WATER	GRUNDFOS	MAGNA3 100-120 F	4	150 / 15	76	2	208-230	1	YES	LOCAL
PU-33	LIQUID LOOP RADIATOR	HOT WATER	GRUNDFOS	MAGNA3 100-120 F	4	150 / 15	76	2	208-230	1	YES	LOCAL
PU-34	LIQUID LOOP RADIATOR	HOT WATER	GRUNDFOS	MAGNA3 100-120 F	4	150 / 15	76	2	208-230	1	YES	LOCAL
PU-35	LIQUID LOOP RADIATOR	HOT WATER	GRUNDFOS	MAGNA3 100-120 F	4	150 / 15	76	2	208-230	1	YES	LOCAL

FANS

TAG	DESCRIPTION	SERVICE	MANUFACTURER	MODEL	OUTPUT [AS NOTED]	POWER [HP]	VOLTAGE [V]	PHASE	VFD	POWER SUPPLY [LOCAL / VENDOR]
FN-01	FAN	FD-01	KICE	FC15	5000 CFM @ 9.7" H2O	30	230 / 460	3	YES	**LOCAL**
FN-02	FAN	FD-02	KICE	FC15	5000 CFM @ 9.7" H2O	30	230 / 460	3	YES	**LOCAL**
FN-03	FAN	FD-03	KICE	FC15	5000 CFM @ 9.7" H2O	30	230 / 460	3	YES	**LOCAL**
FN-04	FAN	FD-04	KICE	FC15	5000 CFM @ 9.7" H2O	30	230 / 460	3	YES	**LOCAL**

PIPING EQUIPMENT

TAG	DESCRIPTION	SERVICE	MANUFACTURER	MODEL	TYPE	PIPE SIZE [IN]	PRESSURE RATING [PSI]	TEMPURATURE RATING [DEGREES F]	POWER [V/Hz]	POWER SUPPLY [LOCAL / VENDOR]
VA-01	3-WAY FLANGED GLOBE VALVE	CHP ENGINE GS-01.5	BELIMO	G765 2AFX24-MFT95-X1	ACTUATED	2 1/2	175	350	24 / 60	VENDOR
VA-02	3-WAY FLANGED GLOBE VALVE	CHP ENGINE GS-02.5	BELIMO	G765 2AFX24-MFT95-X1	ACTUATED	2 1/2	175	350	24 / 60	VENDOR
VA-03	3-WAY FLANGED GLOBE VALVE	CHP ENGINE GS-03.5	BELIMO	G765 2AFX24-MFT95-X1	ACTUATED	2 1/2	175	350	24 / 60	VENDOR
VA-04	3-WAY FLANGED GLOBE VALVE	CHP ENGINE GS-04.5	BELIMO	G765 2AFX24-MFT95-X1	ACTUATED	2 1/2	175	350	24 / 60	VENDOR
VA-05	3-WAY FLANGED GLOBE VALVE	CHP ENGINE GS-05.5	BELIMO	G765 2AFX24-MFT95-X1	ACTUATED	2 1/2	175	350	24 / 60	VENDOR
VA-06	3-WAY FLANGED GLOBE VALVE	CHP ENGINE GS-06.5	BELIMO	G765 2AFX24-MFT95-X1	ACTUATED	2 1/2	175	350	24 / 60	VENDOR
VA-07	3-WAY FLANGED GLOBE VALVE	CHP ENGINE GS-07.5	BELIMO	G765 2AFX24-MFT95-X1	ACTUATED	2 1/2	175	350	24 / 60	VENDOR
VA-08	3-WAY FLANGED GLOBE VALVE	CHP ENGINE GS-08.5	BELIMO	G765 2AFX24-MFT95-X1	ACTUATED	2 1/2	175	350	24 / 60	VENDOR

HEAT EXCHANGERS

TAG	DESCRIPTION	SERVICE	MANUFACTURER	MODEL	CAPACITY [MBH]	RATED FLOW [GPM]	WET WEIGHT [LB]	PRESSURE RATING [PSI]	MATERIAL
HX-01	HEAT EXCHANGER	FD-01	EMERGENT COILS	TBD	TBD	TBD	TBD	TBD	TBD
HX-02	HEAT EXCHANGER	FD-02	EMERGENT COILS	TBD	TBD	TBD	TBD	TBD	TBD
HX-03	HEAT EXCHANGER	FD-03	EMERGENT COILS	TBD	TBD	TBD	TBD	TBD	TBD
HX-04	HEAT EXCHANGER	FD-04	EMERGENT COILS	TBD	TBD	TBD	TBD	TBD	TBD

COOLING

TAG	DESCRIPTION	SERVICE	MANUFACTURER	MODEL	HEAT REJECTION [Kw]	PIPE SIZE [IN]	CURRENT [A]	POWER [HP]	VOLTAGE [V]	PHASE	VFD	POWER SUPPLY [LOCAL / VENDOR]
LR-01	LIQUID LOOP RADIATOR	GS-01 THROUGH GS-04	GUNTNER	GFV 065.3C/2x3-N(L)-F6/2P.M	900	3	31.2	6X 3	460	3	NO	LOCAL
LR-02	LIQUID LOOP RADIATOR	GS-05 THROUGH GS-08	GUNTNER	GFV 065.3C/2x3-N(L)-F6/2P.M	900	3	31.2	6X 3	460	3	NO	LOCAL

TANKS

TAG	DESCRIPTION	SERVICE	MANUFACTURER	MODEL	CAPACITY [GAL]	SHIPPING WEIGHT [LB]	WET WEIGHT [LB]	PRESSURE RATING [PSI]	OPERATING TEMP [DEGREES F]	MATERIAL
BT-01	BUFFER TANK	HEATING WATER	SPVG	CUSTOM ORDER	3,800	3,500	38,000	150	-20 TO 400	STEEL
BT-02	BUFFER TANK	HEATING WATER	SPVG	CUSTOM ORDER	3,800	3,500	38,000	150	-20 TO 400	STEEL
EX-01	EXPANSION TANK	POTABLE WATER	AMTROL	AX-15V-DD	8	26	93	150	240 MAX	STEEL
EX-02	EXPANSION TANK	HEATING WATER	AMTROL	AX-280V	84	605	762	150	240 MAX	STEEL
EX-03	EXPANSION TANK	POTABLE WATER	AMTROL	AX-15V-DD	8	26	93	150	240 MAX	STEEL
EX-04	EXPANSION TANK	HEATING WATER	AMTROL	AX-280V	84	605	762	150	240 MAX	STEEL

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REV	DESCRIPTION	DRAW DATE:	APPROVED DATE:

REFERENCE DRAWINGS

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ENGINEER'S STAMP

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UNIT HEATER

TAG	DESCRIPTION	SERVICE	MANUFACTURER	MODEL	AIR FLOW [CFM]	WEIGHT [LB]	CAPACITY [BTU/HR]	PIPE SIZE [IN]	MOTOR [HP]	POWER [V/PHASE]	POWER SUPPLY [LOCAL / VENDOR]
UH-01	UNIT HEATER	ENGINE ROOM	MODINE	HSB-63	1,120	48	45,600	1 1/4	1/12	115	LOCAL
UH-02	UNIT HEATER	ENGINE ROOM	MODINE	HSB-63	1,120	48	45,600	1 1/4	1/12	115	LOCAL
UH-03	UNIT HEATER	WOOD CHIP DRYING AREA	MODINE	HSB-63	1,120	48	45,600	1 1/4	1/12	115	LOCAL
UH-04	UNIT HEATER	WOOD CHIP DRYING AREA	MODINE	HSB-63	1,120	48	45,600	1 1/4	1/12	115	LOCAL
UH-05	UNIT HEATER	WOOD CHIP DRYING AREA	MODINE	HSB-63	1,120	48	45,600	1 1/4	1/12	115	LOCAL
UH-06	UNIT HEATER	WOOD CHIP DRYING AREA	MODINE	HSB-63	1,120	48	45,600	1 1/4	1/12	115	LOCAL
UH-07	UNIT HEATER (RADIATOR)	RESTROOM	MYSON	T621-6-18	N/A	113	11,046	3/4	N/A	N/A	N/A
UH-08	UNIT HEATER (RADIATOR)	OFFICE SPACE	MYSON	T621-6-18	N/A	113	11,046	3/4	N/A	N/A	N/A

COMPRESSED AIR

TAG	DESCRIPTION	SERVICE	MANUFACTURER	MODEL	AIR FLOW [CFM AT MAX PRESSURE]	WEIGHT [LB]	CAPACITY [GAL]	MAX PRESSURE [PSI]	PIPE SIZE [IN]	MOTOR [HP]	POWER [V/PHASE	POWER SUPPLY [LOCAL / VENDOR]
AC-01	AIR COMPRESSOR	GS-01 / GS-02	INGERSOL-RAND	W7.5ie-A145-80H	25	647	80	145	1/2	10		LOCAL
AC-02	AIR COMPRESSOR	GS-03 / GS-04	INGERSOL-RAND	W7.5ie-A145-80H	25	647	80	145	1/2	10		LOCAL
AC-03	AIR COMPRESSOR	GS-05 / GS-06	INGERSOL-RAND	W7.5ie-A145-80H	25	647	80	145	1/2	10		LOCAL
AC-04	AIR COMPRESSOR	GS-07 / GS-08	INGERSOL-RAND	W7.5ie-A145-80H	25	647	80	145	1/2	10		LOCAL

PIPE SPECIFICATION TABLE

SERVICE	SCHEDULE	NOMINAL DIAMETER [IN]	MATERIAL	TYPE	CONNECTIONS	PRESSURE LIMIT [PSI]	TEMPURATURE LIMIT [DEGREES F]	INSULATION	ISULATION THICKNESS
BOILER DRAIN	80	1	CAST IRON	A53, GRADE B, TYPE S	THREADED	300	400	NONE	NA
HEATING WATER (INSIDE)	40	3/4	CARBON STEEL	API 5L, GRADE B, SEAMLESS	WELDED	150	400	GLASS WOOL	2"
HEATING WATER (INSIDE)	40	1	CARBON STEEL	API 5L, GRADE B, SEAMLESS	WELDED	150	400	GLASS WOOL	2"
HEATING WATER (INSIDE)	40	1 1/4	CARBON STEEL	API 5L, GRADE B, SEAMLESS	WELDED	150	400	GLASS WOOL	2"
HEATING WATER (INSIDE)	40	1 1/2	CARBON STEEL	API 5L, GRADE B, SEAMLESS	WELDED	150	400	GLASS WOOL	2"
HEATING WATER (INSIDE)	40	2	CARBON STEEL	API 5L, GRADE B, SEAMLESS	WELDED	150	400	GLASS WOOL	2"
HEATING WATER (INSIDE)	40	2 1/2	CARBON STEEL	API 5L, GRADE B, SEAMLESS	WELDED	150	400	GLASS WOOL	2"
HEATING WATER (INSIDE)	40	3	CARBON STEEL	API 5L, GRADE B, SEAMLESS	WELDED	150	400	GLASS WOOL	2"
HEATING WATER (INSIDE)	40	4	CARBON STEEL	API 5L, GRADE B, SEAMLESS	WELDED	150	400	GLASS WOOL	2"
HEATING WATER (INSIDE)	40	6	CARBON STEEL	API 5L, GRADE B, SEAMLESS	WELDED	150	400	GLASS WOOL	2"
DOMESTIC WATER	TYPE K	1	COPPER	ASTM B88	SWEAT	100	200	CLOSED CELL FOAM	1 1/2
WASTE WATER	TYPE K	1 1/2	COPPER	ASTM B88	SWEAT	100	200	NONE	NA
COMPRESSED AIR	40	3/4	CARBON STEEL	API 5L, GRADE B, SEAMLESS	THREADED	150	400	NONE	NA
COMPRESSED AIR	40	1	CARBON STEEL	API 5L, GRADE B, SEAMLESS	THREADED	150	400	NONE	NA
COMPRESSED AIR	40	1 1/2	CARBON STEEL	API 5L, GRADE B, SEAMLESS	THREADED	150	400	NONE	NA

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ENGINEER'S STAMP

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DRAWN: D. RECORD DATE: 2022-08-04

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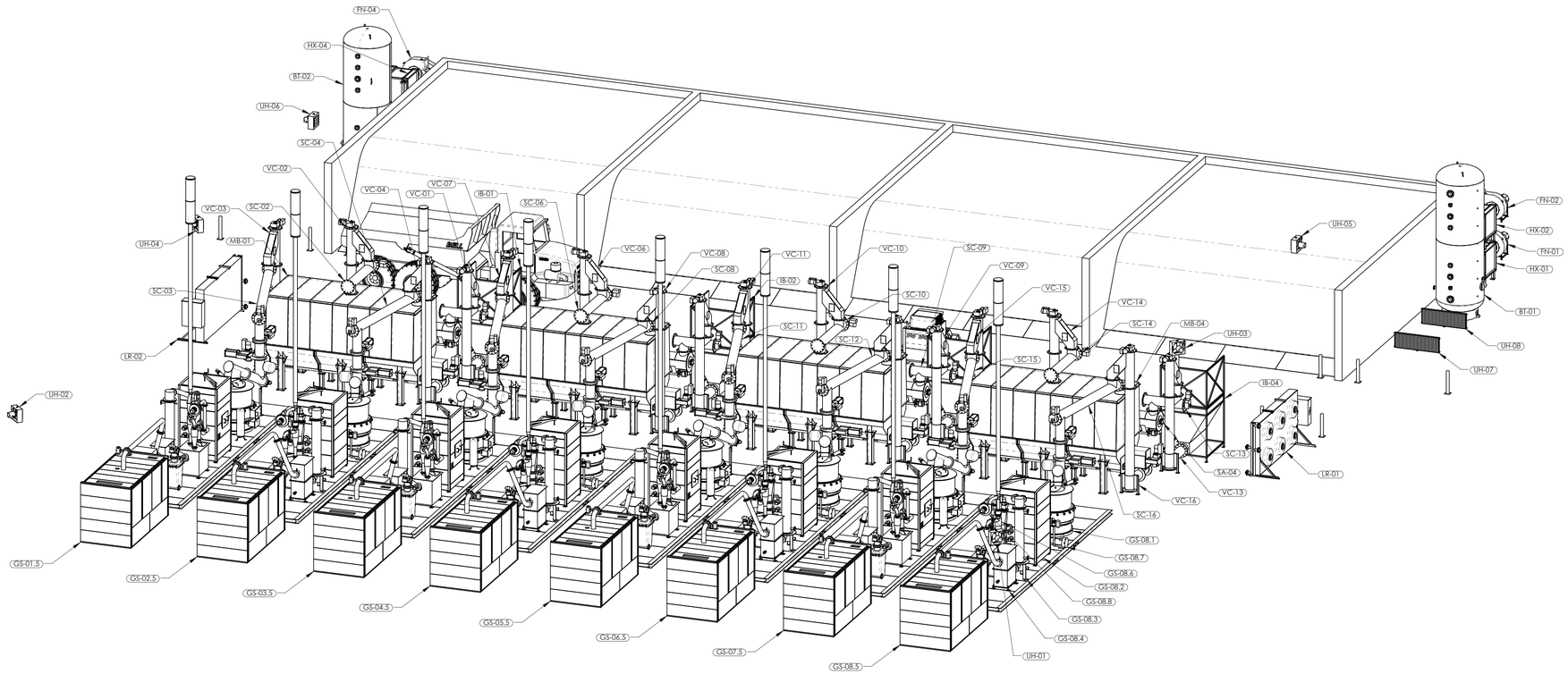

ITEM	QTY	UNITS	DESCRIPTION	EQUIPMENT TAG
1	1	EA	BUFFER TANK	BT-01
2	1	EA	BUFFER TANK	BT-02
3	1	EA	DRYER FAN	FN-01
4	1	EA	DRYER FAN	FN-02
5	1	EA	DRYER FAN	FN-03
6	1	EA	DRYER FAN	FN-04
7	1	EA	GASIFIER CARBURETOR	GS-01.1
8	1	EA	GASIFIER FILTER	GS-01.2
9	1	EA	GASIFIER GAS COOLER	GS-01.3
10	1	EA	GASIFIER ASH EXTRACTOR	GS-01.4
11	1	EA	GASIFIER ENGINE	GS-01.5
12	1	EA	GASIFIER ASH BUNKER	GS-01.6
13	1	EA	GASIFIER FILTER RECIRCULATION FAN	GS-01.7
14	1	EA	GASIFIER ASH BUNKER FAN	GS-01.8
15	1	EA	GASIFIER CARBURETOR	GS-02.1
16	1	EA	GASIFIER FILTER	GS-02.2
17	1	EA	GASIFIER GAS COOLER	GS-02.3
18	1	EA	GASIFIER ASH EXTRACTOR	GS-02.4
19	1	EA	GASIFIER ENGINE	GS-02.5
20	1	EA	GASIFIER ASH BUNKER	GS-02.6
21	1	EA	GASIFIER FILTER RECIRCULATION FAN	GS-02.7
22	1	EA	GASIFIER ASH BUNKER FAN	GS-02.8
23	1	EA	GASIFIER CARBURETOR	GS-03.1
24	1	EA	GASIFIER FILTER	GS-03.2
25	1	EA	GASIFIER GAS COOLER	GS-03.3
26	1	EA	GASIFIER ASH EXTRACTOR	GS-03.4
27	1	EA	GASIFIER ENGINE	GS-03.5
28	1	EA	GASIFIER ASH BUNKER	GS-03.6
29	1	EA	GASIFIER FILTER RECIRCULATION FAN	GS-03.7
30	1	EA	GASIFIER ASH BUNKER FAN	GS-03.8
31	1	EA	GASIFIER CARBURETOR	GS-04.1
32	1	EA	GASIFIER FILTER	GS-04.2
33	1	EA	GASIFIER GAS COOLER	GS-04.3
34	1	EA	GASIFIER ASH EXTRACTOR	GS-04.4
35	1	EA	GASIFIER ENGINE	GS-04.5
36	1	EA	GASIFIER ASH BUNKER	GS-04.6
37	1	EA	GASIFIER FILTER RECIRCULATION FAN	GS-04.7
38	1	EA	GASIFIER ASH BUNKER FAN	GS-04.8
39	1	EA	GASIFIER CARBURETOR	GS-05.1
40	1	EA	GASIFIER FILTER	GS-05.2
41	1	EA	GASIFIER GAS COOLER	GS-05.3
42	1	EA	GASIFIER ASH EXTRACTOR	GS-05.4
43	1	EA	GASIFIER ENGINE	GS-05.5
44	1	EA	GASIFIER ASH BUNKER	GS-05.6
45	1	EA	GASIFIER FILTER RECIRCULATION FAN	GS-05.7
46	1	EA	GASIFIER ASH BUNKER FAN	GS-05.8
47	1	EA	GASIFIER CARBURETOR	GS-06.1
48	1	EA	GASIFIER FILTER	GS-06.2
49	1	EA	GASIFIER GAS COOLER	GS-06.3
50	1	EA	GASIFIER ASH EXTRACTOR	GS-06.4
51	1	EA	GASIFIER ENGINE	GS-06.5
52	1	EA	GASIFIER ASH BUNKER	GS-06.6
53	1	EA	GASIFIER FILTER RECIRCULATION FAN	GS-06.7
54	1	EA	GASIFIER ASH BUNKER FAN	GS-06.8
55	1	EA	GASIFIER CARBURETOR	GS-07.1
56	1	EA	GASIFIER FILTER	GS-07.2
57	1	EA	GASIFIER GAS COOLER	GS-07.3
58	1	EA	GASIFIER ASH EXTRACTOR	GS-07.4
59	1	EA	GASIFIER ENGINE	GS-07.5
60	1	EA	GASIFIER ASH BUNKER	GS-07.6
61	1	EA	GASIFIER FILTER RECIRCULATION FAN	GS-07.7
62	1	EA	GASIFIER ASH BUNKER FAN	GS-07.8
63	1	EA	GASIFIER CARBURETOR	GS-08.1
64	1	EA	GASIFIER FILTER	GS-08.2
65	1	EA	GASIFIER GAS COOLER	GS-08.3
66	1	EA	GASIFIER ASH EXTRACTOR	GS-08.4
67	1	EA	GASIFIER ENGINE	GS-08.5
68	1	EA	GASIFIER ASH BUNKER	GS-08.6
69	1	EA	GASIFIER FILTER RECIRCULATION FAN	GS-08.7
70	1	EA	GASIFIER ASH BUNKER FAN	GS-08.8
71	1	EA	DRYER HEAT EXCHANGER	HX-01
72	1	EA	DRYER HEAT EXCHANGER	HX-02
73	1	EA	DRYER HEAT EXCHANGER	HX-03
74	1	EA	DRYER HEAT EXCHANGER	HX-04
75	1	EA	INFEED BIN	IB-01
76	1	EA	INFEED BIN	IB-02
77	1	EA	INFEED BIN	IB-03
78	1	EA	INFEED BIN	IB-04
79	1	EA	LIQUID LOOP RADIATOR, 900kW	LR-01
80	1	EA	LIQUID LOOP RADIATOR, 900kW	LR-02
81	1	EA	GASIFIER METERING BIN	MB-01
82	1	EA	GASIFIER METERING BIN	MB-02
83	1	EA	GASIFIER METERING BIN	MB-03
84	1	EA	GASIFIER METERING BIN	MB-04
85	1	EA	GASIFIER SCREENING AUGER	SA-01
86	1	EA	GASIFIER SCREENING AUGER	SA-02
87	1	EA	GASIFIER SCREENING AUGER	SA-03
88	1	EA	GASIFIER SCREENING AUGER	SA-04
89	1	EA	SCREW CONVEYOR	SC-01
90	1	EA	SCREW CONVEYOR	SC-02
91	1	EA	SCREW CONVEYOR	SC-03
92	1	EA	SCREW CONVEYOR	SC-04
93	1	EA	SCREW CONVEYOR	SC-05
94	1	EA	SCREW CONVEYOR	SC-06
95	1	EA	SCREW CONVEYOR	SC-07
96	1	EA	SCREW CONVEYOR	SC-08
97	1	EA	SCREW CONVEYOR	SC-09
98	1	EA	SCREW CONVEYOR	SC-10
99	1	EA	SCREW CONVEYOR	SC-11
100	1	EA	SCREW CONVEYOR	SC-12
101	1	EA	SCREW CONVEYOR	SC-13
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103	1	EA	SCREW CONVEYOR	SC-15
104	1	EA	SCREW CONVEYOR	SC-16
105	1	EA	UNIT HEATER	UH-01
106	1	EA	UNIT HEATER	UH-02
107	1	EA	UNIT HEATER	UH-03
108	1	EA	UNIT HEATER	UH-04
109	1	EA	UNIT HEATER	UH-05
110	1	EA	UNIT HEATER	UH-06
111	1	EA	RADIATOR	UH-07
112	1	EA	RADIATOR	UH-08
113	1	EA	VERTICAL SCREW CONVEYOR	VC-01
114	1	EA	VERTICAL SCREW CONVEYOR	VC-02
115	1	EA	VERTICAL SCREW CONVEYOR	VC-03
116	1	EA	VERTICAL SCREW CONVEYOR	VC-04
117	1	EA	VERTICAL SCREW CONVEYOR	VC-05
118	1	EA	VERTICAL SCREW CONVEYOR	VC-06
119	1	EA	VERTICAL SCREW CONVEYOR	VC-07
120	1	EA	VERTICAL SCREW CONVEYOR	VC-08
121	1	EA	VERTICAL SCREW CONVEYOR	VC-09
122	1	EA	VERTICAL SCREW CONVEYOR	VC-10
123	1	EA	VERTICAL SCREW CONVEYOR	VC-11
124	1	EA	VERTICAL SCREW CONVEYOR	VC-12
125	1	EA	VERTICAL SCREW CONVEYOR	VC-13
126	1	EA	VERTICAL SCREW CONVEYOR	VC-14
127	1	EA	VERTICAL SCREW CONVEYOR	VC-15
128	1	EA	VERTICAL SCREW CONVEYOR	VC-16

OWNER

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183 MOUNT BAKER ROAD
EASTBOUND WA 98245-9413

PROJECT

BIOMASS GENERATION WITH BIOCHAR FOR ISLAND ENERGY RESILIENCE

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DRAWING TITLE

GENERAL ARRANGEMENT

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ENGINEER'S STAMP

DRAWING TYPE

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SCALE 1:96

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PROJECT: 0055.OPL

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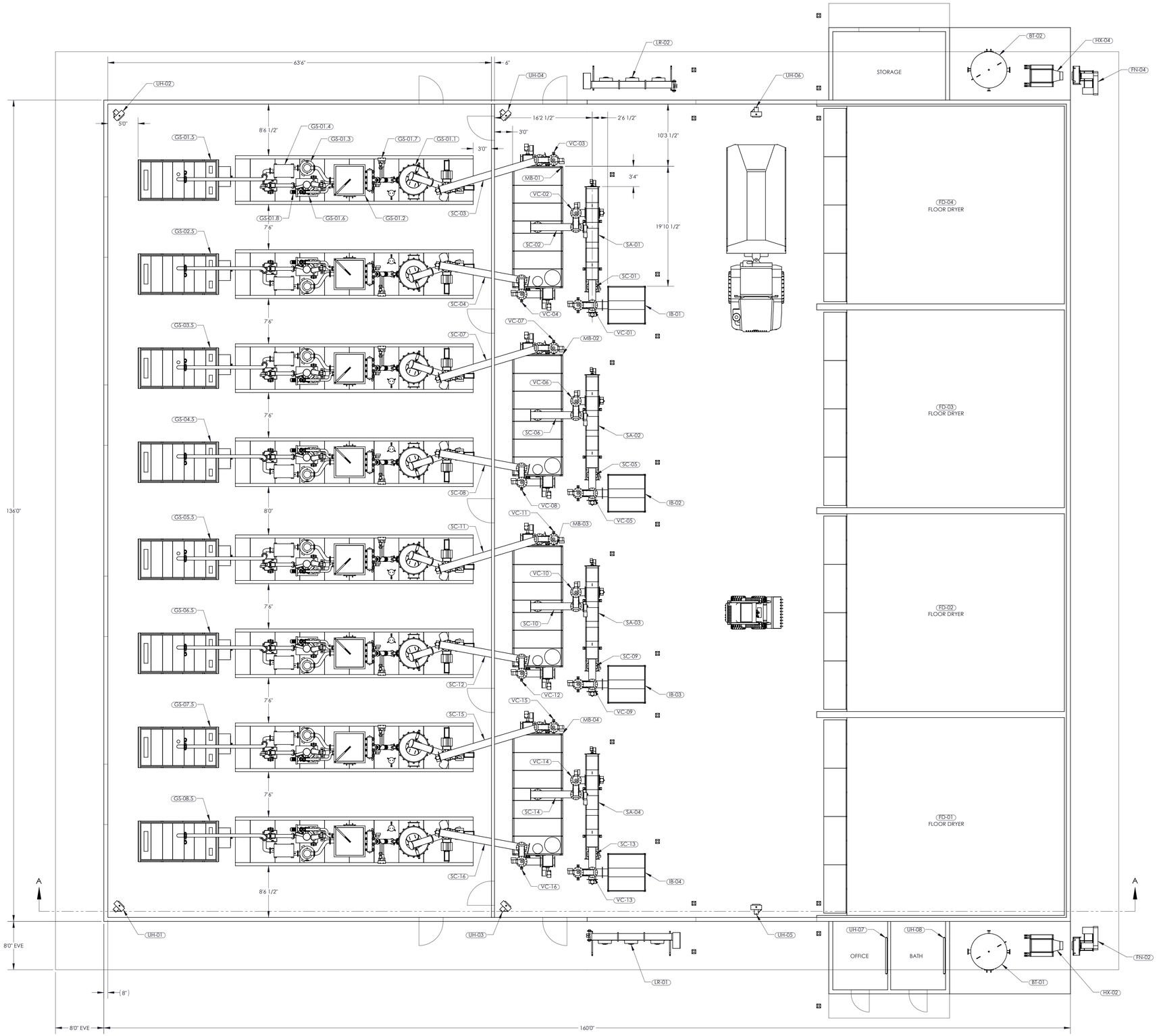

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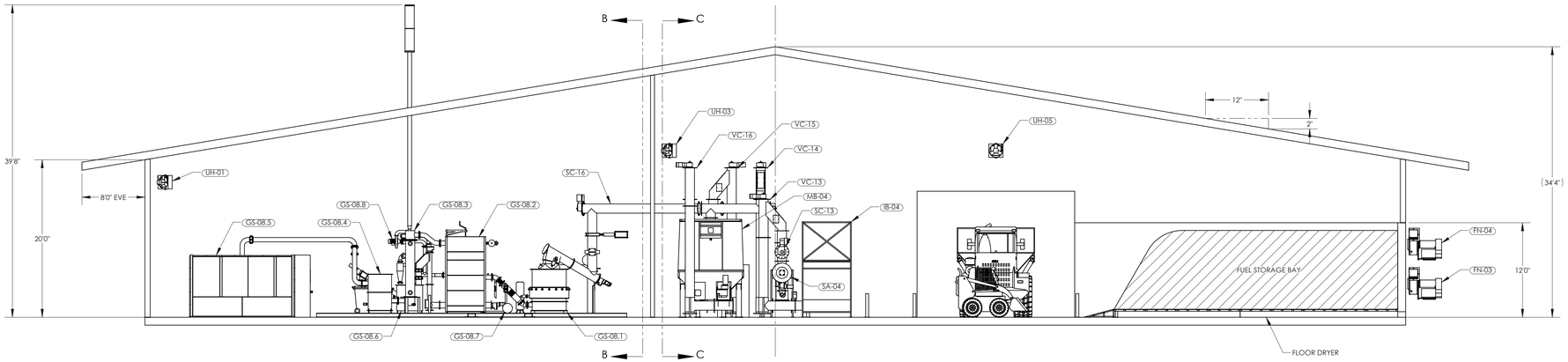
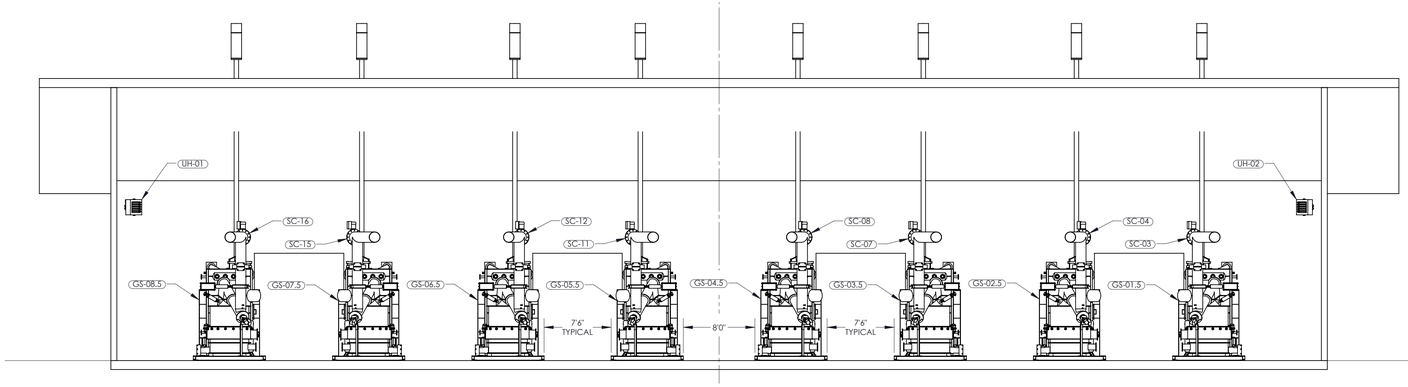
DRAWING NO.

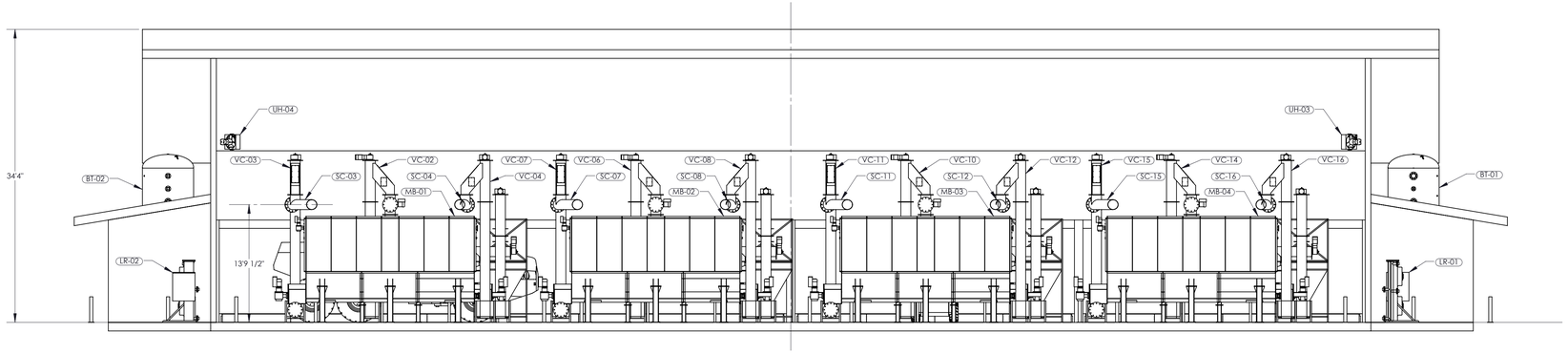
0055-101-111.2



SECTION A-A



SECTION B-B



SECTION C-C

OWNER

OPALCO
Co-op Run. Community Powered.

183 MOUNT BAKER ROAD
EASTBOUND WA 98245-9413

PROJECT

BIOMASS GENERATION WITH BIOCHAR FOR ISLAND ENERGY RESILIENCE

DESIGN FIRM

WISEWOOD ENERGY
TEL. 503.608.7366
FAX 503.715.0483
INFO@WISEWOODENERGY.COM
WWW.WISEWOODENERGY.COM
6800 NE 59TH PLACE
PORTLAND, OR 97218

DRAWING TITLE

GENERAL ARRANGEMENT

REVISIONS

REFERENCE DRAWINGS

	DWG #	DWG TITLE
1		
2		
3		
4		
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11		

ENGINEER'S STAMP

DRAWING TYPE

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

SCALE 1:96

THIS LINE IS 2" AT FULL SCALE
IF IT DOES NOT MEASURE 2"
SCALE ACCORDINGLY

DRAWN: D. RECORD	DATE: 2022-04-15
CHECKED:	DATE:
APPROVED:	DATE:
PROJECT: 0055.OPL	

DRAWING NO.

0055-101-111.3

CONVERSION FACTORS AND PARAMETERS

1 US TON:	2,000	LBS
RAW MATERIAL MOISTURE CONTENT:	40%	MC
DRY CHIPS MOISTURE CONTENT:	**10%**	MC
GREEN BULK DENSITY:	17.1	LB/FT3
DRY BULK DENSITY:	12	LB/FT3
1 YD^3:	27	FT^3
ENERGY IN WOOD, BONE-DRY:	8,000	BTUS/LB
ENERGY IN WOOD, DRY (10% MC):	7,102.96	BTUS/LB
CHIPS DRYER EFFICIENCY:	3,000	BTUS/LB
1 KW:	3412	BTUS
1 hp:	1.341	kW

FUEL SOURCES SUMMARY

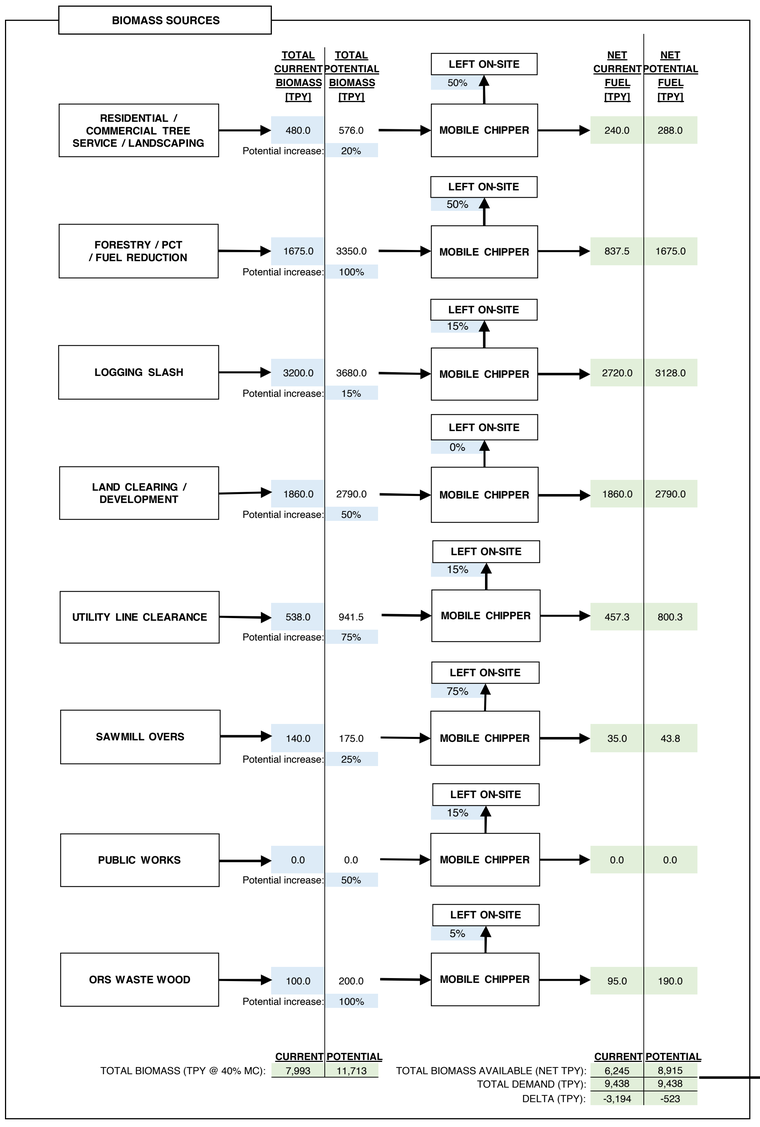
	CURRENT	POTENTIAL
TOTAL BIOMASS [TPY]:	7,993.0	11,712.5
LEFT ON-SITE [TPY]:	1,748.2	2,797.5
DELTA (NET BIOMASS AVAILABLE) [TPY]:	**6,244.8**	**8,915.0**

OPERATION SCHEDULE

	HRS / DAY	DAYS / WEEK	WEEKS / YR	HRS / YR
WOOD PROCESSING	8	5	48	1920
DRYER	24	7	49	8200
GASIFIERS	24	7	49	8200

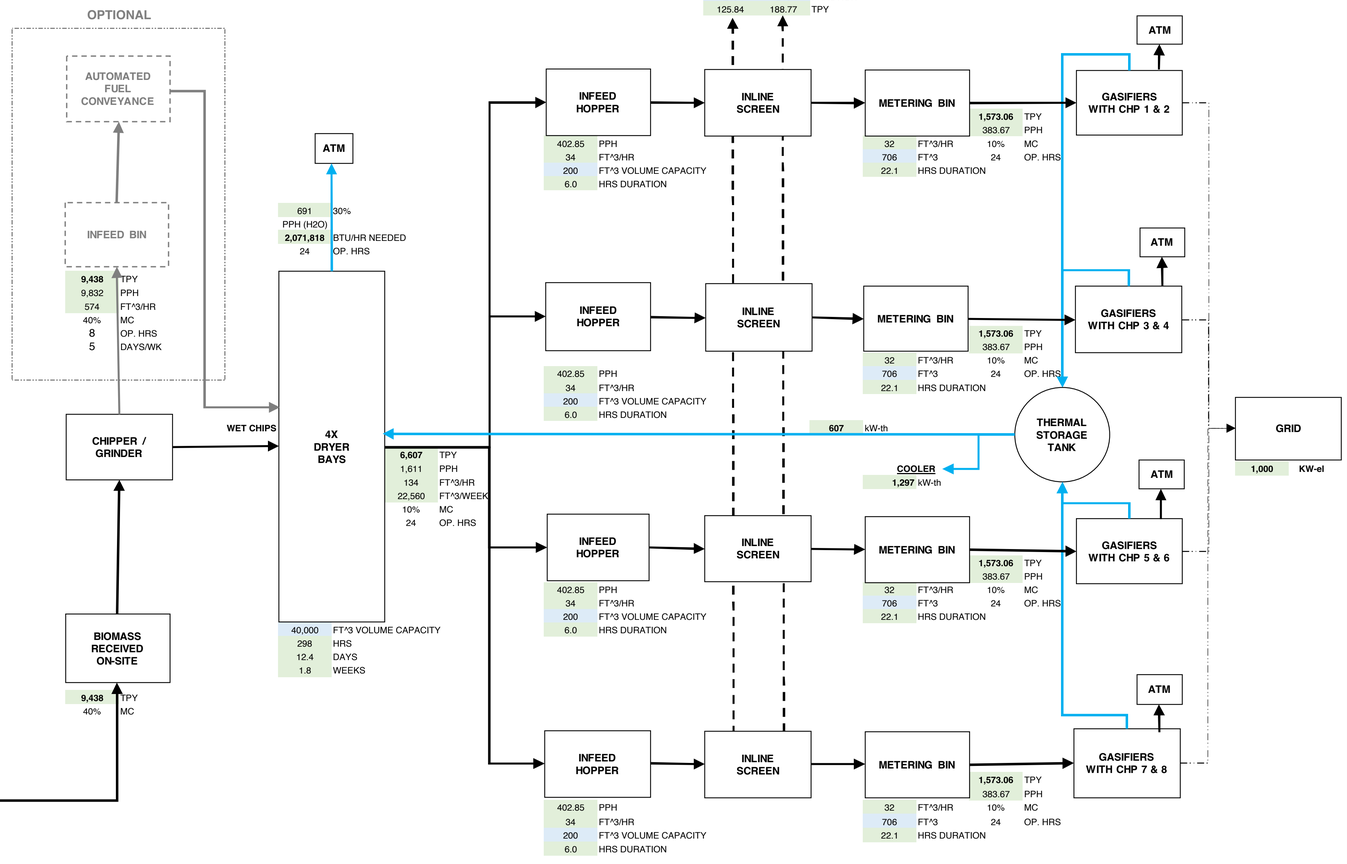
CHP SYSTEM (8X 125 kW GASIFIERS)

125 kW GASIFIER OUTPUT RATING (kW-el):	125		
125 kW GASIFIER OUTPUT RATING (kW-th):	238		
GASIFIER FUEL DEMAND, DRY CHIPS @10%MC - Holtz 125Kw (Kg/hr):	87		
NUMBER OF 125kW GASIFIERS:	8		
ELECTRICAL OUTPUT [kW-el]	1,000		
THERMAL OUTPUT [kW-th]	1,904		
THERMAL OUTPUT [BTU/HR]	6,496,448		
OPERATING HOURS	8,200		
FUEL DEMAND (PPH, DRY)	1,535		
FUEL DEMAND (TPY, DRY)	6,292	10%	MC
FUEL DEMAND (TPY, AS PROCURED)	8,989	40%	MC



BONE-DRY EQUIVALENT

	CURRENT	POTENTIAL
TOTAL BIOMASS AVAILABLE (BDT/YR):	4,795.8	7,027.5
TOTAL BIOMASS AVAILABLE (NET BDT/YR):	3,746.9	5,349.0
TOTAL DEMAND (BDT/YR):	5,663.0	5,663.0
DELTA (BDT/YR):	-1,916	-314



OWNER

OPALCO
Co-op Run. Community Powered.

EASTSOUND, WASHINGTON

PROJECT

BIOMASS GENERATION WITH BIOCHAR FOR ISLAND ENERGY RESILIENCE

DESIGN FIRM

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6800 NE 59TH PLACE
PORTLAND, OR 97218

DRAWING TITLE

BLOCK DIAGRAM

REVISIONS

REV	DESCRIPTION	DRAW DATE:	APPROVED DATE:

REFERENCE DRAWINGS

	DWG #	DWG TITLE
1		
2		
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ENGINEER'S STAMP

DRAWING TYPE

ISSUED FOR REVIEW
IFR

THIS LINE IS 2 INCHES
AT FULL SCALE
IF IT DOES NOT MEASURE 2 INCHES, SCALE ACCORDINGLY

DRAWN: J. RIVAS DATE: 2022-03-22

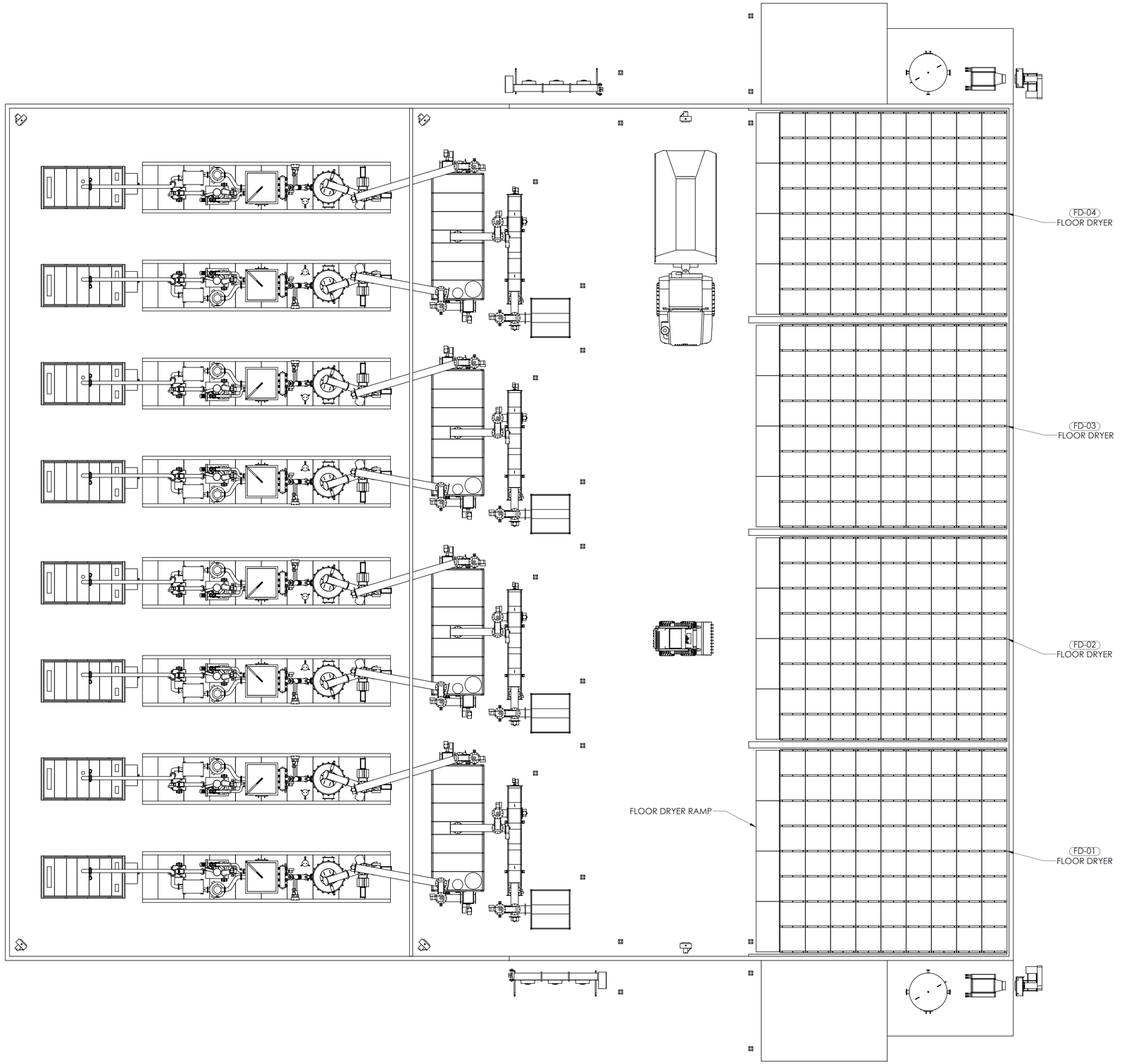
CHECK:

APPROVED:

PROJECT:

DRAWING NO.

0055-110-101



OWNER

OPALCO
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183 MOUNT BAKER ROAD
EASTSOUND WA 98245-9413

PROJECT

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DRAWING TITLE

FLOOR DRYER ARRANGEMENT

REVISIONS

REV	DESCRIPTION	DRAWN: DATE:	APROVED: DATE:

REFERENCE DRAWINGS

	DWG #	DWG TITLE
1	0055-101-111	GENERAL ARRANGEMENT
2	0055-520-301	DRYER DUCTING ARRANGEMENT
3		
4		
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ENGINEER'S STAMP

DRAWING TYPE

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

SCALE 1:96

THIS LINE IS 2" AT FULL SCALE
IF IT DOES NOT MEASURE 2"
SCALE ACCORDINGLY

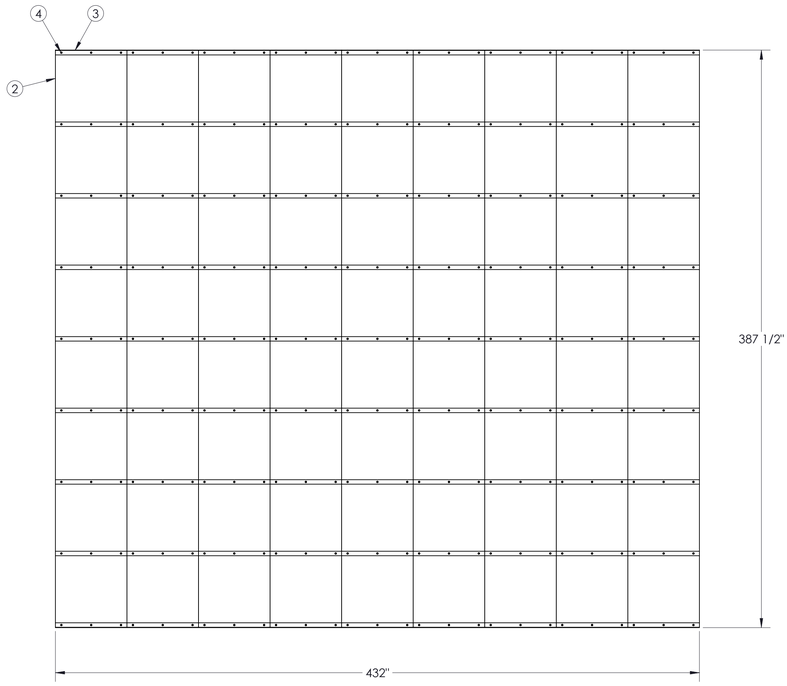
DRAWN: D. RECORD	DATE: 2022-04-29
CHECKED:	DATE:
APPROVED:	DATE:
PROJECT: 0055.OPL	

DRAWING NO.

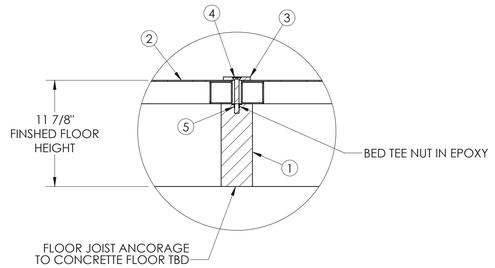
0033-310-101.1

ITEM	QTY	UNITS	DESCRIPTION	MATERIAL	MANUFACTURER
1	925'	EA	4" X 10" FLOOR JOIST SYSTEM	SPRUCE OR DOUGLAS FIR OR EQ	
2	72	EA	FLOOR DRYER PANEL	STEEL	
3	81	EA	FLOOR DRYER HOLD DOWN BAR	3/8" X 3" STEEL FLAT BAR	
4	243	EA	1/2-13 FLAT HEAD CAP SCREW X 4 LG, PARTIAL THREAD	ZINC PLATED STEEL	McMASTER CARR, 91263A217 OR EQ
5	243	EA	1/2-13 TEE NUT INSERT, FOR USE IN WOOD	ZINC PLATED STEEL	McMASTER CARR, 90975A304 OR EQ

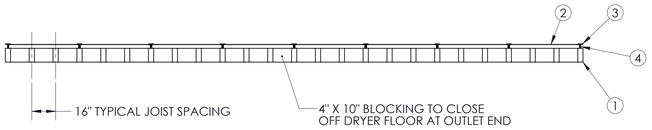
NOTE: THE ABOVE QUANTIES ARE FOR ONE (1) FLOOR DRYER, FOUR (4) FLOOR DRYERS REQUIRED



FLOOR DRYER ASSEMBLY
(4) REQUIRED



DETAIL B
SCALE 1 : 8



SECTION A-A

OWNER

OPALCO
Co-op Run. Community Powered.

183 MOUNT BAKER ROAD
EASTSOUND WA 98245-9413

PROJECT

BIOMASS GENERATION WITH BIOCHAR FOR ISLAND ENERGY RESILIENCE

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DRAWING TITLE

FLOOR DRYER ARRANGEMENT

REVISIONS

REFERENCE DRAWINGS

	DWG #	DWG TITLE
1	0055-101-111	GENERAL ARRANGEMENT
2	0055-520-301	DRYER DUCTING ARRANGEMENT
3		
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ENGINEER'S STAMP

DRAWING TYPE

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

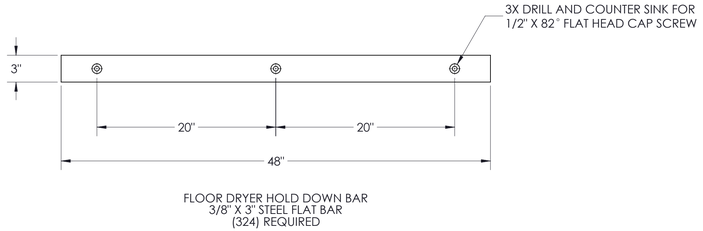
SCALE 1:48

THIS LINE IS 2" AT FULL SCALE
IF IT DOES NOT MEASURE 2"
SCALE ACCORDINGLY

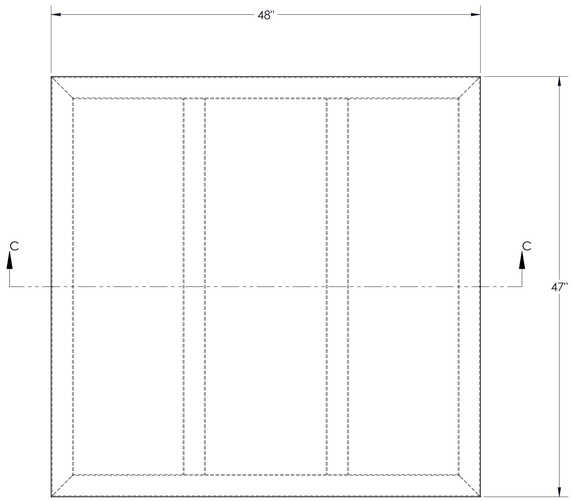
DRAWN: D. RECORD	DATE: 2022-04-29
CHECKED:	DATE:
APPROVED:	DATE:
PROJECT: 0055.OPL	

DRAWING NO.

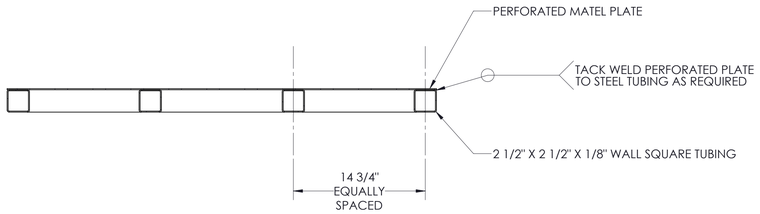
0033-310-101.2



FLOOR DRYER HOLD DOWN BAR
3/8" X 3" STEEL FLAT BAR
(324) REQUIRED



FLOOR DRYER PANEL
(288) REQUIRED



SECTION C-C

OWNER

OPALCO
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EASTSOUND WA 98245-9413

PROJECT

BIOMASS GENERATION WITH BIOCHAR FOR ISLAND ENERGY RESILIENCE

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DRAWING TITLE

FLOOR DRYER ARRANGEMENT

REVISIONS

REFERENCE DRAWINGS

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1	0055-101-111	GENERAL ARRANGEMENT
2	0055-520-301	DRYER DUCTING ARRANGEMENT
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ENGINEER'S STAMP

DRAWING TYPE

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

SCALE 1:8

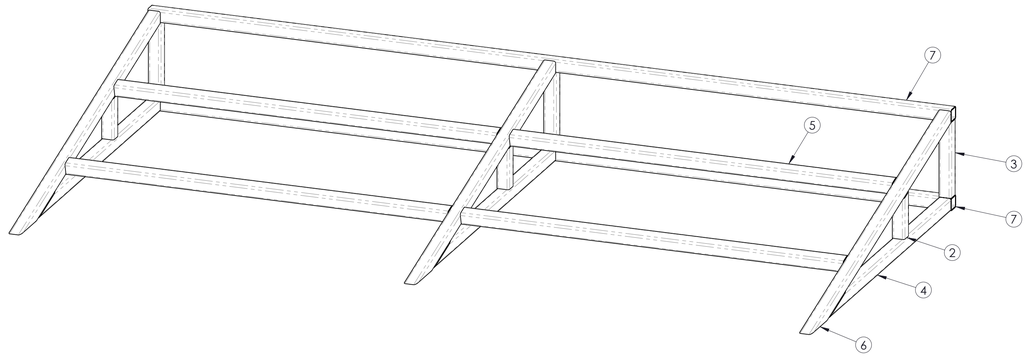
THIS LINE IS 2" AT FULL SCALE
IF IT DOES NOT MEASURE 2"
SCALE ACCORDINGLY

DRAWN: D. RECORD	DATE: 2022-04-29
CHECKED:	DATE:
APPROVED:	DATE:
PROJECT: 0055.OPL	

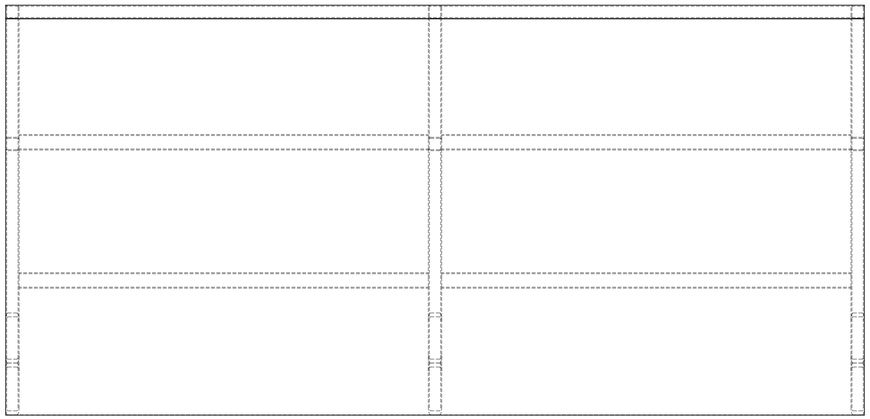
DRAWING NO.

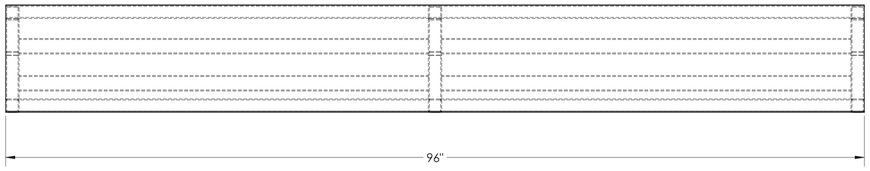
0033-310-101.3

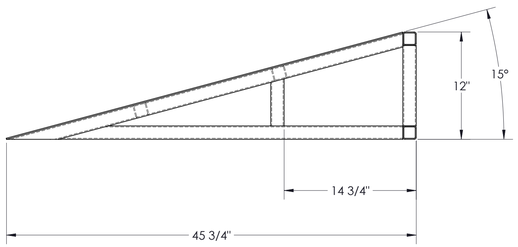
ITEM	QTY	UNITS	DESCRIPTION	LENGTH	TOTAL LENGTH
1	1	EA	1/8" SHEET		
2	3	EA	HSS 1 1/2" X 1 1/2" X 1/8"	5 1/4"	671"
3	3	EA	HSS 1 1/2" X 1 1/2" X 1/8"	9"	671"
4	3	EA	HSS 1 1/2" X 1 1/2" X 1/8"	38 1/2"	671"
5	4	EA	HSS 1 1/2" X 1 1/2" X 1/8"	45 3/4"	671"
6	3	EA	HSS 1 1/2" X 1 1/2" X 1/8"	45 7/8"	671"
7	2	EA	HSS 1 1/2" X 1 1/2" X 1/8"	96"	671"



FLOOR DRYER RAMP
(16) REQUIRED
(1/8" TOP SKIN SHEET NOT SHOWN)







OWNER

OPALCO
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EASTSOUND WA 98245-9413

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DRAWING TITLE

FLOOR DRYER ARRANGEMENT

REVISIONS

REFERENCE DRAWINGS

	DWG #	DWG TITLE
1	0055-101-111	GENERAL ARRANGEMENT
2	0055-520-301	DRYER DUCTING ARRANGEMENT
3		
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ENGINEER'S STAMP

DRAWING TYPE

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

SCALE 1:8

THIS LINE IS 2" AT FULL SCALE
IF IT DOES NOT MEASURE 2"
SCALE ACCORDINGLY

DRAWN: D. RECORD	DATE: 2022-04-29
CHECKED:	DATE:
APPROVED:	DATE:
PROJECT: 0055.OPL	

DRAWING NO.

0033-310-101.4

PIPING SYMBOLS KEY	
	3-WAY ACTUATED GLOBE VALVE
	AIR BLEED
	AIR ASSISTANCE VALVE
	BALL VALVE
	BUTTERFLY VALVE
	CHECK VALVE
	CIRCUIT SETTER VALVE
	DAMPER
	DUPLEX FUEL FILTER
	EXPANSION TANK
	FAN
	FLOW METER
	PRESSURE RELIEF VALVE
	PUMP
	SOLENOID VALVE
	STRAINER

OWNER

OPALCO
Co-op Run. Community Powered.

EASTSOUND, WASHINGTON

PROJECT

BIOMASS GENERATION WITH BIOCHAR FOR ISLAND ENERGY RESILIENCE

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PORTLAND, OR 97218

DRAWING TITLE

MECHANICAL PIPING DIAGRAM

REVISIONS

REV	DESCRIPTION	DRAW DATE:	APPROVED DATE:

REFERENCE DRAWINGS

	DWG #	DWG TITLE
1		
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ENGINEER'S STAMP

DRAWING TYPE

ISSUED FOR REVIEW

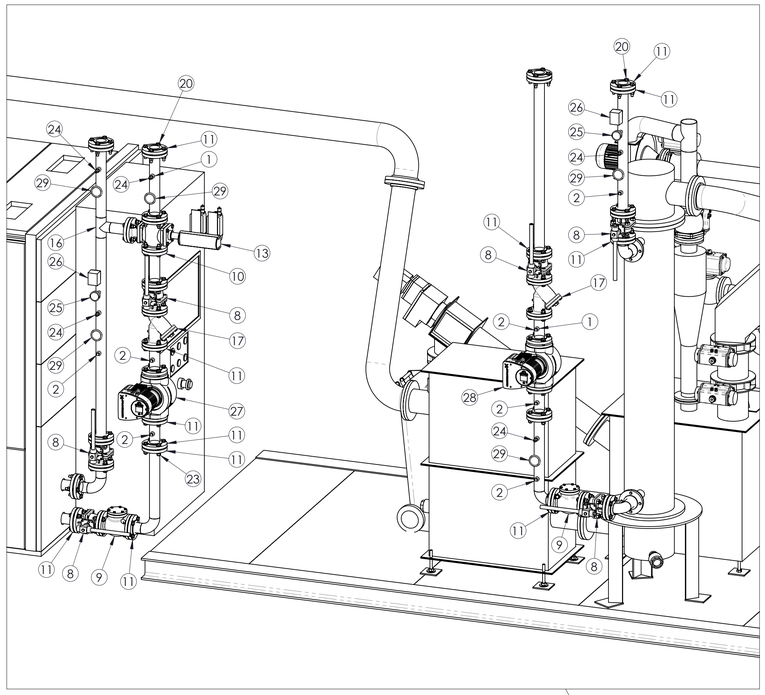
IFR

THIS LINE IS 2 INCHES
AT FULL SCALE
IF IT DOES NOT MEASURE 2 INCHES, SCALE ACCORDINGLY

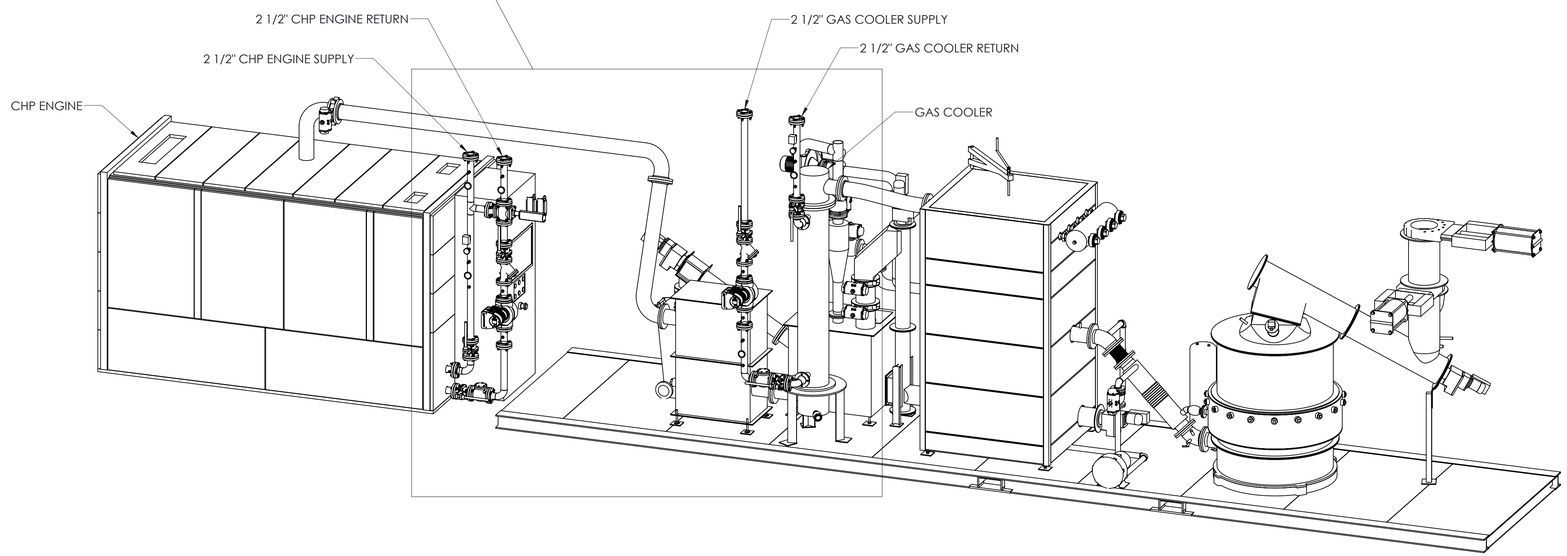
DRAWN:	D. RECORD	DATE: 2022-04-05
CHECK:		
APPROVED:		
PROJECT:		

DRAWING NO.

0055-500-002



DETAIL A
SCALE 1 : 20



ITEM	QTY	UNITS	DESCRIPTION	MATERIAL	MANUFACTURER
1	17	EA	1/2" FNPT WELD ON OUTLET, SCHD 80, FOR PIPE SIZE 3/4" TO 36", 3000 PSI MAXIMUM PRESSURE, ASTM A105	STEEL	McMASTER CARR, 1875N160 OR EQ
2	7	EA	1/2" PIPE PLUG, SQUARE HEAD, CLASS 150	BLACK COATED STEEL	McMASTER CARR, 44605K224 OR EQ
3	2	EA	1/4" BALL VALVE, MNPT X FNPT, 400 PSI AT 100 DEG F, 0-200 DEG F OPERATING TEMP	CHOME PLATED BRASS BODY WITH PTFE SEAL	McMASTER CARR, 4912K2 OR EQ
4	4	EA	1/4" FNPT WELD ON OUTLET, SCHD 80, FOR PIPE SIZE 3/8" TO 36", 3000 PSI MAXIMUM PRESSURE, ASTM A105	STEEL	McMASTER CARR, 4587K31 OR EQ
5	2	EA	1/4" PIPE NIPPLE X 2" LG, MNPT ENDS, SCHD 40	BLACK COATED STEEL	McMASTER CARR, 44615K432 OR EQ
6	3	EA	2 1/2" 90 DEGREE ELBOW, SCHD 40, BUTT WELD, LONG RADIUS	STEEL	FERGUSON, GW9L OR EQ
7	2	EA	2 1/2" 90 DEGREE ELBOW, SCHD 40, BUTT WELD, SHORT RADIUS	STEEL	FERGUSON, GWSR9L OR EQ
8	6	EA	2 1/2" BALL VAVLE, FLANGED ENDS, 275 PSI AT 100 DEG F, 0 TO 500 DEG F OPERATING TEMP	STEEL BODY, 316 STAINLESS STEEL BALL, PTFE SEALS AND SEAT	McMASTER CARR, 46155K26 OR EQ
9	2	EA	2 1/2" CHCEK VALVE, FLANGED ENDS, 200 PSI AT 70 DEG F, 405 DEG F MAX TEMP	IRON BODY, BRONZE DISC AND SEAL	McMASTER CARR, 8200T12 OR EQ
10	3	EA	2 1/2" FLANGE, CLASS 150, FLAT FACE, SLIP ON, ANSI/ASME B16.5 ASTM A105	STEEL	McMASTER CARR, OR EQ
11	32	EA	2 1/2" FLANGE, CLASS 150, RAISED FACE, SLIP ON, ANSI/ASME B16.5 ASTM A105	STEEL	McMASTER CARR, 68095K349 OR EQ
12	3	EA	2 1/2" FLAT FACE FLANGE GASKET, CLASS 150, 1/8" THICK, 800 PSI MAX, -20 TO 220 DEG F TEMP RANGE, 60A DUROMETER	EPDM	McMASTER CARR, 1082N14 OR EQ
13	1	EA	2 1/2" GLOBE VALVE, 3-WAY, FLANGED ENDS, ANSI CLASS 125, 24 VDC ACTUATOR, SPRING RETURN	BRONZE	BELIMO, G765 2AFX24-MF195-X1
14	316 3/8"	FT	2 1/2" PIPE, SCHD 40, WELDED	STEEL	FERGUSON, GBPPEA53BL OR EQ
15	27	EA	2 1/2" RAISED FACE FLANGE GASKET, CLASS 150, 1/8" THICK, 800 PSI MAX, -20 TO 220 DEG F TEMP RANGE, 60A DUROMETER	EPDM	McMASTER CARR, 1082N25 OR EQ
16	1	EA	2 1/2" TEE, SCHD 40, BUTT WELD	STEEL	FERGURSON, DWTL OR EQ
17	2	EA	2 1/2" WYE STRAINER, FLANGED ENDS, 200 PSI AT 70 DEG F, 450 DEG F MAX TEMP	IRON BODY, 304 SS SCREEN	McMASTER CARR, 9814K723 OR EQ
18	240	EA	5/8" FLAT WASHER	ZINC PLATED STEEL	McMASTER CARR OR EQ
19	120	EA	5/8" LOCK WASHER	ZINC PLATED STEEL	McMASTER CARR OR EQ
20	20	EA	5/8-11 HEX HEAD CAP SCREW X 3 1/2" LG, PARTIAL THREAD	ZINC PLATED STEEL	McMASTER CARR OR EQ
21	36	EA	5/8-11 HEX HEAD CAP SCREW X 3 1/4" LG, PARTIAL THREAD	ZINC PLATED STEEL	McMASTER CARR OR EQ
22	64	EA	5/8-11 HEX HEAD CAP SCREW X 3" LG, PARTIAL THREAD	ZINC PLATED STEEL	McMASTER CARR OR EQ
23	120	EA	5/8-11 HEX NUT, GRADE 5	ZINC PLATED STEEL	McMASTER CARR OR EQ
24	5	EA	IMMERSION TEMPERATURE SENSOR, 2 1/2" LONG PROBE, -1/2" MNPT, 200 PSI, -13 TO 221 DEG F OPERATING TEMP	STAINLESS STEEL PROBE	VERIS, TIHA1B0
25	2	EA	PRESSURE GAGE, 0-160 PSI, 1/4" MNPT BACK STEM, 2 1/2" LIQUID FILLED DIAL	304 SS CASE W/ 316 SS STEM	McMASTER CARR, 3795K144
26	2	EA	PRESSURE SWITCH, FOR USE WITH WATER, 2 CIRCUITS, NORMALLY CLOSED, 5-65 PSI SET POINT, 200 PSI MAX PRESSURE, 1/4" FNPT CONNECTION, 120 / 240 VAC	POLYCORBONATE HOUSING	McMASTER CARR, 41535K93
27	1	EA	PUMP, GF 65 FLANGES (2 1/2" NOMINAL), 66 GPM, 20 PSI, 1 3/4 HP, 230 VOLT, 1 PHASE, 60 Hz	CAST IRON HOUSING	GRUNDFOS, MAGNA3 65-150 F
28	1	EA	PUMP, GF 65 FLANGES (2 1/2" NOMINAL), 66 GPM, 20 PSI, 1 3/4 HP, 230 VOLT, 1 PHASE, 60 Hz	CAST IRON HOUSING	GRUNDFOS, MAGNA3 65-150 F
29	5	EA	TEMPURATURE GAGE, 0-250 DEG F (0-120 DEG C), 3" DIAL, 1/2" MNPT STEM X 2 1/2" LG, 400 PSI MAX	STAINLESS STEEL W/ GLASS LENS	McMASTERR CARR, 3946K124 OR EQ

OWNER

OPALCO
Co-op Run. Community Powered.

183 MOUNT BAKER ROAD
EASTSOUND WA 98245-9413

PROJECT

BIOMASS GENERATION WITH BIOCHAR FOR ISLAND ENERGY RESILIENCE

DESIGN FIRM

WISEWOOD ENERGY
TEL. 503.608.7366
FAX 503.715.0483
INFO@WISEWOODENERGY.COM
WWW.WISEWOODENERGY.COM
6800 NE 59TH PLACE
PORTLAND, OR 97218

DRAWING TITLE

125kW GASIFIER HOT WATER PIPING ARRANGEMENT, RIGHT HAND

REVISIONS

REV	DESCRIPTION	DRAWN: DATE:	APROVED: DATE:

REFERENCE DRAWINGS

	DWG #	DWG TITLE
1	0055-520-161	PLANT HOT WATER PIPING ARRANGEMENT
2	0055-520-112	125kW GASIFIER HOT WATER PIPING, LEFT HAND
3		
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ENGINEER'S STAMP

DRAWING TYPE

ISSUED FOR REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

SCALE 1:32

THIS LINE IS 2" AT FULL SCALE
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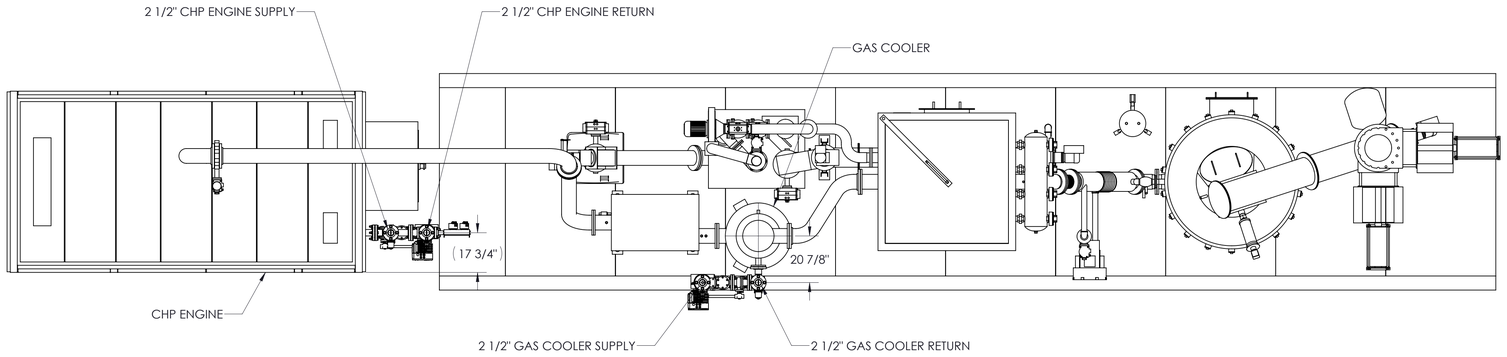
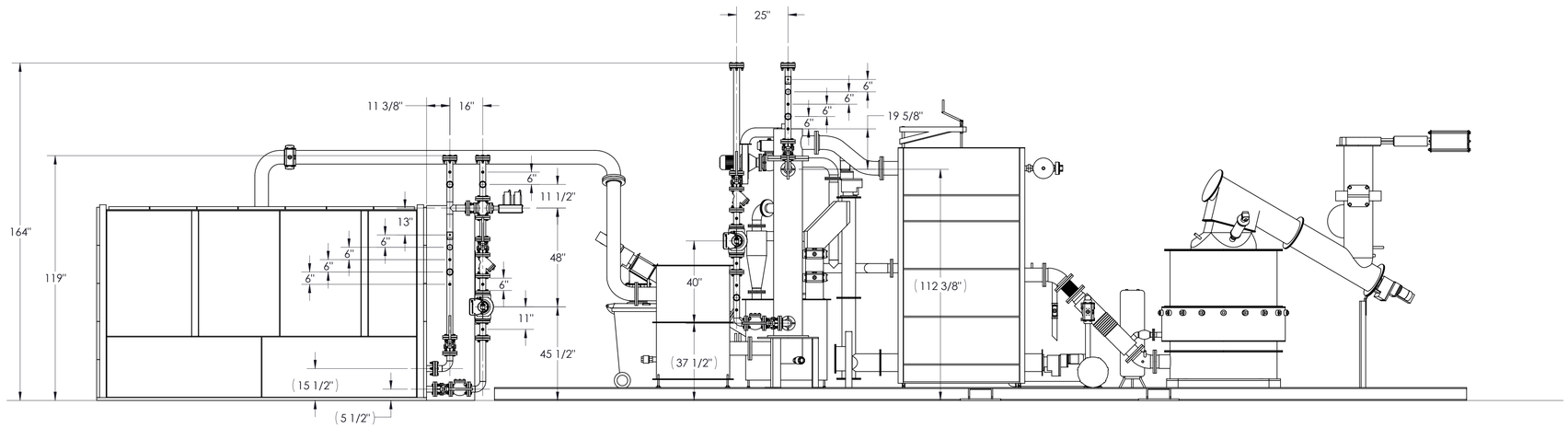
SCALE ACCORDINGLY

DRAWN: D. RECORD	DATE: 2022-04-20
CHECKED:	DATE:
APPROVED:	DATE:
PROJECT: 0055.OPL	

DRAWING NO.

0055-520-111.1





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DRAWING NO.

0055-520-111.2

ITEM	QTY	UNITS	DESCRIPTION	MATERIAL	MANUFACTURER
1	17	EA	1/2" FNPT WELD ON OUTLET, SCHD 80, FOR PIPE SIZE 3/4" TO 36", 3000 PSI MAXIMUM PRESSURE, ASTM A105	STEEL	McMASTER CARR, 1875N160 OR EQ
2	7	EA	1/2" PIPE PLUG, SQUARE HEAD, CLASS 150	BLACK COATED STEEL	McMASTER CARR, 44605K224 OR EQ
3	2	EA	1/4" BALL VALVE, MNPT X FNPT, 400 PSI AT 100 DEG F, 0-200 DEG F OPERATING TEMP	CHOME PLATED BRASS BODY WITH PTFE SEAL	McMASTER CARR, 4912K2 OR EQ
4	4	EA	1/4" FNPT WELD ON OUTLET, SCHD 80, FOR PIPE SIZE 3/8" TO 36", 3000 PSI MAXIMUM PRESSURE, ASTM A105	STEEL	McMASTER CARR, 4587K31 OR EQ
5	2	EA	1/4" PIPE NIPPLE X 2" LG, MNPT ENDS, SCHD 40	BLACK COATED STEEL	McMASTER CARR, 44615K432 OR EQ
6	3	EA	2 1/2" 90 DEGREE ELBOW, SCHD 40, BUTT WELD, LONG RADIUS	STEEL	FERGUSON, GW9L OR EQ
7	2	EA	2 1/2" 90 DEGREE ELBOW, SCHD 40, BUTT WELD, SHORT RADIUS	STEEL	FERGUSON, GWSR9L OR EQ
8	6	EA	2 1/2" BALL VAVLE, FLANGED ENDS, 275 PSI AT 100 DEG F, 0 TO 500 DEG F OPERATING TEMP	STEEL BODY, 316 STAINLESS STEEL BALL, PTFE SEALS AND SEAT	McMASTER CARR, 46155K26 OR EQ
9	2	EA	2 1/2" CHCEK VALVE, FLANGED ENDS, 200 PSI AT 70 DEG F, 405 DEG F MAX TEMP	IRON BODY, BRONZE DISC AND SEAL	McMASTER CARR, 8200T12 OR EQ
10	3	EA	2 1/2" FLANGE, CLASS 150, FLAT FACE, SLIP ON, ANSI/ASME B16.5 ASTM A105	STEEL	McMASTER CARR, OR EQ
11	32	EA	2 1/2" FLANGE, CLASS 150, RAISED FACE, SLIP ON, ANSI/ASME B16.5 ASTM A105	STEEL	McMASTER CARR, 68095K349 OR EQ
12	3	EA	2 1/2" FLAT FACE FLANGE GASKET, CLASS 150, 1/8" THICK, 800 PSI MAX, -20 TO 220 DEG F TEMP RANGE, 60A DUROMETER	EPDM	McMASTER CARR, 1082N14 OR EQ
13	1	EA	2 1/2" GLOBE VALVE, 3-WAY, FLANGED ENDS, ANSI CLASS 125, 24 VDC ACTUATOR, SPRING RETURN	BRONZE	BELIMO, G765 2AFX24-MFT95-X1
14	316 3/8"	FT	2 1/2" PIPE, SCHD 40, WELDED	STEEL	FERGUSON, GBPPEA53BL OR EQ
15	27	EA	2 1/2" RAISED FACE FLANGE GASKET, CLASS 150, 1/8" THICK, 800 PSI MAX, -20 TO 220 DEG F TEMP RANGE, 60A DUROMETER	EPDM	McMASTER CARR, 1082N25 OR EQ
16	1	EA	2 1/2" TEE, SCHD 40, BUTT WELD	STEEL	FERGURSON, DWTL OR EQ
17	2	EA	2 1/2" WYE STRAINER, FLANGED ENDS, 200 PSI AT 70 DEG F, 450 DEG F MAX TEMP	IRON BODY, 304 SS SCREEN	McMASTER CARR, 9814K723 OR EQ
18	240	EA	5/8" FLAT WASHER	ZINC PLATED STEEL	McMASTER CARR OR EQ
19	120	EA	5/8" LOCK WASHER	ZINC PLATED STEEL	McMASTER CARR OR EQ
20	20	EA	5/8-11 HEX HEAD CAP SCREW X 3 1/2" LG, PARTIAL THREAD	ZINC PLATED STEEL	McMASTER CARR OR EQ
21	36	EA	5/8-11 HEX HEAD CAP SCREW X 3 1/4" LG, PARTIAL THREAD	ZINC PLATED STEEL	McMASTER CARR OR EQ
22	64	EA	5/8-11 HEX HEAD CAP SCREW X 3" LG, PARTIAL THREAD	ZINC PLATED STEEL	McMASTER CARR OR EQ
23	120	EA	5/8-11 HEX NUT, GRADE 5	ZINC PLATED STEEL	McMASTER CARR OR EQ
24	5	EA	IMMERSION TEMPERATURE SENSOR, 2 1/2" LONG PROBE, -1/2" MNPT, 200 PSI, -13 TO 221 DEG F OPERATING TEMP	STAINLESS STEEL PROBE	VERIS, TIHA1B0
25	2	EA	PRESSURE GAGE, 0-160 PSI, 1/4" MNPT BACK STEM, 2 1/2" LIQUID FILLED DIAL	304 SS CASE W/ 316 SS STEM	McMASTER CARR, 3795K144
26	2	EA	PRESSURE SWITCH, FOR USE WITH WATER, 2 CIRCUITS, NORMALLY CLOSED, 5-65 PSI SET POINT, 200 PSI MAX PRESSURE, 1/4" FNPT CONNECTION, 120 / 240 VAC	POLYCORBONATE HOUSING	McMASTER CARR, 41535K93
27	1	EA	PUMP, GF 65 FLANGES (2 1/2" NOMINAL), 66 GPM, 20 PSI, 1 3/4 HP, 230 VOLT, 1 PHASE, 60 Hz	CAST IRON HOUSING	GRUNDFOS, MAGNA3 65-150 F
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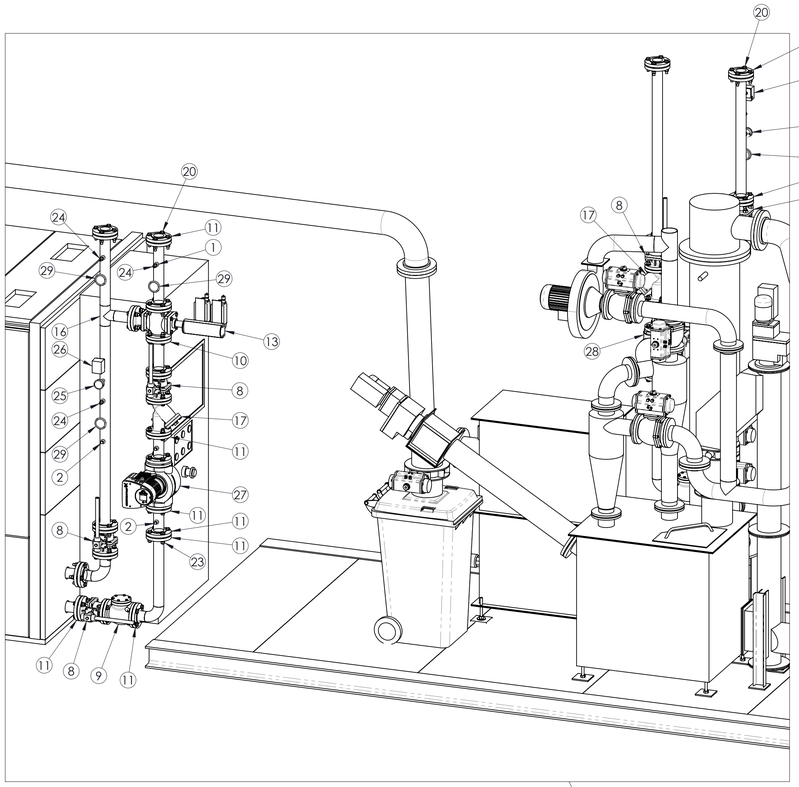
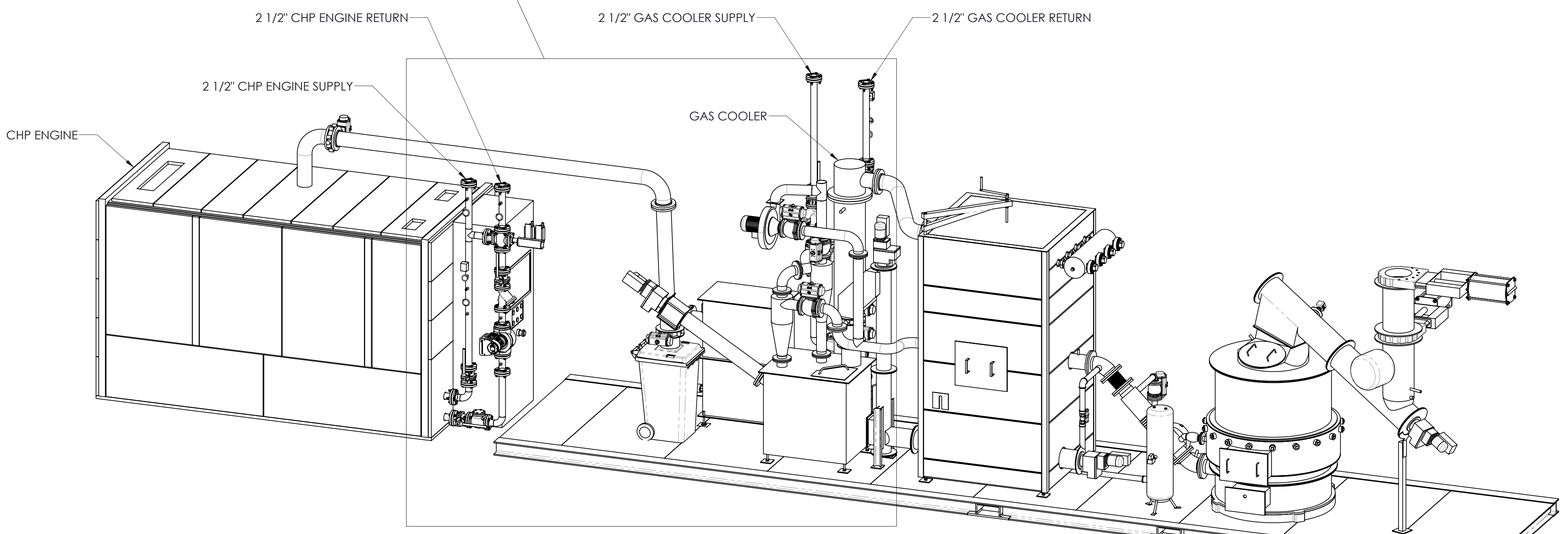


DETAIL B
SCALE 1 : 20



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DRAWING TITLE

125kW GASIFIER HOT WATER PIPING ARRANGEMENT, LEFT HAND

REVISIONS

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ENGINEER'S STAMP

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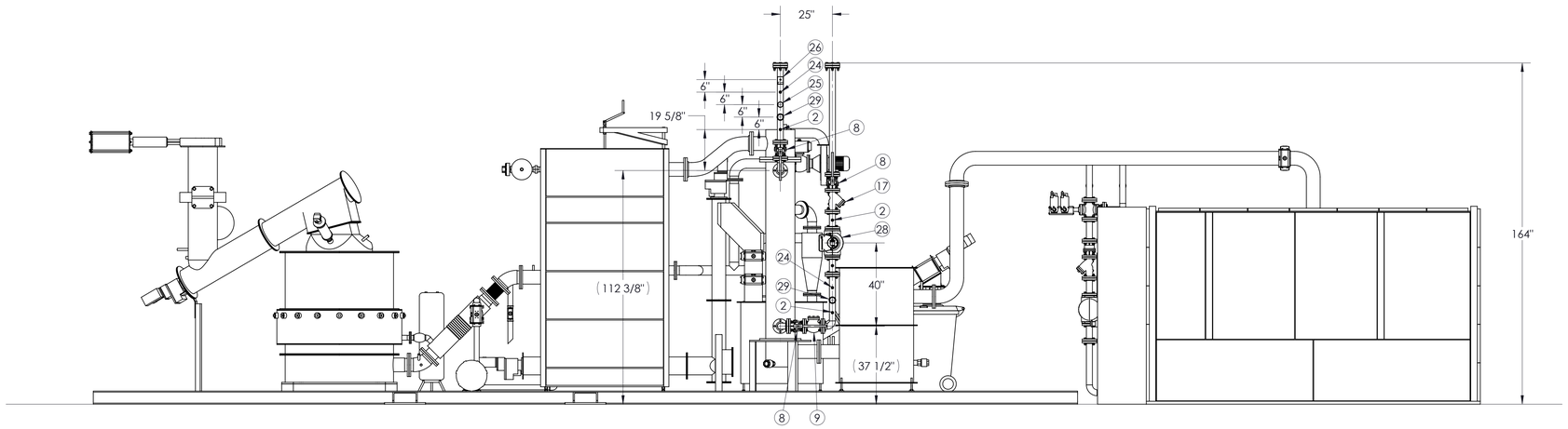

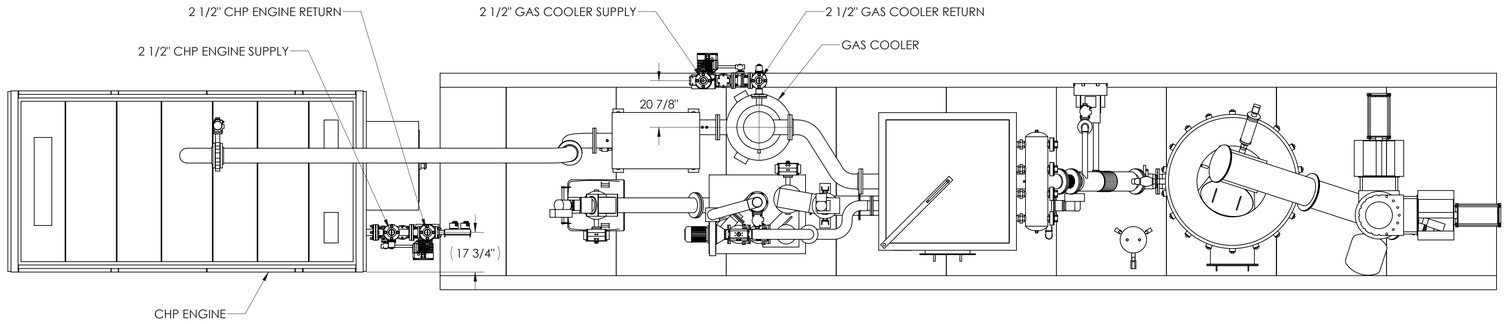

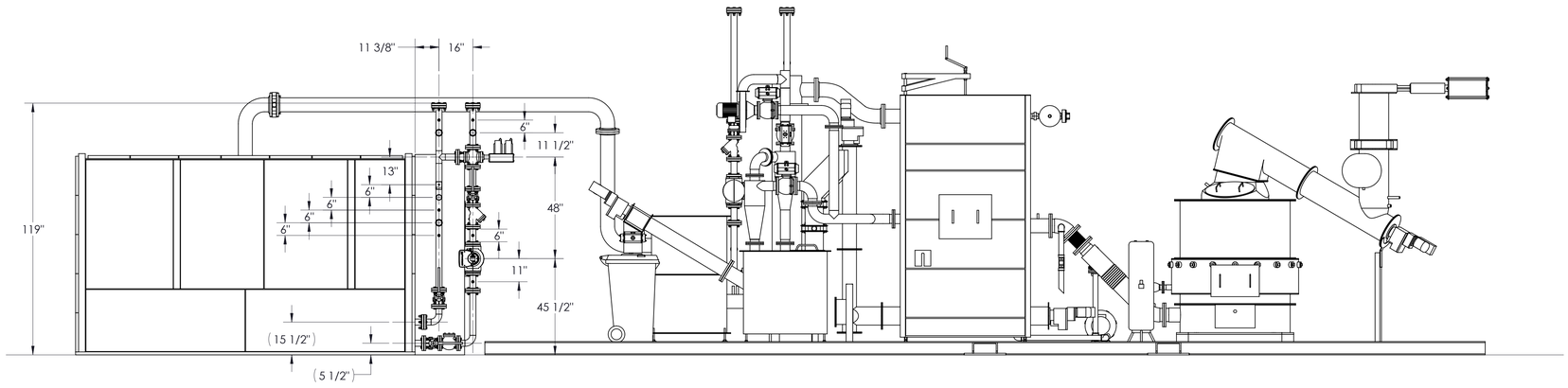

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DRAWING NO.

0055-520-112.2

Attachment C

San Juan County
Pre-Permitting Application Response

SAN JUAN COUNTY DEPARTMENT OF COMMUNITY DEVELOPMENT

135 Rhone Street, PO Box 947, Friday Harbor, WA 98250
(360) 378-2354 | (360) 378-2116
dcd@sanjuanco.com | www.sanjuanco.com

LAND USE PRE-APPLICATION MEETING MEMORANDUM

FILE NUMBER	PREAPP-22-0016
REPORT DATE:	June 25, 2022
TO:	Nerissa Zahora
TPN:	272750005000
PROPERTY INFO	15.02 acres
LAND USE DESIGNATION	Rural Industrial
FROM:	Colin Maycock, AICP, Planner IV *cm*
MEETING DATE:	June 2, 2022
ATTENDEES:	Nerissa Zahora, Andrew Haden, Meagan Hartman, Jeff Sharp, Krista Davis, Kyle Dodd,, Colin Maycock, AICP

---

1. LOCATION OF PROPOSED BIOMASS GENERATOR

The proposed location of the biomass power generator is in the center of the western lobe of Orcas Island.

TPN 272750005000 is a 15.02 acre parcel immediately adjacent to a gravel pit.

The parcel may be accessed via the County's Gravel Pit Road ROW; however, at this time the ROW west of the gravel pit entrance is unimproved.

2. EXISTING CONDITIONS:

TPN 272750005000 has a taxable acreage of 15.02 acres. Aside from light forestry use over the last century, it doesn't appear that the parcel has been significantly developed.

There are no mapped potential wetlands, geohazards, Fish and wildlife habitat conservation areas, cultural resource buffers or FEMA special flood hazard areas on this property.

A potential stream has been mapped across the parcel, **Exhibit 1**.

In the northeastern quadrant, approximately 900 feet from the proposed development, there is a drinking water well that serves the transfer station to the south, **Exhibit 2**.

The entire County is considered a critical aquifer recharge area. All commercial development of the site will be required to meet the code provisions protecting the aquifer, SJCC 18.35.080.

3. PROPOSAL:

The proposal is to create a one (1) Mega Watt (MW) power plant that will generate electricity by burning woody biomass material created on Orcas Island. Sources of burnable material include:

- Residential tree services
- Commercial tree services
- Landscaping
- Forestry

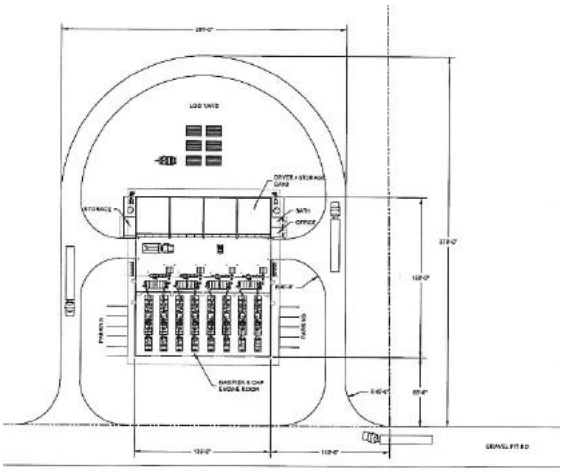
    - Fuel reduction residuals
    - Logging slash
    - Land clearing and development
- Utility line clearing
- Other waste wood that may otherwise be burned or left onsite

The material will be brough to the site in chipped or whole. Whole material will be chipped onsite for use within the facility.

The generated electricity will be fed into the OPALCO grid and will include microgrid controls that will enable critical facilities to operate during outages.

The proposed new structure will cover approximately 21,760 square feet will rise to 34’ and 4” in height.

Construction will entail clearing trees and grading approximately 105,450 square feet altogether and includes approximately 26,000 square feet for the storage of flammable material.



The project would also include upgrading the County ROW by building a road that meets County construction standards.

4. LANDUSE DESIGNATION:

The proposed biomass power generator would be located on a parcel that has the landuse designation of Rural Industrial.

Land Uses	Classification of Uses by Land Use Designation								
	Rural Designations					Resource Lands		Special Lands[4]	
	RGU	RR	RFF	RI	RC	AG	FOR	C	N
								Con-stitution Sites)	
Commercial power-generation facilities	C	N	N	P/C	P/C	C	C	N	N
Community sewerage treatment facilities	N	N	N	N	N	N	N	N	N

The construction of commercial power generation facilities is an allowable use for lands with a Rural Industrial landuse designation. Table 18.30.040 establishes that such a development will require either a provisional or conditional use permit. The permit type will be determined when a complete application is submitted and reviewed. That said, it seems likely that the scale of the project, the amount of impervious surface and potential for impacting neighboring parcels, will require a conditional use permit.

Conditional use permits require a public hearing and the Hearing Examiner is the decisionmaker.

The project will require a large stormwater plan, prepared by a qualified professional, addressing Minimum Requirements # 1 – 10.

The project will require water service and onsite sewage disposal. The applicant may request access to the onsite potable water source operated by the County's Solid Waste Utility.

Construction of an approved road to access the site will be required.

5. CRITICAL AREAS:

The entire county is considered a critical aquifer recharge area. The critical aquifer recharge area is the only mapped critical area on this parcel, **Exhibit 1**.

The County's GIS has identified a potential waterway, the applicant shall be required to evaluate the potential stream and identify any possible adverse impacts the project may have on the potential stream.

6. CULTURAL RESOURCES:

The proposal is not within a cultural resource buffer. A cultural resource report is not required prior to development.

7. STATE ENVIRONMENTAL PROTECTION ACT (SEPA):

Although the full extent of the clearing and grading required for this project has yet to be determined, it is likely that a SEPA threshold determination will be necessary. WAC 197-11-800 identifies actions that are exempt from SEPA threshold determinations, given the size of the proposal, it appears highly unlikely that grading will result in less than 100 cubic yards of disturbance. A SEPA checklist shall be prepared by the applicant as part of the application process.

8. STORMWATER:

The applicant expects the final application to entail significant excavation and grading; however, at this time the extent of the excavation and grading is not yet determined. The size of the site and the character of the proposed development suggests that excavation and grading is likely to require a stormwater management plan. A large stormwater plan, prepared by a qualified professional, addressing the Minimum Requirements # 1-10 shall be required.

9. PROJECT PLANS REVIEW (COMMUNITY DEVELOPMENT):

The proposal to construct a biomass power generator requires a provisional/conditional permit. The level of permit to be determined on the basis of the application. (However, it is prudent to expect a CUP.)

The applicant must demonstrate compliance with the following sections of San Juan County Code:

SJCC 18.30.040, Table 18.30.040
SJCC 18.35.85-105
SJCC 18.40.430
SJCC 18.60.050, Table 6.2
SJCC 18.60.060
SJCC 18.60.070
SJCC 18.60.080
SJCC 18.60.090
SJCC 18.60.120
SJCC 18.60.150
SJCC 18.80.030
SJCC 18.80.090
SJCC 18.80.100

The applicant must demonstrate the proposal's consistency with San Juan County Comprehensive Plan, Section B, Element 2, Subsection 2.2.C and Subsection 2.3.C.

10. REQUIRED PERMITS AND REPORTS:

- Application and code consistency narrative
- SEPA checklist, threshold determination and supporting documents.
- Site plan
- Clearing and grading application
- Stormwater management plan
- Proof of water and septic service
- ROW permit
- Water course evaluation

CODE CITATIONS

San Juan County Comprehensive Plan, Section B, Element 2, subsections 2.2.C (Energy) and 2.3.D (Agricultural resource lands).

2.2.C Energy

Goal: To conserve energy and promote energy efficiency.

Policies:

1. Promote education on site planning methods that make maximum use of energy-saving features of the natural environment.

2. Provide opportunities within land use designations for the development and use of alternative energy resources which are compatible with the natural environment.

2.3.C.(d). Rural Industrial

Goal: To provide areas for rural oriented industrial uses which are not generally compatible with activity center land uses, which compliment rural character and development, and which can be served by rural governmental services.

Policies:

(1) Areas which are characterized by the following criteria may be designated as Rural Industrial on the *Comprehensive Plan* Official Maps:

i. Lands with an existing or historical commitment to rural industrial uses;

ii. Lands with direct access to a public roadway classified as a minor or major arterial;

iii. Lands where on-site physical features can be used to protect surrounding lands from negative impacts; and

iv. Areas with parcels sizes large enough to accommodate expansion of existing uses or serve several new uses in a concentrated area.

(2) Rural industrial uses should be limited to those which are most appropriately located in the rural environment because of incompatibility with intensive, mixed use development patterns characteristic of activity centers. Such uses include, but are not limited to, storage yards, lumber mills, wood craft manufacturing, gas storage facilities, and cement batch plants.

(3) New residential development (except where accessory to commercial or industrial use) within these areas should be prohibited.

(4) Establish performance standards for all development in Rural Industrial areas to ensure that allowed uses are consistent with the rural character of the area and minimize adverse environmental impacts. Standards should address access, circulation, signage, parking, noise, odor, vibration, spray, smoke, screening, lighting, waste disposal, and storm drainage control.

SAN JUAN COUNTY CODE

18.40.430 Utility (electrical, sewerage, and other) distribution and transmission lines and substations.

"Wired utility distribution lines" operate at voltages of 15 kV and lower, and distribute power from a substation to the end user (connecting via a service line; see SJCC 18.60.150). "Wired utility transmission lines" operate at voltages of 24.9 kV and above. They move bulk power between substations and do not directly serve the end consumer.

The following standards apply to all utility distribution and transmission lines:

A. New utility distribution lines shall be placed underground wherever reasonable and practicable. Undergrounding of existing lines in the course of routine maintenance and replacement is encouraged where practicable, particularly where such undergrounding would enhance recognized scenic and open space areas and resources.

B. Environmental impacts resulting from installation or maintenance of utilities and utility facilities shall be avoided or minimized. Where no feasible alternative to the impact exists, and mitigation is not feasible, appropriate compensating measures should be developed.

C. Where revegetation of areas disturbed during construction is required by this code in order to mitigate erosion, surface water runoff, habitat, aesthetic or other impacts, such areas shall be replanted with native vegetation and maintained until firmly established. Clearing shall be confined to that necessary to allow installation and to prevent interference by vegetation once the system is in operation.

D. Utilities and transportation facilities shall be installed in the same rights-of-way when the effect will be to reduce the adverse impacts on the physical environment.

E. Applications for utility substations shall include baseline and projected electromagnetic field (EMF) density in accordance with the protocols in Table 4.2. Test measurements and results shall be shown on the permit application site plan. Post-construction and any operational testing shall also be done in accordance with Table 4.2. Post-construction test results shall be submitted to the director within 90 days to complete the file record, and copies will be made available to the public upon request.

F. Extension of community sewerage system lines outside of activity centers shall be allowed only if:

1. The extension is demonstrated to be necessary to remedy existing or potential groundwater contamination problems or to correct existing or impending health hazards, as determined by the County sanitarian; or

2. The extension is to provide sewage collection and treatment services to a public elementary or secondary school.

G. Routine maintenance and replacement of wired utility transmission and distribution lines and poles within existing rights-of-way, where frequently flooded areas, geologically hazardous areas, wetlands, and fish and wildlife habitat conservation areas are not present and where exempt from SEPA and Shoreline Master Program review (see SJCC 18.80.050 and 18.80.110), are authorized without further permit application and approval; provided, that such construction and activities must comply with applicable development and performance standards of this chapter and Chapter 18.60 SJCC.

Table 4.2. Protocol for Testing of Electromagnetic Fields (EMF) at Utility Substations.[1, 2]

Test Parameter	Test Equipment	Testing Method
Field Density of EMF produced by 60 Hz AC Power Equipment	ELF[3] monitor with three-axis sampling capability.	1) Record EMF levels at 50-foot intervals along property lines of the subject property (site). 2) Record EMF levels at 20-foot intervals along the fenceline of substation equipment. Measurements shall be made at waist height.

Notes:

1. A charged object produces an electric field in the space around it; an object that carries current or which is a magnet produces a magnetic field in the nearby area. Energy is transferred via these "electromagnetic fields" (EMF) to people and other living organisms that pass through the fields. "Field density" or "flux density" is a measure of the strength of the fields. Unit of measurement of flux density: milli-Gauss.

2. Reporting requirements for this testing: see SJCC 18.40.430(E).

3. Abbreviations used:

ELF = Extremely low frequency radiation, 30 to 300 Hz

EMF = Electromagnetic field

AC = Alternating current

Hz = Hertz, a unit of frequency equal to one cycle of an electromagnetic wave per second

Gauss = A unit of magnetic flux density, = 10^{-4} Wb/m^2 = 10^{-4} Volt-seconds/square meter

(Ord. 52-2008 § 10; Ord. 2-1998 Exh. B § 4.32)

Table 6.2. Density, Dimension, and Open Space Standards for Rural, Resource, and Special Land Use Districts.

Development Standard	Land Use District[1]								
	Rural					Resource		Special	
	RGU	RR	RFF	RI	RC	AG	FOR	C	N
Maximum Density (parcel area/total number of dwelling units)	[Please refer to the *Comprehensive Plan* official maps.]								*See* Note 2
Minimum Lot Area	See SJCC 18.70.010(E)								*See* Note 2
Minimum Front or Road Setbacks[4, 5, 6, 16]									
Existing road for collector (feet from centerline)	45	45	45	45	45	45	45	45	45
All other roads (feet from centerline)	40	40	40	40	40	40	40	40	40
Minimum Rear and Side Setbacks[4, 5, 6, 16]									
Parcels smaller than five acres (feet)	10	10	10	10	10	10	10	10	10
Parcels five acres or larger, and average width ≥ 80 feet (feet)	15	15	15	15	15	15	15	15	15
Maximum Dimensions									
Building height (feet)[7, 8]	35[9]	35[9]	35[9]	35[9]	35[9]	35	35	35	35
Area of impervious surface (%)[10, 15, 16]	10	10	15[13]	20	10	10	10	10	10
Set-Aside Requirements									
Minimum required open space or landscaped area (%)[11, 16]	30	30	30	30	30	0N.A.[12]	N.A.	N.A.	N.A.
Maximum developable area (%)[16]	0N.A.	N.A.	N.A.	N.A.	N.A.	*See* Note 14	*See* Note 14	N.A.	N.A.

Notes:

1. Rural, resource, and special land use districts:

RGU = Rural general use RR = Rural residential RFF = Rural farm-forest

RI	=	Rural industrial	RC	=	Rural commercial	AG	=	Agricultural resource lands
FOR	=	Forest resource lands	C	=	Conservancy	N	=	Natural

2. Only one single-family residence is allowed per existing parcel. Land division for the purpose of additional development is prohibited.

3. Setbacks from roads outside of activity centers are measured from the centerline of the existing road. This measurement shall be to a line parallel to and measured perpendicularly from the appropriate line. Side and rear setbacks are measured from the edge of the property in the same manner as street setbacks.

4. Fences are exempt from setback requirements, except when impairing safe sight lines at intersections, as determined by the County engineer.

5. Setbacks do not apply to mail boxes, wells, pump houses, bus shelters, septic systems and drainfields, landscaping (including berms), utility apparatus such as poles, wires, pedestals, manholes, and vaults, and other items as approved by the administrator.

6. Road right-of-way setbacks may be waived, at the discretion of the County engineer, when the presence of shoreline setbacks, property lines, topography or other restrictions make it unreasonable to construct a structure without encroaching into the road right-of-way setback.

7. Chimneys, smokestacks, fire or parapet walls, ADA-required elevator shafts, flagpoles, utility lines and poles, skylights, communication sending and receiving devices, HVAC and similar equipment, and spires associated with places of worship are exempt from height requirements.

8. Structures used for the storage of materials for agricultural activities are exempt for the maximum building height requirements.

9. Approved subarea plans may establish different height requirements in rural districts.

10. Impervious surface is measured by calculating the horizontal land area of all surface areas that create a barrier to or retard the entry of water into the soil in comparison with natural conditions prior to development, including but not limited to buildings, parking areas, driveways, roads, sidewalks, patios, packed earth, and oiled surfaces. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces. See also SJCC 18.60.070, Storm drainage standards.

11. Required only for parcels over one acre in size.

12. "N.A." = Not Applicable.

13. In RFF land use districts, no more than 30 percent of the area of a parcel shall be covered by impervious surfaces, exclusive of roads and driveways.

14. On all agricultural or forest resource lands (AG and FOR), the maximum area of development which is not related to agricultural or forestry uses and activities shall be limited to 20 percent of

the parcel area, but not less than one acre, regardless of the assigned density. Further, in the division of a parcel by any means, the allowable area for conversion of the parent parcel to nonfarm and/or nonforestry use shall not be exceeded. This shall not apply to parcels smaller than five acres.

15. This standard may be exceeded for parcels that are less than five acres in size. However, in such cases where the total percentage of impervious surface will exceed that specified, the administrator shall require measures to be employed to reduce the long-term stormwater runoff from the parcels, such as French drains for directing roof runoff into appropriately sized dry wells, and retention/detention measures for large parking areas.

16. This development standard shall not apply to residential development in subdivisions which consist of lots less than 0.3 acres in area that are (except for access roads and driveways) surrounded on all sides by property preserved as permanent open space.

(Ord. 26-2002 § 4; Ord. 12-2001 § 6; Ord. 11-2000 § 5; Ord. 6-2000; Ord. 7-1999; Ord. 2-1999; Ord. 2-1998 Exh. B § 6.5)

18.60.060 Clearing and grading standards.

A. General Regulations.

1. All grading and clearing activities shall be conducted so as to minimize potential adverse effects of these activities on forested lands, surface water quality and quantity, groundwater recharge, wildlife habitat, and scenic resources.

2. Grading to construct ponds and reservoirs shall:

a. Be located at least 30 feet from the edge of a public road right-of-way;

b. Maintain in-stream flows of natural drainage courses; and

c. Protect adjacent property from damage.

B. Drainage and Erosion Control. This subsection shall apply to any development for which a permit is required by this code or which is permitted outright by regulations in Chapter 18.30 SJCC.

All grading activities shall be accomplished as follows:

1. Design and maintain adequate buffers of undisturbed native vegetation to minimize off-site impacts of surface water runoff, erosion, and sedimentation.

2. Design and construct all graded surfaces that are to be revegetated to slope gradients (generally less than 1:2 or 1:3 slopes) so that the graded surfaces will hold topsoil and to minimize surface runoff, erosion, and sedimentation.

3. Selectively salvage the upper six to 12 inches of topsoil, stockpile it, and respread over all disturbed areas to be revegetated.

4. Any area cleared or graded and not covered with gravel or an impervious surface shall be seeded immediately on completion of the project. If erosion is probable, areas with exposed soil shall be protected by temporary means during construction. All disturbances should at least be revegetated with grasses and forbs; include shrubs, and trees as appropriate in the revegetation effort. Use of plant species native to the County is encouraged.

5. Natural vegetation shall be retained to the maximum extent possible in construction and operation of any use. All development shall ensure that soil erosion and sedimentation of drainage ways will be controlled to prevent damage to adjoining property and downstream drainage channels and receiving waters.

6. Surface drainage shall not be directed to or discharged into County roads or ditches within County rights-of-way unless approved by the County engineer.

7. A drainage analysis shall be prepared if required by SJCC 18.60.070. Drainage controls may be required to regulate velocities of runoff water and to control pollutants, erosion, and sedimentation if it is probable that damage could occur downstream to property or to water quality. Such controls may include landscaping or reestablishing native vegetation, ponds, catch basins, and other control structures.

8. For effective long-term weed control, it is suggested that the landowner coordinate with the County weed control board to eradicate nuisance species.

C. Best Management Practices (BMPs). BMPs from the Stormwater Management Manual (SMM) (see SJCC 18.60.070) or as specified by the County engineer shall be employed in the control of erosion and sediment during construction, to permanently stabilize soil exposed during construction, and in the design and operation of stormwater and drainage control systems. These include BMPs for:

1. Erosion and sediment control and small parcel construction BMPs at Section II-5 in the SMM;

2. Control of pollutants other than sediment on construction sites at Section II-3 in the SMM;

3. BMPs for problem areas on construction sites at Section II-2 in the SMM; and

4. BMPs for runoff control at Section III in the SMM.

a. Infiltration and filtration at Section III-3;

b. Detention at Section III-4;

c. Biofiltration at Section III-6;

d. Oil/water separators at Section III-7; and

e. Stream stabilization at Section III-8.a.

D. Environmentally Sensitive Areas. All clearing and grading activities that will occur in or adversely affect environmentally sensitive areas shall be subject to the regulations of SJCC 18.35.020 through 18.35.050 et seq., shall be reviewed for consistency with the applicable sections of this code (e.g., Chapter 18.40 SJCC, Performance and Use-Specific Standards; Chapter 18.50 SJCC, Shoreline Master Program; and Chapter 18.60 SJCC, Development Standards), and may only be approved by the decision-maker if they have been found to meet the requirements set forth by this code:

1. Geologically Hazardous Areas. Standards governing development activities in these areas are found in SJCC 18.35.055 through 18.35.070.

2. Frequently Flooded Areas. Fills in flood hazard areas as identified on the FIRMs (flood insurance rate maps) maps are not permitted unless the administrator finds that no reasonable alternative exists.

3. Critical Aquifer Recharge Areas. Standards governing development activities in these areas are found in SJCC 18.35.080.

4. Regulated Wetlands. Alteration (filling, excavating, or draining) of regulated wetlands shall be subject to the provisions of SJCC 18.35.085 through 18.35.105.

5. Fish and Wildlife Habitat Areas. Standards governing development activities in these areas are found in SJCC 18.35.110 through 18.35.140.

E. Grading.

1. Project or building permits which involve grading of 100 or more cubic yards are subject to environmental review under the State Environmental Policy Act (SEPA) (see SJCC 18.80.050) unless the grading is SEPA-exempt under WAC 197-11-800.

(Note: this does not apply when grading is associated with a development or activity which is categorically exempt from SEPA review requirements. Most minor new construction, including construction of a single-family house and related outbuildings, is exempt from SEPA review; see WAC 197-11-800.)

2. Clearing and Grading Permit. The clearing and grading permit is a development permit that is processed using the procedures under the Uniform Building Code, adopted as the San Juan County building code, Chapter 15.04 SJCC.

a. All grading of 500 cubic yards or more is subject to a clearing and grading permit, except grading associated with the following:

i. Maintenance of gravel roads;

ii. A SEPA-exempt (cf. WAC 197-11-800(2)(d)) residential driveway;

iii. Construction of a Class I – III logging road (per RCW 76.09.050 and WAC Title 222);

iv. Drainage improvements constructed in accordance with SJCC 18.60.060(B) and 18.60.070; or

v. Construction of a pond of one-half acre or less which is not in a regulated wetland (cf. SJCC 18.35.085 through 18.35.105).

b. Applications for projects which require a clearing and grading permit shall include the following information:

i. Source of fill material and deposition of excess material;

ii. Physical characteristics of fill material;

iii. Proposed methods of placement and compaction;

iv. Proposed surfacing material;

v. Proposed method(s) of drainage and erosion control;

vi. Methods for restoration of the site;

vii. Demonstration that instream flow of water will remain unobstructed;

viii. Demonstration that erosion and sedimentation from outflow channels will be minimized by vegetation or other means; and

ix. Demonstration that pond runoff will be controlled to protect adjacent property from damage. (Ord. 7-2005 § 17; Ord. 12-2001 § 6; Ord. 2-1998 Exh. B § 6.6)

18.60.070 Storm drainage standards.

All new development and redevelopment must conform to the standards and minimum requirements set by the Washington Department of Ecology Stormwater Management Manual for Western Washington, Publication Nos. 05-10-029 through 05-10-033. In addition, the best management practices identified in the January 2005 Low Impact Development Technical Guidance Manual for Puget Sound, produced by the Puget Sound Action Team, are acceptable alternatives for managing runoff, controlling soil erosion, and maximizing and protecting recharge.

A. Definitions. For the purposes of this section, the definitions at I-2.1 of the SMM shall apply:

1. “Small parcel development” is a development that creates or adds less than 5,000 square feet of impervious area, and that is either of the following:

a. The construction of an individual, detached, single-family residence, accessory dwelling unit, or duplex; or

b. Land-disturbing activities of less than one acre that include grading of 100 or more cubic yards.

2. “New development” includes land-disturbing activities, structural development (construction, installation or expansion of a building or other structure), creation of impervious surfaces, Class IV General forest practices and COHP plans, and subdivision, short subdivision and binding site plans as defined in RCW 58.17.020.

3. “Redevelopment” includes, on an already developed site, the creation or addition of impervious surfaces, structural development, and replacement of impervious surface that is not part of routine maintenance; and also, land-disturbing activities that are associated with the above activities.

4. “Impervious surface” means a hard surface area which creates a barrier to the entry of water into the soil mantle in comparison with natural conditions prior to development, or which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include roofs, driveways, patios, packed earth, and oiled surfaces. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces.

5. A “land-disturbing activity” results in a change in the existing soil cover (both vegetative and nonvegetative) or the existing topography, and includes but is not limited to demolition, construction, clearing, grading, filling, and excavation.

B. Exemptions. Commercial agriculture, and forest practices regulated under WAC Title 222, except for Class IV General forest practices and COHPs (see SJCC 18.40.120 through 18.40.180), are exempt from the provisions of the minimum requirements.

C. Small Parcel Minimum Requirements. Small parcel development meeting the criteria of subsection (A)(1) of this section shall be required to control erosion and sediment during construction and to permanently stabilize soil exposed during construction. Such development shall:

1. Comply with the minimum requirements 1 through 4 for small parcels in Section I-2.3 of the SMM, and shall employ the small parcel best management practices (BMPs) of Section II-5.10. Additional guidance is provided in Sections I-3.3, I-4, and II-5.9 of the SMM;

2. Prepare a small parcel erosion and sediment control plot plan or illustration (or, show on other diagrams being prepared for the project, if appropriate) showing:

a. Vicinity map;

b. Location of the structure and its access;

c. All applicable setback requirements;

d. Location of all applicable erosion and sediment control BMPs; and

e. Existing site features and sensitive areas.

D. New Development Minimum Requirements.

1. New development that includes (a) the creation or addition of 5,000 or more square feet of impervious surface and (b) land-disturbing activities of less than one acre shall comply with minimum requirements 2 through 11 in Sections I-2.6 through I-2.15 of the SMM, and the small parcel minimum requirements of subsection (C) of this section.

2. New development that includes (a) the creation or addition of 5,000 or more square feet of impervious surface, and/or (b) land-disturbing activities of one acre or more, shall comply with minimum requirements 1 through 11 in Sections I-2.5 through I-2.15 of the SMM, and a stormwater site plan shall be prepared.

3. Stormwater Site Plan. A stormwater site plan required by subsections (D)(2), (E)(1) or (2) of this section shall be developed to the standards of Sections I-3.4 and I-3.5 of the SMM, and include:

a. Project overview;

b. Plot plan, including the elements of subsection (C)(2) of this section and:

i. Locations of structures and other impervious surfaces;

ii. Locations of stormwater runoff control facilities;

iii. Road rights-of-way and easements;

c. Preliminary conditions summary;

d. Analysis of off-site water quality impacts (including groundwater) resulting from the project, and mitigation measures;

e. Analysis and design of proposed stormwater runoff control facilities, including treatment and source control BMPs (cf. Section I-4 of the SMM, which provides a list of and selection process for BMPs);

f. Erosion and sediment control plan;

g. Special reports and studies;

h. Stormwater and drainage system maintenance and operations manual.

E. Redevelopment Minimum Requirements.

1. Where redevelopment of 5,000 or more square feet of impervious surface occurs:

a. The new development minimum requirements 1 through 11 in Sections I-2.5 through I-2.15 of the SMM shall apply to that portion of the site that is being redeveloped;

b. Source-control BMPs (cf. Section I-4 of the SMM, which provides a list of and selection process for BMPs) shall be applied to the entire site (including adjoining parcels if they are part of the project); and

c. A stormwater site plan shall be prepared.

2. In addition to the requirements of subsection (E)(1) of this section, a stormwater site plan (see subsection (D)(3) of this section) shall also be prepared to implement the minimum requirements to the maximum extent practicable for the entire site when any of the following conditions apply:

a. Existing sites larger than one acre with 50 percent or more impervious surface;

b. Sites that discharge to a receiving water that has a documented water quality problem as defined by the County health and community services department or by criteria listed in Section I-2.4.2.B.2 of the SMM; or

c. Sites where the need for additional stormwater control measures has been identified through a special study by the County or town of Friday Harbor, such as a watershed plan or marine habitat protection plan. (Ord. 52-2008 § 12; Ord. 21-2002 § 7; Ord. 2-1998 Exh. B § 6.7)

18.60.080 Roads – Generally.

The following shall apply to all public and private roads:

A. The San Juan County Scenic Roads Manual shall be the primary guideline for all roads in San Juan County, except where it conflicts with state or federal regulations.

B. New roads shall not be constructed in areas designated natural or conservancy when a feasible alternative exists. Roads permitted in such areas shall be located, designed, and constructed to ensure minimal environmental impacts.

C. New roads and improvements to existing roads within agricultural resource lands shall be located and designed to minimize disruption of existing or potential agricultural uses.

D. Drainage from roads and road construction shall be controlled using best management practices (BMPs), as provided under SJCC 18.60.070 (see also Section I-4 of the SMM, which provides a list of and selection process for BMPs), so that the transport of pollutants and sediment into water bodies or onto adjacent properties will be avoided or minimized.

E. Logging roads included in a valid forest practices permit are not subject to this section.

F. The design and construction of roads shall minimize the impacts on existing residences and historic structures (as defined in Element 9 of the Comprehensive Plan, Historic and Archaeological Preservation).

G. Modifications to design and construction standards for a specific road project may be approved by the County engineer. (Ord. 2-1998 Exh. B § 6.8.1)

18.60.090 Roads – Public roads. SHARE

A. General.

1. The San Juan County engineer is responsible for the design and construction of all County roads.

2. The standard right-of-way width is 60 feet for collector roads, and 50 feet for all other roads.

3. No herbicides, pesticides, or other chemicals shall be used for weed control in road rights-of-way.

4. Driveway permits are required for access to County roads. Applications will be reviewed by the administrator for the requirements of the environmentally sensitive areas overlay district (see SJCC 18.35.020 through 18.35.050) and of the State Environmental Policy Act (SJCC 18.80.050) prior to being forwarded to the County engineer. Such permits shall be limited as follows:

a. The number of access points along roads shall be limited to one per parcel, except:

i. For agricultural access;

ii. When the parcel topography makes a single access point impractical for the entire parcel;

iii. When access is being provided for parking lots with 20 or more parking spaces; or

iv. When additional access points are approved by the County engineer.

b. New access points to collector roads shall not be allowed if reasonable access from any other road is available.

c. Clear unobstructed sight distance in both directions from the driveway shall be the distance measured in feet which is a minimum of 10 times the posted speed limit, unless otherwise approved by the County engineer.

d. Storm drainage and culvert sizing shall be based upon engineering analysis and the standards of SJCC 18.60.060(B) and 18.60.070. Maximum length of surface drainage for

roadside ditches before discharging onto adjacent property or into natural drainageway shall be 1,000 feet. When a culvert is required, the minimum diameter shall be 12 inches.

e. All driveway approaches shall be constructed in accordance with the construction standards for driveway access permits (see Figure 6.1).

f. The permits shall be conditioned to address impacts to environmentally sensitive areas or as indicated by SEPA analysis, if applicable.

g. The County engineer shall have the authority to approve or deny all driveway permits, which decision is final and not subject to administrative appeal.

5. In all rural, resource, and special district designations, roads shall not be widened to provide for parking unless it satisfies a public need.

6. A traffic study based on the most current edition of the Highway Capacity Manual shall be performed for any proposed development that will result in an increase of 100 or more one-way trips per day onto a County road, inside or outside of an activity center or urban growth area. Inside of an activity center or urban growth area, all intersections that may be affected by the proposed development must be included in the traffic study. The number of one-way trips to be generated by the development shall be as is defined in the most current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual.

B. Road and Right-of-Way Dedication.

1. Where any public road right-of-way abutting a property proposed for a development is subject to a conditional use permit or to Chapter 18.70 SJCC and has insufficient width to conform to the County's adopted road standards for the class of road involved, the County engineer may:

a. Require the dedication of sufficient additional right-of-way to bring the abutting half of the right-of-way (measured from the existing County road centerline) into conformance with the adopted standards; and

b. Obtain additional easements to cut and fill on the subject property adjacent to the County road, and to provide for drainage of surface and stormwater runoff by directing the runoff along or into natural drainageways on lots adjacent to the County road. Such drainage should be designed and mitigated to avoid or minimize impacts to the environment and to the affected properties.

2. The County may accept the dedication of private roads as new County roads and rights-of-way only if all of the following criteria are met:

a. The road meets County standards;

b. There are adequate finances to maintain the road;

c. The road lies within a village, hamlet, or residential activity center, or urban growth area designation; and

d. An evaluation by the County engineer deems the road to be of general public benefit.

C. Road Vacations.

1. This section shall apply to all applications to the board of County commissioners seeking vacation of a County road right-of-way or any portion of one.

2. Every petition to the board for vacation abandonment of any road right-of-way shall conform to the requirements of Chapters 35.79 or 36.87 RCW and shall be accompanied by the required fee.

3. Application shall be accompanied by the applicant's choice of a bond or cash in the amount to be determined by the County engineer, payable to San Juan County, to cover estimated costs and expenses incurred in the examination, reports, and all proceedings pertaining to such petition to vacate, including the cost of appraisals.

4. Whenever the board shall direct the County engineer to report upon such vacation, the report shall include the following matters in addition to the requirements of Chapter 36.87 RCW:

a. The fair market value of the area sought to be vacated as determined by appraisals or as determined by the County engineer based on property assessment of surrounding lands;

b. A report from each utility addressing its need for continued uses of the area sought to be vacated. An easement for utility uses may be maintained if a vacation is granted;

c. Whether public funds have ever been expended to improve or maintain the road;

d. Whether the road is within a subdivision or short subdivision;

e. Whether after vacating the road, access to a public road by another property would be impaired;

f. A report on the cost of maintaining the section of road in question for the past three years.

5. The planning commission and planning department will review all vacation applications and make a recommendation to the board. The board shall consider the relationship of the proposed vacation to the goals and policies of the Comprehensive Plan.

6. All petitions for road vacation shall be reviewed for the following:

a. Roads that abut a body of fresh or salt water may not be vacated except as provided for in RCW 36.87.130.

b. Roads that have a public amenity (e.g., scenic vistas or pull-outs) should not be vacated.

c. Roads that provide a means of public access to the shoreline shall not be vacated.

d. Roads that provide the only legal access to private property shall not be vacated until alternative access has been provided.

7. If the board denies a vacation, all sums paid to the County shall be forfeited to the County.

8. If the board approves a vacation, compensation to the County shall include all costs and expenses incurred in evaluation and in the hearing on the petition for vacation. The board may also require compensation to include all of, or a portion of, road improvements as well as the fair market value of the land vacated.

9. Approval of a petition to vacate a road shall not be effective until all fees and compensations have been paid.

D. Non-Ferry-Served Island Road Standards – Public Roads.

1. Standard Design. The minimum standards for travel way shall be a four-foot-wide path, within a cleared width of 10 feet. All brush, trees, and stumps shall be removed from the cleared width. The path surfacing shall include a four-inch depth of aggregate material. The aggregate material may be 5/8-inch crushed rock or other materials approved by the County engineer. The pathway may require drainage facilities.

2. Optional Design.

a. If a property owner desires to construct a wider or more substantial travel way, he or she shall notify all of the owners of land abutting the road. Such notice shall include the scope of the proposed improvements and procedures for approval. In order for the project to proceed, 51 percent or more of the abutting property owners (one vote per parcel) must approve the project. With approval of the abutting property owners, the property owners desiring such improvements shall prepare drawings, including drainage facilities, typical section, grades and surfacing depth and source, and then submit these for the review and approval of the County engineer.

b. If the County desires to construct a wider or more substantial travel way, the County shall notify all of the owners of land abutting the road. Such notice shall include the scope of the proposed improvements and procedures for approval. A public hearing will be scheduled with the BOCC to discuss and approve a final standard for the travel way.

c. The following describes improvement funding:

i. If the desire for a road improvement project is submitted through petitions or other evidence of general public interest of the land owners on a particular island, and if the BOCC approves the project, the County may take responsibility for the funding and construction of the project.

ii. If the County recommends a public road improvement project in its review of a subdivision application and if the project is approved by the BOCC, as outlined in Chapters 18.70 and 18.80 SJCC, then the subdivision applicant will be responsible for the funding and construction of the road project. (Ord. 26-2002 § 4; Ord. 2-1998 Exh. B § 6.8.2)

18.80.100 Permit procedures for conditional use and variance permits.

A. Purpose and Applicability. Conditional use permits allow flexibility in the implementation of this code by controlling undesirable impacts through specific permit conditions. Variances ensure that all persons and their property are guaranteed equal rights and opportunities under similar circumstances. A variance is never to be used to endow certain persons or property with special privileges denied to all others under similar circumstances. Variances may only be granted for dimensional, bulk, and area requirements specified by this code. (For changes from use or density standards, see the procedures for a site-specific redesignation, SJCC 18.90.020.) The following uses are subject to this section:

1. Conditional Uses (indicated by "C" in Tables 18.30.030 and 18.30.040) and discretionary uses (indicated by "D" in Tables 18.30.030 and 18.30.040) that the director has determined require a conditional use permit;

2. Variances from standards other than those in Chapter 18.50 SJCC.

B. Notice and Public Hearing. Notice of application and of public hearing is required in accordance with the procedures in SJCC 18.80.030. An open-record predecision hearing is required for conditional use permit and variance applications (see SJCC 18.80.040).

C. Decisionmaking Authority. The hearing examiner has the authority to approve or deny conditional use permit and/or variance applications, and to impose conditions of approval on such permits.

D. Conditional Use Permits – Criteria for Approval. A conditional use permit shall be granted by the County only if the following criteria are met:

1. The proposed use will not be contrary to the intent or purposes and regulations of this code or the Comprehensive Plan;

2. The proposal is appropriate in design, character and appearance with the goals and policies for the land use designation in which the proposed use is located;

3. The proposed use will not cause significant adverse impacts on the human or natural environments that cannot be mitigated by conditions of approval;

4. The cumulative impact of additional requests for like actions (the total of the conditional uses over time or space) will not produce significant adverse effects to the environment that cannot be mitigated by conditions of approval;

5. The proposal will be served by adequate facilities including access, fire protection, water, stormwater control, and sewage disposal facilities;

6. The location, size, and height of buildings, structures, walls and fences, and screening vegetation associated with the proposed use shall not unreasonably interfere with allowable development or use of neighboring properties;

7. The pedestrian and vehicular traffic associated with the conditional use will not be hazardous to existing and anticipated traffic in the neighborhood;

8. The proposal complies with the performance standards set forth in Chapter 18.40 SJCC;

9. The proposal does not include any use or activity that would result in the siting of an incompatible use adjacent to an airport or airfield (RCW 36.70.547); and

10. The proposal conforms to the development standards in Chapter 18.60 SJCC.

E. Variances – Criteria. A variance shall be granted only if the applicant demonstrates that the following criteria have been met:

1. Literal interpretation and application of provisions of this code would deprive the applicant of the rights commonly enjoyed by other properties in the same district under the terms of this code, and allowing the variance will be in harmony with the intent and spirit of this code;

2. A variance is necessary for the preservation and enjoyment of a property right possessed by other property in the same vicinity or district, but which is denied to the property in question because of special circumstances on that property;

3. That the hardship described under this subsection is specifically related to the property and is the result of unique conditions such as irregular lot shape, size, or natural features, and the application of this code, and not, for example, from deed restrictions or the applicant's own actions;

4. The granting of the variance will not be materially detrimental to the public welfare or injurious to the right of other property owners in the vicinity; and

5. The variance will not permit a use prohibited by this code in the district in which the subject property is located.

F. Term. Unless a shorter time period is specified in permit conditions, development authorized through a conditional use or variance permit shall be completed within five years from the date of permit approval or the permit shall become null and void. An extension of up to one year may be granted by the decisionmaking authority if the permittee demonstrates good cause for an extension. (Ord. 11-2011 § 8; Ord. 15-2002 § 10; Ord. 4-2001 §§ 2, 3; Ord. 14-2000 § 7(AAA); Ord. 2-1998 Exh. B § 8.10)

Exhibit 1

CRITICAL AREA & ARCHAEOLOGY REVIEW

Department of Community Development · 135 Rhone St · PO Box 947
Friday Harbor, WA 98273 · 360-378-2116 · inspections: 360-378-6270
www.sanjuanco.com/dcd · dcd@sanjuanco.com

Purpose: Using maps of Critical Areas and Archaeology, we will identify reports required for development. Actual conditions in the field control. A 3 to 5-day turnaround is normal.

APPLICANT

Applicant(s):	OPALCO/Public Works	Email:	Rguerry@opalco.com
Mailing Address:		Phone:	
City:		State:	Zip:
Owner(s):	Public Works	Email:	pubwks@sanjuanco.com
Mailing Address:		Phone:	
City:		State:	Zip:

PROPERTY

Tax Parcel Number: 27275005000	☐ General Information
Site Address: Sec 27, t 37N, R 2W	■ Specific Information, for a Project
Island: Orcas	☐ Date Needed if Urgent:

PROJECT

Describe all proposed work:
Construction of a 1 mw power plant Electricity to be generated by burning Orcas Island biomass. Electricity will be used in the Orcas Island grid.

Check all proposals that might apply: ☐ ***Site plan is attached***

■ Well ■ Septic ☐ Grading ■ Clearing/Vegetation Removal ■ Driveway / Road

☐ SFR ☐ SFR Addition ☐ Deck ☐ Garage ☐ Accessory Dwelling ☐ Accessory Structure

☐ Bulkhead ☐ Shoreline stabilization ☐ Dock ☐ Mooring Buoy ☐ Stairs to beach ☐ Work in/over water

■ Commercial or Institutional Development

☐ Land division ☐ Boundary line modification

☐ Other:

Will <u>all</u> work take place within an existing "development area"?* ☐ YES ☐ NO

*An area that has been directly altered as a result of development. It includes, but is not limited to, the area containing structures, driveways, gardens, landscaped areas, areas of grading, excavation, or fill (See SJCC18.20.040 for full definition).

Is the existing structure non-comforming to critical area buffers or shoreline aesthetic setback? ☐ YES ☐ NO

TO BE COMPLETED BY STAFF

LAND USE AND SHORELINE DESIGNATIONS, FLOOD ZONE, CRITICAL AREA, ARCHAEOLOGY

Shoreline designation(s):		Land use designation: Rural Industrial	
Subarea Plan or Activity Center:		Plat Name:	
■	Possible Wetlands within 300' ☑ NONE	■	Geologically hazardous areas within 200' ☑ NONE
☐	Special Flood Hazard Area _____ DFIRM _____ BFE _____ Elevation certificate # _____, if available ☐ A/AE ☐ VE ☑ NONE		☐ Unstable bluffs ☐ Slope > 50% ☐ Slope >15% ☐ Subclass 'e' soils
■	Fish and Wildlife Habitat Conservation Areas within 200' Specifically list them in the "**Notes**" section below. Feeder Bluff ☑ NONE		☐ Non-bedrock marine shoreline ☐ Coastal Zone Atlas U, UB, URS, UOS
■	Archaeology ☑ NONE		

Plat Restrictions and Notes:

☐ No Mapped Critical Areas ☐ No Mapped Archaeology

REQUIRED REPORTS

Critical Area reports which are required by SJCC 18.35.020 – 140 must be prepared by a "qualified professional" (SJCC 18.20.170) .

☐	Archaeology report from a qualified archaeologist for development on sites with known archaeology. (SJCC 18.60.210; Chapter 27.44 and 27.53 RCW; and Chapter 25-48 WAC) See attached bulletin.	
☐	Wetland report for development or activities occurring within 300 feet of a wetland.	
☐	Geotechnical report for development or activities within 200 feet of a geohazard area SJCC 18.35.070.	☐ DCD geotechnical report waiver. Must meet the criteria on the attached waiver form.
☐	Geotechnical report that determines the coastal geologic buffer for non-bedrock marine shoreline (SJCC 18.35.130 Figure 3.1 Step 2).	
☐	Elevation certificate for buildings, mobile homes, and above ground gas or liquid storage tanks (SJCC Chapter 15.12) located within a FEMA Special Flood Hazard Area.	
☐	Biological habitat assessment for new development proposed within a Special Flood Hazard Area.	
☐	FWHCA Habitat Assessment for untyped streams, fish bearing streams, and lakes.	
☐	FWHCA Habitat Assessment for development or activities located within 200 feet of a marine fish and Wildlife Habitat Conservation area (FWHCAs) (SJCC 18.35.115) that are within the FWHCA water quality buffer.*	
☐	Commercial, industrial, public and institutional project applications must include a list of the quantities and types of chemicals that will be used, proposed spill containment plans, and a plan for disposal of waste materials (SJCC 18.35.080 Critical Aquifer Recharge Areas).	
☐	Stormwater plan. Complete the attached impervious surfaces worksheet to determine the type of stormwater plan that must be submitted.	
☐	A Residential Pre-application (RPA) ($400) is recommended to determine the FWHCA shoreline setback. Otherwise a "qualified professional" (SJCC 18.20.170) should be consulted to make the determination.	

PLANNER SIGNATURE: _____ **DATE:** June 2, 2022

DCD Planner Colin Maycock E-mail colinm@sanjuanco.com Phone 360-370-7573

***SJCC 18.50.060 contains requirements for shoreline modifications and SJCC 18.50.420 applies to shoreline stabilization projects.**

Impervious Surface Worksheet

San Juan County Public Works
915 Spring st | Friday Harbor | WA | 98250
(360) 370-0500 www.sanjuanco.com/312/Community-Development

1.) Expected land-disturbing activity _____ Sq Ft Parcel Number 27275005000

Shoreline parcel (yes or no) Select

Open Permit #'s _____

Permits within last 2 years Select

Land Use Designation: Rural Industrial

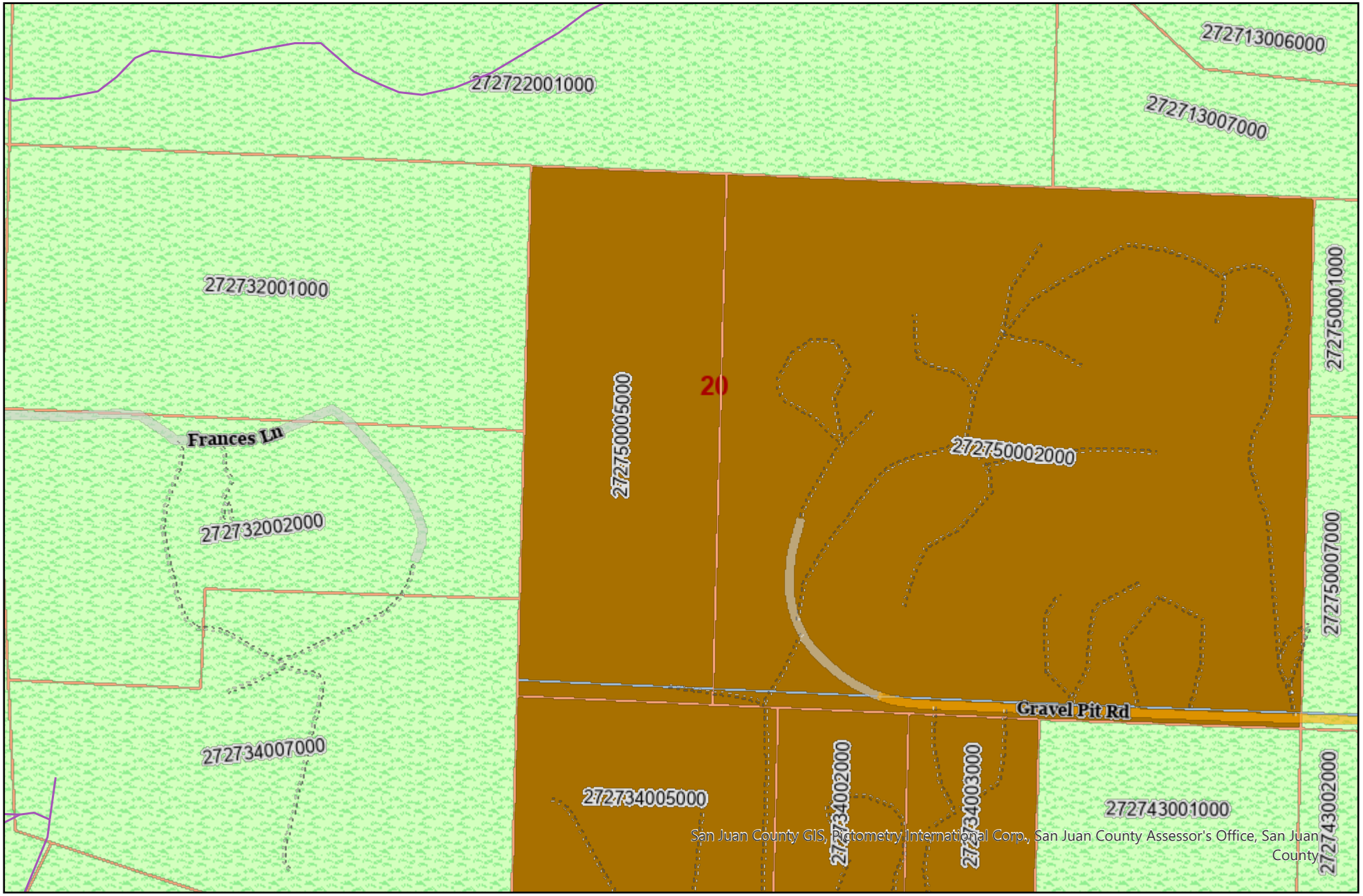
2.) Identify and list below all impervious surfaces (a surface that prevents or retards the entry of water into the soil such as ROOFTOPS, WALKWAYS, PATIOS, DRIVEWAYS, PARKING LOTS, CONCRETE, ASPHALT, OIL, MACADAM, GRAVEL) for your parcel below:

Type of Impervious or Hard Surface	Existing (Sq ft)	Proposed Replaced (Sq ft)	Proposed New (Sq ft)	Subtotal of NEW + REPLACED
House + Attached garage roof area				0
Detached garage + carport roof area				0
Accessory dwelling or structure unit roof area				0
Patio + covered deck area				0
Driveway + compacted gravel				0
Parking area				0
Sidewalk				0
Other				0
Other				0
Other				0
TOTALS				0 **Ft Sq**

	Stormwater Requirements	Fee
All projects with **NEW + REPLACED** impervious surfaces **UNDER 2000 Sq ft** *and* Total Land Disturbing Activities **UNDER 7000 Sq ft**	Minimum Requirement #2 certification	None
All projects with **NEW + REPLACED** impervious surfaces **GREATER THAN 2000 Sq ft** *and/or* Total Land Disturbing Activities **GREATER THAN 7000 Sq ft**	Minimum Requirements # 1-5 (Small Project)	245.00
All projects with **EXISTING + NEW + REPLACED** impervious surfaces **GREATER THAN 5000 Sq Ft** *or* **CONVERT ¾ ACRES OR MORE OF VEGETATION TO LAWN OR LANDSCAPED AREAS** *or* **CONVERT 2.5 ACRES OR MORE OF NATIVE VEGETATION TO PASTURE.**	Minimum Requirement #1-10 (Larger Project)	245.00

TOTAL IMPERVIOUS SURFACES (Existing + New + Replaced)	0 **Ft Sq**

This Worksheet must be completed and submitted with your building permit application, along with applicable fees



SAN JUAN COUNTY WASHINGTON

This map is derived from San Juan County's Geographic Information System (GIS). It is intended for reference only and is not guaranteed to survey accuracy. The information represented on this map is subject to change without notice

1 in = 333 feet

0 0 0 mi

N

TPN272750005 Rural Industrial

Date: 6/2/2022 Time: 8:54 AM

SAN JUAN COUNTY WASHINGTON

This map is derived from San Juan County's Geographic Information System (GIS). It is intended for reference only and is not guaranteed to survey accuracy. The information represented on this map is subject to change without notice

1 in = 333 feet

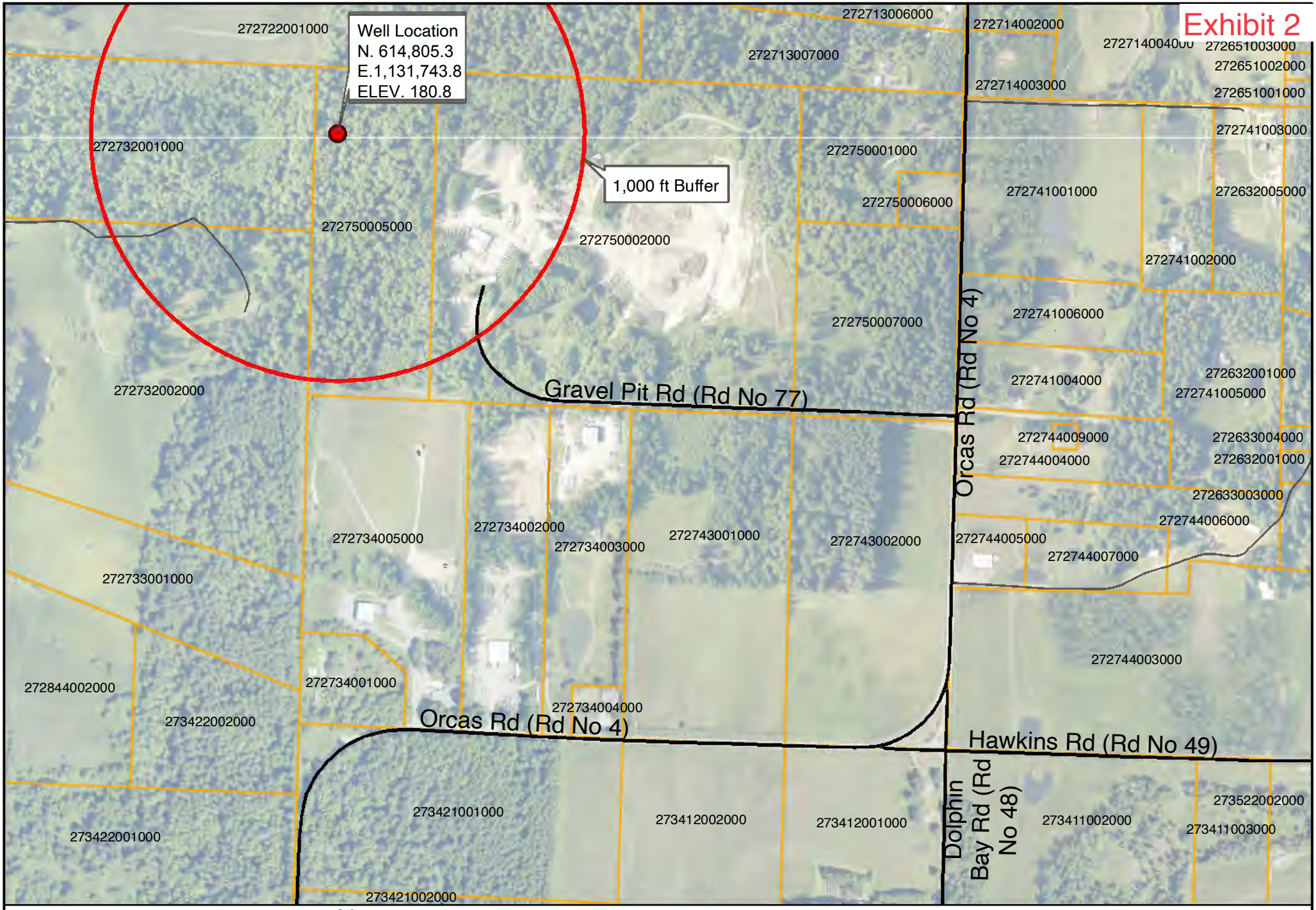
0 0 0 mi

N

TPN272750005 Water Course

Date: 6/2/2022

Time: 8:33 AM



This map is a graphic representation derived from San Juan County's Geographic Information System. It is designed and intended for reference only, and is not guaranteed to survey accuracy. Information represented in this map is subject to change without notice.

Well Location
Orcas Island
San Juan County, Washington

Figure 1

Drawn By: JH

Date: 8/23/2016

Attachment D

OPALCO Interconnection Summary

Eastsound, Washington

Biomass Interconnection

Introduction

The purpose of this document is to provide a preliminary overview of the system improvement requirements to connect the proposed biomass generator into OPALCO's system. OPALCO assumes that the generator will tie into the distribution system at 12.47 kV with a 2.5 MVA transformer and typical impedances. This would provide minimal fault current contribution to the system and not impact the current distribution equipment. New connection requirements are listed within this document, but may not encompass all the required changes. This document only serves as a preliminary review.

Overview

The generation facility will connect into the overhead distribution system off Gravel Pit Rd. Future fault current and load flow studies will need to be completed to determine if any other system improvements will be required on the distribution line. Under initial review the system is not anticipated to require any significant upgrades outside of the equipment and construction listed below.

Interconnection construction will include materials to build in a new switching terminal into the current distribution line. This can be done with overhead or underground equipment with the latter requiring a three-way vacuum fault interrupting device with associated protection. OPALCO assumed overhead construction and the equipment included in this document is for such construction.

Figure 1 below shows the interconnection location with two poles across the street to break the distribution line and feed in and out. Two reclosers will be installed to feed either distribution circuit. One circuit going North feeds Eastsound substation, while the other feeder South feeds Orcas substation.

Figure 1: Overhead Construction Overview

Required Equipment for interconnection

- Three Phase recloser (gang operated) on the distribution line headed toward Orcas
    - Source and low side three phase PT's
    - SEL-651R-2 or similar control (requires sync check)
    - Fiber communication with mirror bit tripping
- Three Phase recloser (gang operated) on the distribution line headed toward Eastsound
    - Source and low side three phase PT's
    - SEL-651R-2 or similar control (requires sync check)
    - Fiber communication with mirror bit tripping
- Upgraded three phase control at Orcas Substation
    - Source and low side three phase PT's
    - SEL-651R-2 or similar control (requires sync check)
    - Fiber communication with mirror bit tripping
- Upgraded three phase control at Eastsound Substation
    - Source and low side three phase PT's
    - SEL-651R-2 or similar control (requires sync check)
    - Fiber communication with mirror bit tripping
- Transformer Protection
    - SEL-787 Differential Protection with sync check
    - Fiber communication with mirror bit tripping
    - Three phase PT's and CT's required on both sides of the transformer
- Metering
    - Metering class CT's and SEL-735 meter

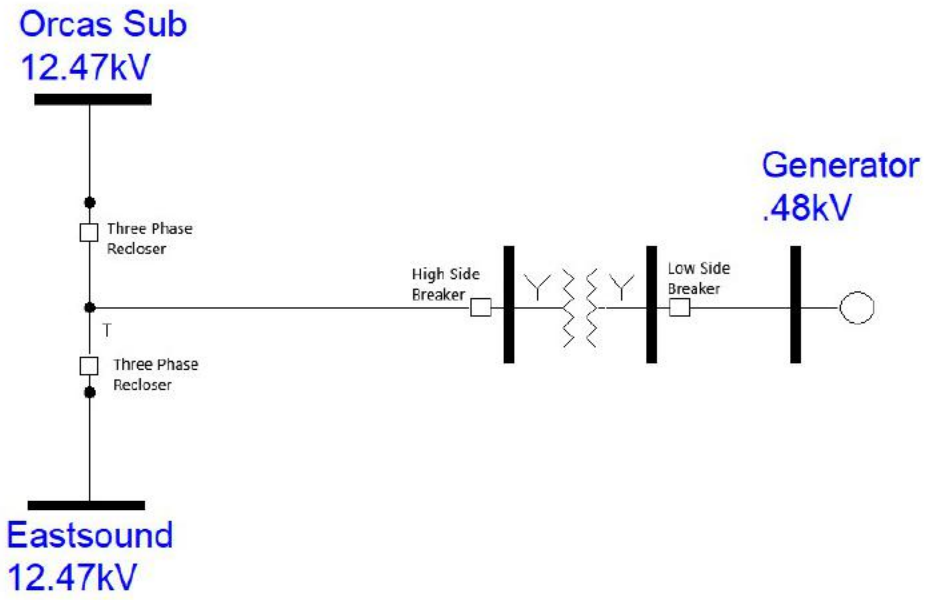


Figure 2: Oneline of System with interconnection

In addition to the associated upgrades a fault current, coordination, and arc flash study will be required to determine any additional equipment and or setting changes on the system.

Protection Criteria

12.47 kV Recloser/Breaker

- Phase Time Overcurrent (51P)
- Phase Instantaneous Overcurrent (50P)
- Ground Time Overcurrent (51G)
- Ground Instantaneous Overcurrent (50G)
- Mirror Bits for Transfer Trip capabilities

Transformer Protection

- Differential Elements (87R, 87U)
- High-side Phase Instantaneous Overcurrent (50P)
- High-side Phase Time Overcurrent (51P)
- High-side Ground Instantaneous Overcurrent (50G)
- High-side Ground Time Overcurrent (51G)
- Low-side Phase Time Overcurrent (51P)
- Low-side Neutral/Ground Time Overcurrent (51N/G)
- Communication and Mirror Bit communication
- RTAC interface for SCADA

Cost Summary:

- Three Phase recloser (gang operated) on the distribution line headed toward Orcas
  - $55,000
- Three Phase recloser (gang operated) on the distribution line headed toward Eastsound
  - $55,000
- Upgraded three phase control at Orcas Substation
  - $40,000
- Upgraded three phase control at Eastsound Substation
  - $40,000
- Transformer Protection, equipment, and testing
  - $90,000
- Transformer (2.5 MVA step up transformer)
  - $200,000
- Metering
  - $50,000
- Conductor, insulator, arrestor improvements
  - $50,000
- Communication Upgrades for transfer trip
  - $80,000

In 2022 dollars the estimated cost for the interconnection is approximately $480,000. This cost may not represent the final costs due to equipment cost, labor constraints, or cost increases.

Attachment E

Capital Cost Opinion Summary

Orcas Power & Light Cooperative

WISEWOOD ENERGY

Biomass Energy Generation with Biochar for Island Energy Resilience
Preliminary Capital Cost Opinion Summary

Location Eastsound, WA
Client Contact Russell Guerry
Date Last Modified 8/8/22

Proposed System CHP
Proposed System Output 1 MW
Fuel Type Forest Residuals

Project Manager Andrew Haden
Email info@wisewoodenergy.com

Item Description	Est. Hours	Labor Cost	Materials Cost	Other Cost	Item Cost	% Total Project
Direct Costs						
Design & Engineering	**0**	**$ -**	**$ -**	**$ 123,000**	**$ 123,000**	**0.59%**
Emissions modeling/air quality permitting assistance						
Mechanical design and engineering						
Structural engineering EXCLUDED						
Electrical engineering EXCLUDED						
Microgrid controls engineering EXCLUDED						
Permits	**0**	**$ -**	**$ -**	**$ 15,000**	**$ 15,000**	**0.07%**
Building permit						
DEQ Permit						
Mobilization	**0**	**$ -**	**$ -**	**$ 35,000**	**$ 35,000**	**0.17%**
Secure storage facility						
Materials receiving and handling						
Construction safety barriers, etc						
Civil	**0**	**$ -**	**$ 211,000**	**$ -**	**$ 211,000**	**1.01%**
Demolition and site preparation (land clearing)						
Structural	**0**	**$ -**	**$ 2,076,000**	**$ -**	**$ 2,076,000**	**9.93%**
Concrete slab and footings, 9"						
Interior concrete walls for floor dryer bays, 12"						
Metal building (pre-fabricated), 136' x 160'						
Building installation, incl. insulation EXCLUDES PW						
Roll-up doors, installed, 20' x 16'						
Roll-up doors, installed 10' x 12'						
Roll-up doors, installed 10' x 10'						
Finishing work (man doors, windows, trim,etc), installed						
Parking areas and perimeter walkway asphalt						
Gravel roadway/yard						
Biomass Fuel Storage And Conveyance	**850**	**$ 107,000**	**$ 300,000**	**$ -**	**$ 407,000**	**1.95%**
Floor dryer						
Combined Heat-And-Power Gasifier Systems	**3,340**	**$ 417,000**	**$ 7,415,000**	**$ -**	**$ 7,833,000**	**37.48%**
Gasifiers, 133kW ea						
Filter						
Ash discharge system						
Gas cooler						
Continuous feed system						
Control system including switchgear						
Metering bin, 30 m^3						
Infeed bin						
Screening auger for fines and overs						
Augers for fuel conveyance (6 per gasifier)						
Sound insulation, engine						
Installation and commissioning supervision by vendor, est. 3 wks, billed T&M						
Travel and room/board for vendor, est. 2 trips, billed R&M						
Silencers - exhaust stack 10"						
Gasifiers option - SCR catalytic converter						
Exhaust stack						
Hydronic Equipment	**1,220**	**$ 152,000**	**$ 293,000**	**$ -**	**$ 445,000**	**2.13%**
Pump, heat exchanger						
Pump, gas cooler						
Pump, CHP engine						
Pump, unit heater supply						
Pump, unit heater supply						
Pump, sump						
Pump, LLR						
Heat exchanger, floor dryer						
Buffer tank, 3,800 gal						
Liquid loop radiator (cooling)						
Expansion tank, heating water, 84 gal						
Expansion tank, potable water, 8 gal						
Metal Piping	**590**	**$ 73,000**	**$ 196,000**	**$ -**	**$ 269,000**	**1.29%**
Steel pipe, per gasifier						
Fire Protection	**30**	**$ 3,000**	**$ 76,000**	**$ -**	**$ 79,000**	**0.38%**
Water storage tank, galvanized, 33,000 gal						
Sprinkler system						
Insulation	**0**	**$ -**	**$ 222,000**	**$ -**	**$ 222,000**	**1.06%**
Installation labor and materials - HW piping to gasifiers only						
Installation labor and materials - buffer tank only						
Other Mechanical	**120**	**$ 15,000**	**$ 152,000**	**$ -**	**$ 167,000**	**0.80%**
Fan, floor dryer						
Air compressor						
Unit heater, industrial spaces						
Unit heater, occupied spaces						

Electrical	**0**	**$ -**	**$ 990,000**	**$ -**	**$ 990,000**	**4.74%**
Electrical - controls and power distribution (installed) Switchgear (installed) Connection to grid (see OPALCO summary report)						
Plumbing	**100**	**$ 13,000**	**$ 25,000**	**$ -**	**$ 38,000**	**0.18%**
Sink, drains, trim, supply lines Septic system EXCLUDED						
Unlisted Items And Punchlist	**0**	**$ -**	**$ -**	**$ 418,000**	**$ 418,000**	**2.00%**
Unlisted items allowance Closeout activities across all disciplines						
Logistics	**0**	**$ -**	**$ -**	**$ 260,000**	**$ 260,000**	**1.24%**
Crane and rigging, small Freight to project site, gasifier containers Freight to project site, general						
Insurance & Bonding	**0**	**$ -**	**$ -**	**$ 38,000**	**$ 38,000**	**0.18%**
Project-specific builders risk insurance Bonding EXCLUDED						
Contractor Expenses	**0**	**$ -**	**$ -**	**$ 195,000**	**$ 195,000**	**0.93%**
Contractor per diem Contractor travel						
Inspections	**0**	**$ -**	**$ -**	**$ 5,000**	**$ 5,000**	**0.02%**
Third party inspections - concrete slump test Stack testing EXCLUDED						
Subtotal Direct Costs	**6,250**	**$ 780,000**	**$ 11,960,000**	**$ 1,090,000**	**$ 13,830,000**	**66.15%**
Indirect Costs						
General Contractor				**$ 1,728,000**	**$ 1,728,000**	**8.27%**
Overhead Profit						
Construction Project Management				**$ 256,000**	**$ 256,000**	**1.22%**
Project management, including travel Installation consulting and commissioning Operations and maintenance manuals						
Construction Administration - RFIs and Construction Details				**$ 9,000**	**$ 9,000**	**0.04%**
Mechanical design						
Taxes				**$ 1,778,000**	**$ 1,778,000**	**8.51%**
WA State Retail Tax 6.50% WA State B&O Tax 1.50% San Juan County Sales Tax 1.30%						
Contingency				**$ 3,301,000**	**$ 3,301,000**	**15.79%**
Estimating and contracting contingency						
Subtotal Indirect Costs				**$ 7,070,000**	**$ 7,070,000**	**33.84%**
Total Capital Costs					**$ 20,900,000**	**100%**

Prices shown reflect market data based on similar projects and preliminary engineering as of: 8/8/22
Price estimate good for 30 days
Taxes shown reflect state and local rates in the state of: WA 8/8/22
Assumptions include $125/hr labor rate and USD/EUR exchange rate of: 1.05
Cost summary is rounded to the nearest ten hours and thousand dollars for line items, and ten thousand dollars for subtotals and totals
Any items not specifically listed should be considered Exclusions

Notes
1: Estimated Cost Variance is determed at the line item level based upon the certainty of the source data and aggregated to provide a risk adjusted total project cost

Attachment F

Operating Cost Opinion

San Juan Island Conservation District

Appropriate Technologies for Fire Mitigation, Energy Independence, & Soil Carbon in San Juan County

Scenario Energy & Cost Analysis

WISEWOOD ENERGY

Location	Eastsound, WA	**Proposed System Output (kW)**	1,000	**Project Manager**	Nerissa Zahora
Client Contact	Russell Guerry	**Proposed System Output (MBH)**	NA	**Email**	info@wisewoodenergy.com
Proposed System	Power Plant	**Proposed System Fuel Type**	Forest Residuals (Bark, Limbs, Tops, etc)	**Date Last Modified**	11/17/22

Scenario	Description	Buildings to Receive Electricity
Scenario 1	OPALCO Biomass Power Plant	1. Eastsound Substation 2. Orcas Substation
Scenario 2	Third Party Biomass Power Plant	1. Eastsound Substation 2. Orcas Substation

	Scenario 1 - OPALCO Biomass Power Plant	Scenario 2 - Third Party Biomass Power Plant
	1000 kW Gasifier 0 MBH Boiler	1000 kW Gasifier 0 MBH Boiler
	Sourced From: Data Estimates	*Sourced From: Data Estimates*

SCENARIO SUMMARY				
Biomass Gasifier Output				
Number of gasifier units		8		8
Nominal electricity capacity [kW, per unit]		125		125
Nominal heat capacity nameplate [kW per unit]		238		238
Modeled gasifier operations [hrs/yr]		8,200		8,200
Estimated Energy Production - Biomass				
Net annual gasifier coverage [kWh/yr]		7,872,000		7,872,000
Gross thermal energy generation [MMBtu/yr, after wood drying]		44,778		44,778
Wood Fuel Demand				
Type of wood fuel - Gasifier		Wood Chips		Wood Chips
Specified wood fuel moisture content - Gasifier [MC, %]		10%		10%
Total wood fuel use - Gasifier [BDT/yr]		5,662		5,662
BIOMASS SYSTEM OPERATING COSTS				
Delivered Wood Fuel				
Estimated portion of wood fuel 1 [%]		50%		50%
Procured wood fuel 1 moisture content [%]		40%		40%
Wood fuel 1 use @ procured MC [GT/yr]		4,718		4,718
Estimated procured wood fuel 1 price [$/GT]	$	-	$	-
Estimated portion of wood fuel 2 [%]		50%		50%
Procured wood fuel 2 moisture content [%]		40%		40%
Wood fuel 2 use @ procured MC [GT/yr]		4,718		4,718
Estimated procured wood fuel 2 price [$/GT]	$	55	$	55
Subtotal	$	259,508	$	259,508
Waste Disposal - Gasifier				
Estimated ash generation [ton/yr]		198		198
Ash container volume [cu-yd]		2.6		2.6
Ash removal [interval/yr]		49		49
Estimated tar generation [lt/yr]		7,500		7,500
Estimated ash disposal fee [$/ton]	$	260	$	260
Waste service fee [$/load-ash]	$	-	$	-
Estimated tar disposal fee [$/lt]	$	0.55	$	0.55
Subtotal	$	55,658	$	55,658
Biomass System Fuel Costs	$	315,166	$	315,166
Biomass System O&M Costs				
Operations Labor				
Fuel handling estimated labor rate [$/hr]	$	50	$	50
Estimated fuel handling FTE		0.82		0.82
O&M estimated labor rate - Gasifier [$/hr]	$	50	$	50
Estimated Gasifier O&M FTE		1.01		1.01
Administrative estimated labor rate [$/hr]	$	30	$	30
Estimated administative FTE		1.00		1.00
Total estimated FTE		2.83		2.83
Subtotal	$	252,319	$	252,319
Third Party Services - Gasifier				
Estimated labor rate [$/hr]	$	125	$	125
Annual & periodic maintenance services [avg hrs/yr]		678		678
Estimated travel expenses [$/yr]		$17,993	$	31,546
Subtotal		$102,699		$102,699
Biomass Consumables				
Gasifier consumables	$	179,200	$	179,200
Subtotal	$	179,200	$	179,200
Administration				
Estimated remote monitoring services [$/yr]	$	10,677	$	10,677
Internet & video surveillance services [$/yr]	$	720	$	720
Estimated insurance [$/yr]	$	3,750	$	3,750
Estimated lease fee [$/yr]	$	6,000	$	12,000
Subtotal	$	21,147	$	27,147
Taxes[3]				
Estimated sales tax [%]		0.000%		0.000%
Estimated sales tax [$/yr]	$	-	$	-
Estimated property tax [%]		0.000%		0.000%
Estimated property taxes [$/yr]	$	-	$	-
Subtotal	$	-	$	-
Maintenance Fee				
Maintenance fee [%]		0.0%		10.0%
Subtotal	$	-	$	72,919
Biomass System Maintenance Costs	$	555,365	$	634,283
Proposed Biomass Operating Cost, Total	$	870,530	$	949,449
ESTIMATED COST OF ENERGY[2]				
Cost of Energy - Power Only [$/kWh]	$	0.111	$	0.121

1: Demand and Time of Use (TOU) charges, if applicable, are incorporated into single average price per kWh.

2: Capital cost not included in estimated cost of energy.

3: Taxes not included at this time in the project.

Attachment G

Financial Pro Forma

San Juan Island Conservation District
Appropriate Technologies for Fire Mitigation, Energy Independence, & Soil Carbon in San Juan County
Financial Pro Forma for Scenario 1 - Host Ownership with Investment Tax Credit, and No Grants

WISEWOODENERGY

Location Eastsound, WA
Client Contact Russell Guerry
Proposed System Power Plant

Proposed System Output, Electric (kW): 1000 kW
Proposed System Output, Thermal (kW): NA
Proposed Biomass Fuel: Forest Residuals (Bark, Limbs, Tops, etc)

Project Manager Nerissa Zahora
Email info@wisewoodenergy.com
Date Last Modified 11/17/22

ESTIMATED EBITDA & LEVELIZED COST OF ENERGY		
Year 1 EBITDA - Host Ownership		NA
Lifetime Electricity Generation (kWh)		208,608,000
Modeled Price Paid for Power		NA
Modeled Price Paid for Power Escalator		NA
LCOE - Unlevered	$	0.133 /kWh
LCOE - Levered with ITC	$	0.110 /kWh

MODELED SOURCES & USES

Project Sources		Amount	% of Total	LTC		$ / kW
Debt Source 1 - [Source]	$	12,000,000	54.6%	54.6%	$	12,000
Debt Source 2 - [Source]	$	-	0.0%	0.0%	$	-
Project Host Equity	$	3,028,763	13.8%	0.0%	$	3,029
Third Party Tax Investor Equity	$	6,946,842	31.6%	0.0%	$	6,947
Grant 1 - Clean Energy Fund	$	-	0.0%	0.0%	$	-
Grant 2 - CWEWIP	$	-	0.0%	0.0%	$	-
Total Sources	**$**	**21,975,605**	**100.0%**	**0.0%**	**$**	**21,976**

Project Uses		Amount	% of Total	0%		$ / kW
Project Capex (Total)	$	20,898,000	95.1%	0.0%	$	20,898
Development Fee (0%) of CapEx	$	-	0.0%	0.0%	$	-
Transaction Costs	$	35,000	0.2%	0.0%	$	35
Interest During Construction	$	759,444	3.5%	0.0%	$	759
Loan Origination Fees	$	283,161	1.3%	0.0%	$	283
Total Uses	**$**	**21,975,605**	**100.0%**	**0.0%**	**$**	**21,976**

MODELED DEBT & TAX CREDIT FINANCING

		Debt Source 1 - [Source]		Tax Investor Bridge Loan		Total
Amount	$	12,000,000	$	6,877,373	$	18,877,373
Origination Fee		1.50%		1.50%		
Annual Interest Rate		5.00%		6.00%		
Loan Term (Years)		25		2		
Loan Repayment Year		28		3		
Number of Monthly Payments		300		24		
Monthly Payment	$	70,151	$	304,809	$	374,960
Annual Payments	$	841,810	$	3,751,173	$	4,592,983

Estimated Investment Tax Credit Value	$	6,432,261
Tax Investor Bridge Loan (not included in total Sources/Uses)	$	6,877,373

ASSUMPTIONS

System Life	25	Project Host Tax Rate Corporation	28%
Discount Rate	8%	Third Party Tax Investor Tax Rate Corporation	28%
Fossil Fuel Price Escalator	4%	ITC/PTC Tax Rate ITC in lieu of PTC	30%
Wood Fuel, Electricity, and Labor Price Escalator	2%		

PROJECT CASH FLOWS

	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25
Proposed Biomass System														
Proposed Biomass System Operating Cost														
Wood Fuel 1 - Low	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Wood Fuel 1 - High	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Wood Fuel 2 - Low	$ 9,407,694	$ -	$ -	$ 134,996	$ 275,392	$ 280,900	$ 286,518	$ 292,248	$ 298,093	$ 304,055	$ 310,136	$ 342,415	$ 378,054	$ 417,402
Wood Fuel 2 - High	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Gasifier Waste Disposal	$ 2,017,706	$ -	$ -	$ 28,953	$ 59,064	$ 60,246	$ 61,451	$ 62,680	$ 63,933	$ 65,212	$ 66,516	$ 73,439	$ 81,083	$ 89,522
Subtotal Operating Costs	$ 11,425,400	$ -	$ -	$ 163,949	$ 334,456	$ 341,146	$ 347,968	$ 354,928	$ 362,026	$ 369,267	$ 376,652	$ 415,855	$ 459,137	$ 506,924
Proposed Biomass System Maintenance Cost														
Operating Labor	$ 9,147,065	$ -	$ -	$ 131,256	$ 267,763	$ 273,118	$ 278,580	$ 284,152	$ 289,835	$ 295,632	$ 301,544	$ 332,929	$ 367,581	$ 405,839
Gasifier Third Party Services	$ 3,723,046	$ -	$ -	$ 53,424	$ 108,985	$ 111,165	$ 113,388	$ 115,656	$ 117,969	$ 120,328	$ 122,735	$ 135,509	$ 149,613	$ 165,185
Consumables	$ 6,496,365	$ -	$ -	$ 93,220	$ 190,168	$ 193,972	$ 197,851	$ 201,808	$ 205,844	$ 209,961	$ 214,161	$ 236,451	$ 261,061	$ 288,232
Administration (Remote Monitoring, Internet, Insurance)	$ 766,625	$ -	$ -	$ 11,001	$ 22,441	$ 22,890	$ 23,348	$ 23,815	$ 24,291	$ 24,777	$ 25,273	$ 27,903	$ 30,807	$ 34,014
Taxes	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Management Fee (if applicable)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Subtotal Maintenance Costs	$ 20,133,101	$ -	$ -	$ 288,901	$ 589,357	$ 601,145	$ 613,168	$ 625,431	$ 637,939	$ 650,698	$ 663,712	$ 732,792	$ 809,062	$ 893,269
Total Proposed Biomass Energy Costs	**$ 31,558,501**	**$ -**	**$ -**	**$ 452,850**	**$ 923,814**	**$ 942,290**	**$ 961,136**	**$ 980,359**	**$ 999,966**	**$ 1,019,965**	**$ 1,040,364**	**$ 1,148,646**	**$ 1,268,199**	**$ 1,400,194**

NOTES
1: Debt, equity, and grant amounts and terms are based on reasonable current assumptions for the purposes of modeling, and are not guarantees of actual funding.
2: Investment Tax Credits (ITC) assumptions, if included, are based on most recent federal rules and common return variables, and are subject to change. INFLATION REDUCTION ACT OF 2022 UPDATE: Legislation relevant to the ITC is currently pending and/or recently passed; changes to the ITC are not necessarily incorporated into this pro forma.

San Juan Island Conservation District
Appropriate Technologies for Fire Mitigation, Energy Independence, & Soil Carbon in San Juan County
Financial Pro Forma for Scenario 1 - Host Ownership with Investment Tax Credit, and with Grants

WISEWOODENERGY

Location Eastsound, WA
Client Contact Russell Guerry
Proposed System Power Plant

Proposed System Output, Electric (kW): 1000 kW
Proposed System Output, Thermal (kW): NA
Proposed Biomass Fuel: Forest Residuals (Bark, Limbs, Tops, etc)

Project Manager Nerissa Zahora
Email info@wisewoodenergy.com
Date Last Modified 11/17/22

ESTIMATED EBITDA & LEVELIZED COST OF ENERGY		
Year 1 EBITDA - Host Ownership		NA
Lifetime Electricity Generation (kWh)		208,608,000
Modeled Price Paid for Power		NA
Modeled Price Paid for Power Escalator		NA
LCOE - Unlevered	$	0.132 /kWh
LCOE - Levered with ITC	$	0.093 /kWh

MODELED SOURCES & USES

Project Sources		Amount	% of Total	LTC		$ / kW
Debt Source 1 - [Source]	$	7,000,000	32.2%	32.2%	$	7,000
Debt Source 2 - [Source]	$	-	0.0%	0.0%	$	-
Project Host Equity	$	3,823,706	17.6%	0.0%	$	3,824
Third Party Tax Investor Equity	$	6,885,852	31.7%	0.0%	$	6,886
Grant 1 - Clean Energy Fund	$	2,500,000	11.5%	0.0%	$	2,500
Grant 2 - CWEWIP	$	1,500,000	6.9%	0.0%	$	1,500
Total Sources	**$**	**21,709,558**	**100.0%**	**0.0%**	**$**	**21,710**

Project Uses		Amount	% of Total	0%		$ / kW
Project Capex (Total)	$	20,898,000	96.3%	0.0%	$	20,898
Development Fee (0%) of CapEx	$	-	0.0%	0.0%	$	-
Transaction Costs	$	35,000	0.2%	0.0%	$	35
Interest During Construction	$	569,303	2.6%	0.0%	$	569
Loan Origination Fees	$	207,255	1.0%	0.0%	$	207
Total Uses	**$**	**21,709,558**	**100.0%**	**0.0%**	**$**	**21,710**

MODELED DEBT & TAX CREDIT FINANCING

		Debt Source 1 - [Source]		Tax Investor Bridge Loan		Total
Amount	$	7,000,000	$	6,816,994	$	13,816,994
Origination Fee		1.50%		1.50%		
Annual Interest Rate		5.00%		6.00%		
Loan Term (Years)		25		2		
Loan Repayment Year		28		3		
Number of Monthly Payments		300		24		
Monthly Payment	$	40,921	$	302,133	$	343,055
Annual Payments	$	491,056	$	3,718,240	$	4,209,296

Estimated Investment Tax Credit Value	$	6,375,789
Tax Investor Bridge Loan (not included in total Sources/Uses)	$	6,816,994

ASSUMPTIONS

System Life	25	Project Host Tax Rate Corporation	28%
Discount Rate	8%	Third Party Tax Investor Tax Rate Corporation	28%
Fossil Fuel Price Escalator	4%	ITC/PTC Tax Rate ITC in lieu of PTC	30%
Wood Fuel, Electricity, and Labor Price Escalator	2%		

PROJECT CASH FLOWS

	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25
Proposed Biomass System														
Proposed Biomass System Operating Cost														
Wood Fuel 1 - Low	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Wood Fuel 1 - High	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Wood Fuel 2 - Low	$ 9,407,694	$ -	$ -	$ 134,996	$ 275,392	$ 280,900	$ 286,518	$ 292,248	$ 298,093	$ 304,055	$ 310,136	$ 342,415	$ 378,054	$ 417,402
Wood Fuel 2 - High	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Gasifier Waste Disposal	$ 2,017,706	$ -	$ -	$ 28,953	$ 59,064	$ 60,246	$ 61,451	$ 62,680	$ 63,933	$ 65,212	$ 66,516	$ 73,439	$ 81,083	$ 89,522
Subtotal Operating Costs	$ 11,425,400	$ -	$ -	$ 163,949	$ 334,456	$ 341,146	$ 347,968	$ 354,928	$ 362,026	$ 369,267	$ 376,652	$ 415,855	$ 459,137	$ 506,924
Proposed Biomass System Maintenance Cost														
Operating Labor	$ 9,147,065	$ -	$ -	$ 131,256	$ 267,763	$ 273,118	$ 278,580	$ 284,152	$ 289,835	$ 295,632	$ 301,544	$ 332,929	$ 367,581	$ 405,839
Gasifier Third Party Services	$ 3,723,046	$ -	$ -	$ 53,424	$ 108,985	$ 111,165	$ 113,388	$ 115,656	$ 117,969	$ 120,328	$ 122,735	$ 135,509	$ 149,613	$ 165,185
Consumables	$ 6,496,365	$ -	$ -	$ 93,220	$ 190,168	$ 193,972	$ 197,851	$ 201,808	$ 205,844	$ 209,961	$ 214,161	$ 236,451	$ 261,061	$ 288,232
Administration (Remote Monitoring, Internet, Insurance)	$ 766,625	$ -	$ -	$ 11,001	$ 22,441	$ 22,890	$ 23,348	$ 23,815	$ 24,291	$ 24,777	$ 25,273	$ 27,903	$ 30,807	$ 34,014
Taxes	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Management Fee (if applicable)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Subtotal Maintenance Costs	$ 20,133,101	$ -	$ -	$ 288,901	$ 589,357	$ 601,145	$ 613,168	$ 625,431	$ 637,939	$ 650,698	$ 663,712	$ 732,792	$ 809,062	$ 893,269
Total Proposed Biomass Energy Costs	**$ 31,558,501**	**$ -**	**$ -**	**$ 452,850**	**$ 923,814**	**$ 942,290**	**$ 961,136**	**$ 980,359**	**$ 999,966**	**$ 1,019,965**	**$ 1,040,364**	**$ 1,148,646**	**$ 1,268,199**	**$ 1,400,194**

NOTES
1: Debt, equity, and grant amounts and terms are based on reasonable current assumptions for the purposes of modeling, and are not guarantees of actual funding.
2: Investment Tax Credits (ITC) assumptions, if included, are based on most recent federal rules and common return variables, and are subject to change. INFLATION REDUCTION ACT OF 2022 UPDATE: Legislation relevant to the ITC is currently pending and/or recently passed; changes to the ITC are not necessarily incorporated into this pro forma.

San Juan Island Conservation District
Appropriate Technologies for Fire Mitigation, Energy Independence, & Soil Carbon in San Juan County
Financial Pro Forma for Scenario 2 - Third Party Ownership with Investment Tax Credit, and No Grants

WISEWOOD ENERGY

Location Eastsound, WA
Client Contact Russell Guerry
Proposed System Power Plant

Proposed System Output, Electric (kW): 1000 kW
Proposed System Output, Thermal (kW): NA
Proposed Biomass Fuel: Forest Residuals (Bark, Limbs, Tops, etc)

Project Manager Nerissa Zahora
Email info@wisewoodenergy.com
Date Last Modified 11/17/22

RETURNS SUMMARY

	Project Host		Third Party Tax Investor	
Returns Summary	**Pre-Tax**	**Post-Tax**	**Pre-Tax**	**Post-Tax**
Total Investment	$4,191,050	$4,191,050	$7,286,862	$7,286,862
Total Cash Flow Distributions & Tax Benefits	$11,452,522	$9,370,628	$1,168,423	$8,673,108
Total Net Returns	$7,261,472	$5,179,578	-$6,118,439	$1,386,246
Total IRR	6.9%	13.2%	-35.6%	2622.1%
Cash Flow Multiple	2.7x	2.2x	0.2x	1.2x
Stabilized Yield - Year 11	7.2%	3.2%	0.0%	0.0%
Breakeven Year	18	9	-	3

ESTIMATED EBITDA & LEVELIZED COST OF ENERGY

Year 1 EBITDA - Third Party Ownership	$	939,831
Lifetime Electricity Generation (kWh)		208,608,000
Modeled Price Paid for Power	$	0.240 / kWh
Modeled Price Paid for Power Escalator		2.0%
LCOE - Unlevered	$	0.141 / kWh
LCOE - Levered with ITC	$	0.117 / kWh

MODELED SOURCES & USES

Project Sources		**Amount**	**% of Total**	**LTC**		**$ / kW**
Debt Source 1 - [Source]	$	12,000,000	52.1%	52.1%	$	12,000
Debt Source 2 - [Source]	$	-	0.0%	0.0%	$	-
Project Host Equity	$	3,753,838	16.3%	0.0%	$	3,754
Third Party Tax Investor Equity	$	7,286,862	31.6%	0.0%	$	7,287
Grant 1 - Clean Energy Fund	$	-	0.0%	0.0%	$	-
Grant 2 - CWEWIP	$	-	0.0%	0.0%	$	-
Total Sources	**$**	**23,040,701**	**100.0%**	**0.0%**	**$**	**23,041**

Project Uses		**Amount**	**% of Total**	**0%**		**$ / kW**
Project Capex (Total)	$	20,898,000	90.7%	0.0%	$	20,898
Development Fee (5%) of CapEx	$	1,044,900	4.5%	0.0%	$	1,045
Transaction Costs	$	35,000	0.2%	0.0%	$	35
Interest During Construction	$	774,591	3.4%	0.0%	$	775
Loan Origination Fees	$	288,210	1.3%	0.0%	$	288
Total Uses	**$**	**23,040,701**	**100.0%**	**0.0%**	**$**	**23,041**

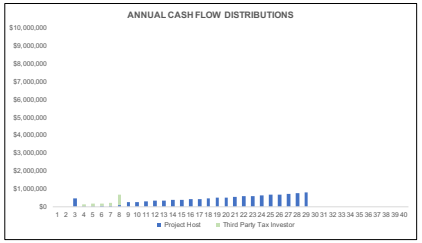
MODELED DEBT & TAX CREDIT FINANCING

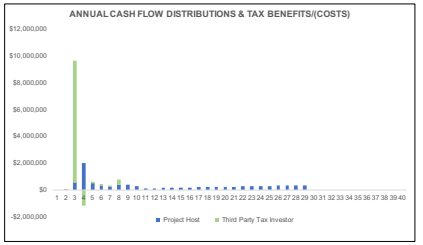
		Debt Source 1 - [Source]		**Tax Investor Bridge Loan**		**Total**
Amount	$	12,000,000	$	7,213,994	$	19,213,994
Origination Fee		1.50%		1.50%		
Annual Interest Rate		5.00%		6.00%		
Loan Term (Years)		25		2		
Loan Repayment Year		28		3		
Number of Monthly Payments		300		24		
Monthly Payment	$	70,151	$	319,729	$	389,879
Annual Payments	$	841,810	$	3,934,778	$	4,776,588

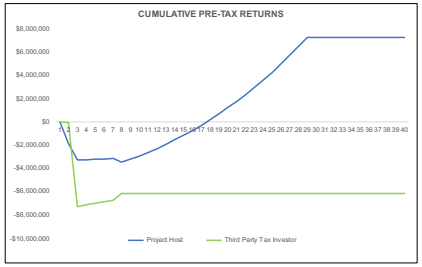
Estimated Investment Tax Credit Value	$	6,747,095
Tax Investor Bridge Loan (not included in total Sources/Uses)	$	7,213,994

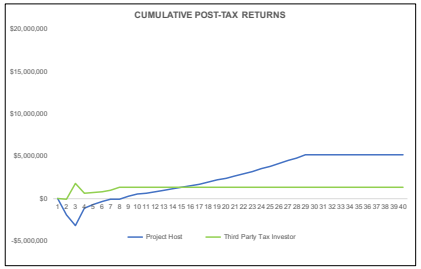
ASSUMPTIONS

System Life	25	Project Host Tax Rate Corporation	28%
Discount Rate	8%	Third Party Tax Investor Tax Rate Corporation	28%
Fossil Fuel Price Escalator	4%	ITC/PTC Tax Rate ITC in lieu of PTC	30%
Wood Fuel, Electricity, and Labor Price Escalator	2%		









PROJECT CASH FLOWS

	Total	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**	**Year 15**	**Year 20**	**Year 25**
Proposed Biomass System														
Biomass System Revenue														
Power Purchase Agreement (PPA)	$ 68,490,244	$ -	$ -	$ 982,803	$ 2,004,919	$ 2,045,017	$ 2,085,918	$ 2,127,636	$ 2,170,189	$ 2,213,593	$ 2,257,864	$ 2,492,865	$ 2,752,324	$ 3,038,788
Other Revenue	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Potential Annual Revenue	$ 68,490,244	$ -	$ -	$ 982,803	$ 2,004,919	$ 2,045,017	$ 2,085,918	$ 2,127,636	$ 2,170,189	$ 2,213,593	$ 2,257,864	$ 2,492,865	$ 2,752,324	$ 3,038,788
Proposed Biomass System Operating Cost														
Wood Fuel 1 - Low	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Wood Fuel 1 - High	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Wood Fuel 2 - Low	$ 9,407,994	$ -	$ -	$ 134,996	$ 275,392	$ 280,900	$ 286,518	$ 292,248	$ 298,093	$ 304,055	$ 310,136	$ 342,415	$ 378,054	$ 417,402
Wood Fuel 2 - High	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Gasifier Waste Disposal	$ 2,017,706	$ -	$ -	$ 28,953	$ 59,064	$ 60,246	$ 61,451	$ 62,680	$ 63,933	$ 65,212	$ 66,516	$ 73,439	$ 81,083	$ 89,522
Subtotal Operating Costs	$ 11,425,400	$ -	$ -	$ 163,949	$ 334,456	$ 341,146	$ 347,968	$ 354,928	$ 362,026	$ 369,267	$ 376,652	$ 415,855	$ 459,137	$ 506,924
Proposed Biomass System Maintenance Cost														
Operating Labor	$ 9,147,065	$ -	$ -	$ 131,256	$ 267,763	$ 273,118	$ 278,580	$ 284,152	$ 289,835	$ 295,632	$ 301,544	$ 332,929	$ 367,581	$ 405,839
Gasifier Third Party Services	$ 3,723,046	$ -	$ -	$ 53,424	$ 108,985	$ 111,165	$ 113,388	$ 115,656	$ 117,969	$ 120,328	$ 122,735	$ 135,509	$ 149,613	$ 165,185
Consumables	$ 6,496,365	$ -	$ -	$ 93,220	$ 190,168	$ 193,972	$ 197,851	$ 201,808	$ 205,844	$ 209,961	$ 214,161	$ 236,451	$ 261,061	$ 288,232
Administration (Remote Monitoring, Internet, Insurance)	$ 984,137	$ -	$ -	$ 14,122	$ 28,809	$ 29,385	$ 29,973	$ 30,572	$ 31,183	$ 31,807	$ 32,443	$ 35,820	$ 39,548	$ 43,664
Taxes	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Management Fee (if applicable)	$ 2,643,446	$ -	$ -	$ 37,932	$ 77,382	$ 78,929	$ 80,508	$ 82,118	$ 83,760	$ 85,436	$ 87,144	$ 96,214	$ 106,229	
Subtotal Maintenance Costs	$ 22,994,059	$ -	$ -	$ 329,954	$ 673,106	$ 686,569	$ 700,300	$ 714,306	$ 728,592	$ 743,164	$ 758,027	$ 836,923	$ 924,031	$ 1,020,205
Total Proposed Biomass Energy Costs	**$ 34,419,459**	**$ -**	**$ -**	**$ 493,903**	**$ 1,007,563**	**$ 1,027,714**	**$ 1,048,268**	**$ 1,069,234**	**$ 1,090,618**	**$ 1,112,431**	**$ 1,134,679**	**$ 1,252,778**	**$ 1,383,168**	**$ 1,527,129**
Biomass System Project Cash Flows														
EBITDA	$ 34,070,785	$ -	$ -	$ 488,900	$ 997,356	$ 1,017,303	$ 1,037,649	$ 1,058,402	$ 1,079,570	$ 1,101,162	$ 1,123,185	$ 1,240,087	$ 1,369,156	$ 1,511,659
Cumulative Net Project Economic Benefit		$ -	$ -	$ 488,900	$ 1,486,256	$ 2,503,560	$ 3,541,209	$ 4,599,611	$ 5,679,182	$ 6,780,343	$ 7,903,528	$ 13,865,530	$ 20,448,062	$ 27,715,709
Unlevered Project-Level Returns														
Investment	$ (23,040,701)	$ -	$ (7,949,788)	$ (15,090,913)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Grants	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
EBITDA	$ 34,070,785	$ -	$ -	$ 488,900	$ 997,356	$ 1,017,303	$ 1,037,649	$ 1,058,402	$ 1,079,570	$ 1,101,162	$ 1,123,185	$ 1,240,087	$ 1,369,156	$ 1,511,659
Proceeds from Liquidation	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Unlevered Cash Flows	$ 11,030,084	$ -	$ (7,949,788)	$ (14,602,013)	$ 997,356	$ 1,017,303	$ 1,037,649	$ 1,058,402	$ 1,079,570	$ 1,101,162	$ 1,123,185	$ 1,240,087	$ 1,369,156	$ 1,511,659
Cumulative Net Unlevered Cash Flows		$ -	$ (7,949,788)	$ (22,551,801)	$ (21,554,445)	$ (20,537,141)	$ (19,499,492)	$ (18,441,090)	$ (17,361,519)	$ (16,260,358)	$ (15,137,173)	$ (9,175,171)	$ (2,592,639)	$ 4,675,008

LOAN CASH FLOWS	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25
Debt Source 1 - [Source]														
Beginning Balance	$ -	$ -	$ -	$ 6,000,000	$ 12,000,000	$ 12,000,000	$ 11,752,571	$ 11,492,483	$ 11,219,089	$ 10,931,707	$ 10,629,623	$ 8,870,937	$ 6,613,913	$ 3,717,341
Loan Draws	$ 12,000,000	$ -	$ 6,000,000	$ 6,000,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Principal Payment	$ (12,000,000)	$ -	$ -	$ -	$ -	$ (247,429)	$ (260,088)	$ (273,394)	$ (287,382)	$ (302,085)	$ (317,540)	$ (407,518)	$ (522,991)	$ (671,185)
Interest Payment - Construction (Assumes 50% for draws)	$ (450,000)	$ -	$ (150,000)	$ (300,000)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Interest Payment - Thereafter	$ (9,887,051)	$ -	$ -	$ -	$ (841,810)	$ (594,381)	$ (581,722)	$ (568,415)	$ (554,428)	$ (539,725)	$ (524,270)	$ (434,292)	$ (318,818)	$ (170,624)
Ending Balance	$ (12,450,000)	$ -	$ 6,000,000	$ 12,000,000	$ 12,000,000	$ 11,752,571	$ 11,492,483	$ 11,219,089	$ 10,931,707	$ 10,629,623	$ 10,312,083	$ 8,463,419	$ 6,090,921	$ 3,046,155
Total Debt Source 1 - [Source] Debt Service	**$ (22,337,051)**	**$ -**	**$ (150,000)**	**$ (300,000)**	**$ (841,810)**	**$ (841,810)**	**$ (841,810)**	**$ (841,810)**	**$ (841,810)**	**$ (841,810)**	**$ (841,810)**	**$ (841,810)**	$ (841,810)	$ (841,810)
Tax Investor Bridge Loan (not included in total Sources/Uses)														
Beginning Balance	$ -	$ -	$ -	$ 3,606,997	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Loan Draws	$ 7,213,994	$ -	$ 3,606,997	$ 3,606,997	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Principal Payment	$ (7,213,994)	$ -	$ -	$ (7,213,994)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Interest Payment - Construction (Assumes 50% for draws)	$ (324,630)	$ -	$ (108,210)	$ (216,420)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Interest Payment - Thereafter	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Ending Balance	$ (7,538,624)	$ -	$ 3,606,997	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Tax Investor Bridge Loan (not included in total Sources/	**$ (7,538,624)**	**$ -**	**$ (108,210)**	**$ (7,430,414)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	$ -	$ -
-	-	-												
Debt Service Coverage Ratio (DSCR)	**-**	**-**	**-**	**0.06**	**1.18**	**1.21**	**1.23**	**1.26**	**1.28**	**1.31**	**1.33**	**1.47**	1.63	1.80
Levered Project-Level Returns														
Net Unlevered Cash Flows	$ 11,030,084	$ -	$ (7,949,788)	$ (14,602,013)	$ 997,356	$ 1,017,303	$ 1,037,649	$ 1,058,402	$ 1,079,570	$ 1,101,162	$ 1,123,185	$ 1,240,087	$ 1,369,156	$ 1,511,659
Loan Draws	$ 19,213,994	$ -	$ 9,606,997	$ 9,606,997	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Debt Service	$ (29,101,045)	$ -	$ -	$ (7,213,994)	$ (841,810)	$ (841,810)	$ (841,810)	$ (841,810)	$ (841,810)	$ (841,810)	$ (841,810)	$ (841,810)	$ (841,810)	$ (841,810)
Net Levered Cash Flows	$ 1,143,033	$ -	$ 1,657,209	$ (12,209,010)	$ 155,546	$ 175,494	$ 195,840	$ 216,593	$ 237,761	$ 259,352	$ 281,375	$ 398,277	$ 527,347	$ 669,849
Cumulative Net Levered Cash Flows	$	$ -	$ 3,314,418	$ (21,103,602)	$ (20,792,509)	$ (20,441,521)	$ (20,049,842)	$ (19,616,657)	$ (19,141,135)	$ (18,622,431)	$ (18,059,680)	$ (14,553,773)	$ (9,806,806)	$ (3,689,608)

PROJECT HOST CASH FLOWS	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25
Total Project Host Pre-Tax Returns														
Capital Invested	$ (4,191,050)	$ -	$ (1,876,919)	$ (1,876,919)	$ -	$ -	$ -	$ -	$ (437,212)	$ -	$ -	$ -	$ -	$ -
Cash Flow Distributions / (Contributions)	$ 11,452,522	$ -	$ -	$ 488,900	$ 9,711	$ 29,459	$ 49,601	$ 70,147	$ 91,103	$ 259,352	$ 281,375	$ 398,277	$ 527,347	$ 669,849
Cash Flow from Liquidations	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Project Host Pre-Tax Returns	**$ 7,261,472**	**$ -**	**$ (1,876,919)**	**$ (1,388,019)**	**$ 9,711**	**$ 29,459**	**$ 49,601**	**$ 70,147**	**$ (346,109)**	**$ 259,352**	**$ 281,375**	**$ 398,277**	**$ 527,347**	**$ 669,849**
Cumulative Project Host Pre-Tax Returns	$	$ -	$ (1,876,919)	$ (3,264,938)	$ (3,255,227)	$ (3,225,768)	$ (3,176,167)	$ (3,106,020)	$ (3,452,129)	$ (3,192,777)	$ (2,911,401)	$ (1,158,448)	$ 1,215,036	$ 4,273,635
Annual Yield	0.0%	-44.8%	-33.1%	0.2%	0.7%	1.2%	1.7%	-8.3%	6.2%	6.7%	9.5%	12.6%	16.0%	
Cumulative IRR	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-54.1%	0.0%	-41.9%	-26.1%	-4.2%	2.5%	5.5%
Cumulative Cash Flow Multiple	0.0x	0.0x	0.1x	0.1x	0.1x	0.1x	0.2x	0.2x	0.2x	0.3x	0.7x	1.3x	2.0x	
Total Project Host Post-Tax Returns														
Project Host Pre-Tax Returns	$ 7,261,472	$ -	$ (1,876,919)	$ (1,388,019)	$ 9,711	$ 29,459	$ 49,601	$ 70,147	$ (346,109)	$ 259,352	$ 281,375	$ 398,277	$ 527,347	$ 669,849
Project Host Tax Credits	$ 68,152	$ -	$ -	$ 68,152	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Wisewood Income Tax Impact (27.60% Tax Rate)	$ (2,150,047)	$ -	$ 59	$ 23,559	$ 2,013,155	$ 466,371	$ 303,846	$ 185,231	$ 295,950	$ 125,092	$ (22,456)	$ (216,452)	$ (283,946)	$ (364,179)
Total Project Host Post-Tax Returns	**$ 5,179,578**	**$ -**	**$ (1,876,860)**	**$ (1,296,307)**	**$ 2,022,866**	**$ 495,830**	**$ 353,448**	**$ 255,378**	**$ (50,159)**	**$ 384,444**	**$ 258,919**	**$ 181,825**	**$ 243,400**	**$ 305,671**
Cumulative Project Host Post-Tax Returns	$	$ -	$ (1,876,860)	$ (3,173,167)	$ (1,150,301)	$ (654,471)	$ (301,023)	$ (45,646)	$ (95,804)	$ 288,639	$ 547,558	$ 1,336,201	$ 2,429,529	$ 3,833,334
Annual Yield	0.0%	-44.8%	-30.9%	48.3%	11.8%	8.4%	6.1%	-1.2%	9.2%	6.2%	4.3%	5.8%	7.3%	
Cumulative IRR	0.0%	0.0%	0.0%	-25.1%	-12.2%	-4.8%	-0.6%	-1.4%	3.4%	5.6%	9.5%	11.6%	12.7%	
Cumulative Cash Flow Multiple	0.0x	0.0x	0.1x	0.6x	0.7x	0.8x	0.9x	1.0x	1.1x	1.1x	1.3x	1.6x	1.9x	

THIRD PARTY TAX INVESTOR CASH FLOWS	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25
Total Third Party Tax Investor Pre-Tax Returns														
Capital Invested	$ (7,286,862)	$ -	$ (72,869)	$ (7,213,994)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Preferred Cash Flow Distributions	$ 728,686	$ -	$ -	$ -	$ 145,737	$ 145,737	$ 145,737	$ 145,737	$ 145,737	$ -	$ -	$ -	$ -	$ -
Buyout Distribution	$ 437,212	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 437,212	$ -	$ -	$ -	$ -	$ -
Cash Flow Distributions	$ 2,525	$ -	$ -	$ -	$ 98	$ 298	$ 501	$ 709	$ 920	$ -	$ -	$ -	$ -	$ -
Total Third Party Tax Investor Pre-Tax Returns	**$ (6,118,439)**	**$ -**	**$ (72,869)**	**$ (7,213,994)**	**$ 145,835**	**$ 146,035**	**$ 146,238**	**$ 146,446**	**$ 583,869**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Cumulative Third Party Tax Investor Pre-Tax Returns	$	$ -	$ (72,869)	$ (7,286,862)	$ (7,141,027)	$ (6,994,992)	$ (6,848,754)	$ (6,702,308)	$ (6,118,439)	$ (6,118,439)	$ (6,118,439)	$ (6,118,439)	$ (6,118,439)	$ (6,118,439)
Annual Yield	0.0%	-1.0%	-99.0%	2.0%	2.0%	2.0%	2.0%	8.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumulative IRR	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-35.6%	-35.6%	-35.6%	-35.6%	-35.6%	-35.6%	
Cumulative Cash Flow Multiple	0.0x	0.0x	0.0x	0.0x	0.1x	0.1x	0.2x	0.2x	0.2x	0.2x	0.2x	0.2x	0.2x	
Total Third Party Tax Investor Post-Tax Returns														
Third Party Tax Investor Pre-Tax Returns	$ (6,118,439)	$ -	$ (72,869)	$ (7,213,994)	$ 145,835	$ 146,035	$ 146,238	$ 146,446	$ 583,869	$ -	$ -	$ -	$ -	$ -
Third Party Tax Investor Tax Credits	$ 6,747,095	$ -	$ -	$ 6,747,095	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Tax Equity Investor Income Tax Impact (27.60% Tax Rate)	$ 757,590	$ -	$ 5,888	$ 2,332,369	$ (1,298,432)	$ (40,306)	$ (40,362)	$ (40,419)	$ (161,148)	$ -	$ -	$ -	$ -	$ -
Net Third Party Tax Investor Post-Tax Returns	**$ 1,386,246**	**$ -**	**$ (66,981)**	**$ 1,865,470**	**$ (1,152,597)**	**$ 105,729**	**$ 105,877**	**$ 106,027**	**$ 422,721**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Cumulative Third Party Tax Investor Post-Tax Returns	$	$ -	$ (66,981)	$ 1,798,489	$ 645,892	$ 751,621	$ 857,498	$ 963,525	$ 1,386,246	$ 1,386,246	$ 1,386,246	$ 1,386,246	$ 1,386,246	$ 1,386,246
Annual Yield	0.0%	-0.9%	25.6%	-15.8%	1.5%	1.5%	1.5%	5.8%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumulative IRR	0.0%	0.0%	2685.1%	-36.8%	2622.1%	2622.1%	2622.1%	2622.1%	2622.1%	2622.1%	2622.1%	2622.1%	2622.1%	
Cumulative Cash Flow Multiple	0.0x	0.0x	1.2x	1.1x	1.1x	1.1x	1.1x	1.2x	1.2x	1.2x	1.2x	1.2x	1.2x	

NOTES

1: Debt, equity, and grant amounts and terms are based on reasonable current assumptions for the purposes of modeling, and are not guarantees of actual funding.

2: Investment Tax Credits (ITC) assumptions, if included, are based on most recent federal rules and common return variables, and are subject to change. INFLATION REDUCTION ACT OF 2022 UPDATE: Legislation relevant to the ITC is currently pending and/or recently passed; changes to the ITC are not necessarily incorporated into this pro forma.

San Juan Island Conservation District
Appropriate Technologies for Fire Mitigation, Energy Independence, & Soil Carbon in San Juan County
Financial Pro Forma for Scenario 2 - Third Party Ownership with Investment Tax Credit, and with Grants

WISEWOOD ENERGY

Location Eastsound, WA
Client Contact Russell Guerry
Proposed System Power Plant

Proposed System Output, Electric (kW): 1000 kW
Proposed System Output, Thermal (kW): NA
Proposed Biomass Fuel: Forest Residuals (Bark, Limbs, Tops, etc)

Project Manager Nerissa Zahora
Email info@wisewoodenergy.com
Date Last Modified 11/17/22

RETURNS SUMMARY

Returns Summary	Project Host Pre-Tax	Project Host Post-Tax	Third Party Tax Investor Pre-Tax	Third Party Tax Investor Post-Tax
Total Investment	$4,982,334	$4,982,334	$7,225,873	$7,225,873
Total Cash Flow Distributions & Tax Benefits	$20,560,627	$16,217,121	$1,176,264	$8,613,273
Total Net Returns	$15,578,293	$11,234,786	-$6,049,609	$1,387,400
Total IRR	12.2%	14.2%	-35.5%	118.2%
Cash Flow Multiple	4.1x	3.3x	0.2x	1.2x
Stabilized Yield - Year 11	13.1%	8.5%	0.0%	0.0%
Breakeven Year	12	9	-	3

ESTIMATED EBITDA & LEVELIZED COST OF ENERGY

Year 1 EBITDA - Third Party Ownership	$	939,831
Lifetime Electricity Generation (kWh)		208,608,000
Modeled Price Paid for Power	$	0.240 / kWh
Modeled Price Paid for Power Escalator		2.0%
LCOE - Unlevered	$	0.140 / kWh
LCOE - Levered with ITC	$	0.100 / kWh

MODELED SOURCES & USES

Project Sources		Amount	% of Total	LTC		$ / kW
Debt Source 1 - [Source]	$	7,000,000	30.7%	30.7%	$	7,000
Debt Source 2 - [Source]	$	-	0.0%	0.0%	$	-
Project Host Equity	$	4,548,782	20.0%	0.0%	$	4,549
Third Party Tax Investor Equity	$	7,225,873	31.7%	0.0%	$	7,226
Grant 1 - Clean Energy Fund	$	2,500,000	11.0%	0.0%	$	2,500
Grant 2 - CWEWIP	$	1,500,300	6.6%	0.0%	$	1,500
Total Sources	**$**	**22,774,655**	**100.0%**	**0.0%**	**$**	**22,775**

Project Uses		Amount	% of Total	0%		$ / kW
Project Capex (Total)	$	20,898,000	91.8%	0.0%	$	20,898
Development Fee (5%) of CapEx	$	1,044,900	4.6%	0.0%	$	1,045
Transaction Costs	$	35,000	0.2%	0.0%	$	35
Interest During Construction	$	584,451	2.6%	0.0%	$	584
Loan Origination Fees	$	212,304	0.9%	0.0%	$	212
Total Uses	**$**	**22,774,655**	**100.0%**	**0.0%**	**$**	**22,775**

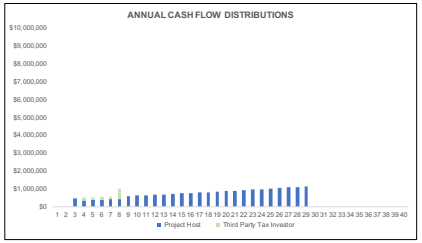
MODELED DEBT & TAX CREDIT FINANCING

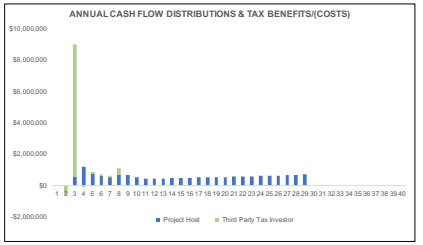
	Debt Source 1 - [Source]		Tax Investor Bridge Loan		Total
Amount	$	7,000,000	$	7,153,614	$ 14,153,614
Origination Fee		1.50%		1.50%	
Annual Interest Rate		5.00%		6.00%	
Loan Term (Years)		25		2	
Loan Repayment Year		28		3	
Number of Monthly Payments		300		24	
Monthly Payment	$	40,921	$	317,053	$ 357,974
Annual Payments	$	491,056	$	3,901,845	$ 4,392,901

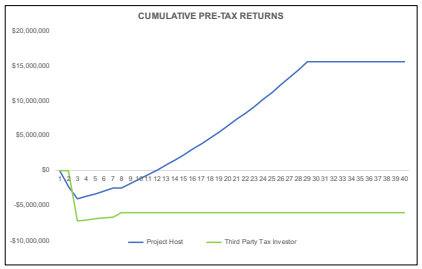
Estimated Investment Tax Credit Value	$	6,690,623
Tax Investor Bridge Loan (not included in total Sources/Uses)	$	7,153,614

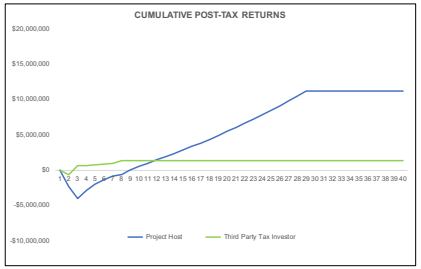
ASSUMPTIONS

System Life	25	Project Host Tax Rate	Corporation 28%
Discount Rate	8%	Third Party Tax Investor Tax Rate	Corporation 28%
Fossil Fuel Price Escalator	4%	ITC/PTC Tax Rate	ITC in lieu of PTC 30%
Wood Fuel, Electricity, and Labor Price Escalator	2%		









PROJECT CASH FLOWS

	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25
Proposed Biomass System														
Biomass System Revenue														
Power Purchase Agreement (PPA)	$ 68,490,244	$ -	$ -	$ 982,803	$ 2,004,919	$ 2,045,017	$ 2,085,918	$ 2,127,636	$ 2,170,189	$ 2,213,593	$ 2,257,864	$ 2,492,865	$ 2,752,324	$ 3,038,788
Other Revenue	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Potential Annual Revenue	$ 68,490,244	$ -	$ -	$ 982,803	$ 2,004,919	$ 2,045,017	$ 2,085,918	$ 2,127,636	$ 2,170,189	$ 2,213,593	$ 2,257,864	$ 2,492,865	$ 2,752,324	$ 3,038,788
Proposed Biomass System Operating Cost														
Wood Fuel 1 - Low	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Wood Fuel 1 - High	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Wood Fuel 2 - Low	$ 9,407,594	$ -	$ -	$ 134,996	$ 275,392	$ 280,900	$ 286,518	$ 292,248	$ 298,093	$ 304,055	$ 310,136	$ 342,415	$ 378,054	$ 417,402
Wood Fuel 2 - High	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Gasifier Waste Disposal	$ 2,017,706	$ -	$ -	$ 28,953	$ 59,064	$ 60,246	$ 61,451	$ 62,680	$ 63,933	$ 65,212	$ 66,516	$ 73,439	$ 81,083	$ 89,522
Subtotal Operating Costs	$ 11,425,400	$ -	$ -	$ 163,949	$ 334,456	$ 341,146	$ 347,968	$ 354,928	$ 362,026	$ 369,267	$ 376,652	$ 415,855	$ 459,137	$ 506,924
Proposed Biomass System Maintenance Cost														
Operating Labor	$ 9,147,065	$ -	$ -	$ 131,256	$ 267,763	$ 273,118	$ 278,580	$ 284,152	$ 289,835	$ 295,632	$ 301,544	$ 332,929	$ 367,581	$ 405,839
Gasifier Third Party Services	$ 3,723,046	$ -	$ -	$ 53,424	$ 108,985	$ 111,165	$ 113,388	$ 115,656	$ 117,969	$ 120,328	$ 122,735	$ 135,509	$ 149,613	$ 165,185
Consumables	$ 6,496,365	$ -	$ -	$ 93,220	$ 190,168	$ 193,972	$ 197,851	$ 201,808	$ 205,844	$ 209,961	$ 214,161	$ 236,451	$ 261,061	$ 288,232
Administration (Remote Monitoring, Internet, Insurance)	$ 984,137	$ -	$ -	$ 14,122	$ 28,809	$ 29,385	$ 29,973	$ 30,572	$ 31,183	$ 31,807	$ 32,443	$ 35,820	$ 39,548	$ 43,664
Taxes	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Management Fee (if applicable)	$ 2,643,446	$ -	$ -	$ 37,932	$ 77,382	$ 78,929	$ 80,508	$ 82,118	$ 83,760	$ 85,436	$ 87,144	$ 96,214	$ 106,229	$ -
Subtotal Maintenance Costs	$ 22,994,059	$ -	$ -	$ 329,954	$ 673,106	$ 686,569	$ 700,300	$ 714,306	$ 728,592	$ 743,164	$ 758,027	$ 836,923	$ 924,031	$ 1,020,205
Total Proposed Biomass Energy Costs	**$ 34,419,459**	**$ -**	**$ -**	**$ 493,903**	**$ 1,007,563**	**$ 1,027,714**	**$ 1,048,268**	**$ 1,069,234**	**$ 1,090,618**	**$ 1,112,431**	**$ 1,134,679**	**$ 1,252,778**	**$ 1,383,168**	**$ 1,527,129**
Biomass System Project Cash Flows														
EBITDA	$ 34,070,785	$ -	$ -	$ 488,900	$ 997,356	$ 1,017,303	$ 1,037,649	$ 1,058,402	$ 1,079,570	$ 1,101,162	$ 1,123,185	$ 1,240,087	$ 1,369,156	$ 1,511,659
Cumulative Net Project Economic Benefit		$ -	$ -	$ 488,900	$ 1,486,256	$ 2,503,560	$ 3,541,209	$ 4,599,611	$ 5,679,182	$ 6,780,343	$ 7,903,528	$ 13,865,530	$ 20,448,062	$ 27,715,709
Unlevered Project-Level Returns														
Investment	$ (18,774,655)	$ -	$ (5,846,650)	$ (12,928,005)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Grants	$ 4,000,000	$ -	$ 2,000,000	$ 2,000,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
EBITDA	$ 34,070,785	$ -	$ -	$ 488,900	$ 997,356	$ 1,017,303	$ 1,037,649	$ 1,058,402	$ 1,079,570	$ 1,101,162	$ 1,123,185	$ 1,240,087	$ 1,369,156	$ 1,511,659
Proceeds from Liquidation	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Unlevered Cash Flows	$ 19,296,130	$ -	$ (3,846,650)	$ (10,439,105)	$ 997,356	$ 1,017,303	$ 1,037,649	$ 1,058,402	$ 1,079,570	$ 1,101,162	$ 1,123,185	$ 1,240,087	$ 1,369,156	$ 1,511,659
Cumulative Net Unlevered Cash Flows		$ -	$ (3,846,650)	$ (14,285,755)	$ (13,288,399)	$ (12,271,096)	$ (11,233,446)	$ (10,175,044)	$ (9,095,474)	$ (7,994,312)	$ (6,871,127)	$ (909,125)	$ 5,673,407	$ 12,941,054

LOAN CASH FLOWS	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25
Debt Source 1 - [Source]														
Beginning Balance	$ -	$ -	$ -	$ 3,500,000	$ 7,000,000	$ 7,000,000	$ 6,855,667	$ 6,703,949	$ 6,544,469	$ 6,376,829	$ 6,200,613	$ 5,174,713	$ 3,858,116	$ 2,168,449
Loan Draws	$ 7,000,000	$ -	$ 3,500,000	$ 3,500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Principal Payment	$ (7,000,000)	$ -	$ -	$ -	$ -	$ (144,333)	$ (151,718)	$ (159,480)	$ (167,639)	$ (176,216)	$ (185,232)	$ (237,719)	$ (305,078)	$ (391,525)
Interest Payment - Construction (Assumes 50% for draws)	$ (262,500)	$ -	$ (87,500)	$ (175,000)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Interest Payment - Thereafter	$ (5,767,447)	$ -	$ -	$ -	$ (491,056)	$ (346,722)	$ (339,338)	$ (331,576)	$ (323,416)	$ (314,840)	$ (305,824)	$ (253,337)	$ (185,977)	$ (99,531)
Ending Balance	$ (7,262,500)	$ -	$ 3,500,000	$ 7,000,000	$ 7,000,000	$ 6,855,667	$ 6,703,949	$ 6,544,469	$ 6,376,829	$ 6,200,613	$ 6,015,382	$ 4,936,995	$ 3,553,037	$ 1,776,924
Total Debt Source 1 - [Source] Debt Service	**$ (13,029,947)**	**$ -**	**$ (87,500)**	**$ (175,000)**	**$ (491,056)**	**$ (491,056)**	**$ (491,056)**	**$ (491,056)**	**$ (491,056)**	**$ (491,056)**	**$ (491,056)**	**$ (491,056)**	$ (491,056)	$ (491,056)
Tax Investor Bridge Loan (not included in total Sources/Uses)														
Beginning Balance	$ -	$ -	$ -	$ 3,576,807	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Loan Draws	$ 7,153,614	$ -	$ 3,576,807	$ 3,576,807	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Principal Payment	$ (7,153,614)	$ -	$ -	$ (7,153,614)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Interest Payment - Construction (Assumes 50% for draws)	$ (321,913)	$ -	$ (107,304)	$ (214,608)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Interest Payment - Thereafter	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Ending Balance	$ (7,475,527)	$ -	$ 3,576,807	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Tax Investor Bridge Loan (not included in total Sources/	**$ (7,475,527)**	**$ -**	**$ (107,304)**	**$ (7,368,222)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	$ -	$ -
-	-													
Debt Service Coverage Ratio (DSCR)	**-**	**-**	**-**	**0.06**	**2.03**	**2.07**	**2.11**	**2.16**	**2.20**	**2.24**	**2.29**	**2.53**	2.79	3.08
Levered Project-Level Returns														
Net Unlevered Cash Flows	$ 19,296,130	$ -	$ (3,846,650)	$ (10,439,105)	$ 997,356	$ 1,017,303	$ 1,037,649	$ 1,058,402	$ 1,079,570	$ 1,101,162	$ 1,123,185	$ 1,240,087	$ 1,369,156	$ 1,511,659
Loan Draws	$ 14,153,614	$ -	$ 7,076,807	$ 7,076,807	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Debt Service	$ (19,921,061)	$ -	$ -	$ (7,153,614)	$ (491,056)	$ (491,056)	$ (491,056)	$ (491,056)	$ (491,056)	$ (491,056)	$ (491,056)	$ (491,056)	$ (491,056)	$ (491,056)
Net Levered Cash Flows	$ 13,528,683	$ -	$ 3,230,157	$ (10,515,912)	$ 506,301	$ 526,248	$ 546,594	$ 567,347	$ 588,515	$ 610,106	$ 632,129	$ 749,031	$ 878,101	$ 1,020,604
Cumulative Net Levered Cash Flows	$	$ -	$ 6,460,314	$ (14,571,510)	$ (13,558,909)	$ (12,506,414)	$ (11,413,227)	$ (10,278,533)	$ (9,101,504)	$ (7,881,291)	$ (6,617,033)	$ 396,415	$ 8,650,922	$ 18,275,660

PROJECT HOST CASH FLOWS	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25
Total Project Host Pre-Tax Returns														
Capital Invested	$ (4,982,334)	$ -	$ (2,274,391)	$ (2,274,391)	$ -	$ -	$ -	$ -	$ (433,552)	$ -	$ -	$ -	$ -	$ -
Cash Flow Distributions / (Contributions)	$ 20,560,627	$ -	$ -	$ 488,900	$ 358,165	$ 377,913	$ 398,055	$ 418,601	$ 439,557	$ 610,106	$ 632,129	$ 749,031	$ 878,101	$ 1,020,604
Cash Flow from Liquidations	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Project Host Pre-Tax Returns	**$ 15,578,293**	**$ -**	**$ (2,274,391)**	**$ (1,785,491)**	**$ 358,165**	**$ 377,913**	**$ 398,055**	**$ 418,601**	**$ 6,005**	**$ 610,106**	**$ 632,129**	**$ 749,031**	**$ 878,101**	**$ 1,020,604**
Cumulative Project Host Pre-Tax Returns	$	$ -	$ (2,274,391)	$ (4,059,882)	$ (3,701,717)	$ (3,323,804)	$ (2,925,748)	$ (2,507,147)	$ (2,501,143)	$ (1,891,036)	$ (1,258,907)	$ 2,247,817	$ 6,375,070	$ 11,187,439
Annual Yield	0.0%		-45.6%	-35.8%	7.2%	7.6%	8.0%	8.4%	0.1%	12.2%	12.7%	15.0%	17.6%	20.5%
Cumulative IRR	0.0%		0.0%	0.0%	0.0%	-56.2%	-37.8%	-25.5%	-25.3%	-13.5%	-7.1%	5.8%	9.9%	11.6%
Cumulative Cash Flow Multiple	0.0x		0.0x	0.1x	0.2x	0.2x	0.3x	0.4x	0.5x	0.6x	0.7x	1.5x	2.3x	3.2x
Total Project Host Post-Tax Returns														
Project Host Pre-Tax Returns	$ 15,578,293	$ -	$ (2,274,391)	$ (1,785,491)	$ 358,165	$ 377,913	$ 398,055	$ 418,601	$ 6,005	$ 610,106	$ 632,129	$ 749,031	$ 878,101	$ 1,020,604
Project Host Tax Credits	$ 67,582	$ -	$ -	$ 67,582	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Wisewood Income Tax Impact (27.60% Tax Rate)	$ (4,411,088)	$ -	$ (5,474)	$ 18,064	$ 833,841	$ 398,082	$ 236,776	$ 119,523	$ 230,840	$ 62,048	$ (83,933)	$ (267,793)	$ (322,007)	$ (385,197)
Total Project Host Post-Tax Returns	**$ 11,234,786**	**$ -**	**$ (2,279,866)**	**$ (1,699,845)**	**$ 1,192,007**	**$ 775,995**	**$ 634,832**	**$ 538,124**	**$ 236,845**	**$ 672,155**	**$ 548,196**	**$ 481,239**	**$ 556,094**	**$ 635,407**
Cumulative Project Host Post-Tax Returns	$	$ -	$ (2,279,866)	$ (3,979,711)	$ (2,787,704)	$ (2,011,709)	$ (1,376,878)	$ (838,754)	$ (601,909)	$ 70,246	$ 618,442	$ 2,882,427	$ 5,511,338	$ 8,528,038
Annual Yield	0.0%		-45.8%	-34.1%	23.9%	15.6%	12.7%	10.8%	4.8%	13.5%	11.0%	9.7%	11.2%	12.8%
Cumulative IRR	0.0%		0.0%	0.0%	-55.9%	-30.1%	-16.2%	-8.2%	-5.4%	0.5%	3.7%	10.2%	12.7%	13.8%
Cumulative Cash Flow Multiple	0.0x		0.0x	0.1x	0.4x	0.5x	0.6x	0.7x	0.9x	1.0x	1.1x	1.6x	2.1x	2.7x

THIRD PARTY TAX INVESTOR CASH FLOWS	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25
Total Third Party Tax Investor Pre-Tax Returns														
Capital Invested	$ (7,225,873)	$ -	$ (72,259)	$ (7,153,614)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Preferred Cash Flow Distributions	$ 722,587	$ -	$ -	$ -	$ 144,517	$ 144,517	$ 144,517	$ 144,517	$ 144,517	$ -	$ -	$ -	$ -	$ -
Buyout Distribution	$ 433,552	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 433,552	$ -	$ -	$ -	$ -	$ -
Cash Flow Distributions	$ 20,124	$ -	$ -	$ -	$ 3,618	$ 3,817	$ 4,021	$ 4,228	$ 4,440	$ -	$ -	$ -	$ -	$ -
Total Third Party Tax Investor Pre-Tax Returns	**$ (6,049,609)**	**$ -**	**$ (72,259)**	**$ (7,153,614)**	**$ 148,135**	**$ 148,335**	**$ 148,538**	**$ 148,746**	**$ 582,510**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Cumulative Third Party Tax Investor Pre-Tax Returns	$	$ -	$ (72,259)	$ (7,225,873)	$ (7,077,738)	$ (6,929,403)	$ (6,780,865)	$ (6,632,119)	$ (6,049,609)	$ (6,049,609)	$ (6,049,609)	$ (6,049,609)	$ (6,049,609)	$ (6,049,609)
Annual Yield	0.0%		-1.0%	-99.0%	2.1%	2.1%	2.1%	2.1%	8.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Cumulative IRR	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-35.5%	-35.5%	-35.5%	-35.5%	-35.5%	-35.5%
Cumulative Cash Flow Multiple	0.0x		0.0x	0.0x	0.0x	0.0x	0.1x	0.1x	0.2x	0.2x	0.2x	0.2x	0.2x	0.2x
Total Third Party Tax Investor Post-Tax Returns														
Third Party Tax Investor Pre-Tax Returns	$ (6,049,609)	$ -	$ (72,259)	$ (7,153,614)	$ 148,135	$ 148,335	$ 148,538	$ 148,746	$ 582,510	$ -	$ -	$ -	$ -	$ -
Third Party Tax Investor Tax Credits	$ 6,690,623	$ -	$ -	$ 6,690,623	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Tax Equity Investor Income Tax Impact (27.60% Tax Rate)	$ 746,386	$ -	$ (541,975)	$ 1,788,292	$ (216,167)	$ (40,940)	$ (40,997)	$ (41,054)	$ (160,773)	$ -	$ -	$ -	$ -	$ -
Net Third Party Tax Investor Post-Tax Returns	**$ 1,387,400**	**$ -**	**$ (614,234)**	**$ 1,325,301**	**$ (68,032)**	**$ 107,394**	**$ 107,542**	**$ 107,692**	**$ 421,737**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Cumulative Third Party Tax Investor Post-Tax Returns	$	$ -	$ (614,234)	$ 711,067	$ 643,035	$ 750,429	$ 857,971	$ 965,663	$ 1,387,400	$ 1,387,400	$ 1,387,400	$ 1,387,400	$ 1,387,400	$ 1,387,400
Annual Yield	0.0%		-8.5%	18.3%	-0.9%	1.5%	1.5%	1.5%	5.8%	0.0%	0.0%	0.0%	0.0%	0.0%
Cumulative IRR	0.0%		0.0%	115.8%	110.5%	114.4%	116.1%	116.9%	118.2%	118.2%	118.2%	118.2%	118.2%	118.2%
Cumulative Cash Flow Multiple	0.0x		-0.1x	1.1x	1.1x	1.1x	1.1x	1.1x	1.2x	1.2x	1.2x	1.2x	1.2x	1.2x

NOTES

1: Debt, equity, and grant amounts and terms are based on reasonable current assumptions for the purposes of modeling, and are not guarantees of actual funding.

2: Investment Tax Credits (ITC) assumptions, if included, are based on most recent federal rules and common return variables, and are subject to change. INFLATION REDUCTION ACT OF 2022 UPDATE: Legislation relevant to the ITC is currently pending and/or recently passed; changes to the ITC are not necessarily incorporated into this pro forma.

Attachment H

Emissions Data Summary

OPALCO

Biomass Generation with Biochar for Island Energy Resilience
Emissions Estimates - Gasifier CHP System

WISEWOOD ENERGY

Location: Eastsound, WA
Client Contact: Russell Guerry
Date Last Modified: 8/9/22
Proposed Scenario: Biomass CHP

Proposed System Output: 1 MW-el / 1.9 MW-th
Proposed Biomass Fuel: Wood Chips
Max. Operation Hours [hrs/yr]: 8,200

Gasifier CHP - Emissions Factors	
Exahust Gas Production [Nm3/hr]	3,408
CO [mg/m3]	40
NOx [mg/m3]	530
VOC [mg/m3]	1.2
PM [mg/m3]	20

Gasifier CHP - Annual Estimated Emissions	
Exahust Gas Production [Nm3/yr]	27,945,600
CO [ton/yr]	1.23
NOx [ton/yr]	16.33
VOC [ton/yr]	0.04
PM [ton/yr]	0.62
Total Gasifier Emissions [ton/yr]	**18.21**

OPALCO

Biomass Generation with Biochar for Island Energy Resilience
Emissions Estimates - Gasifier CHP System

WISEWOOD ENERGY

Location: Eastsound, WA
Client Contact: Russell Guerry
Date Last Modified: 8/9/22
Proposed Scenario: Biomass CHP

Proposed System Output: 1 MW-el / 1.9 MW-th
Proposed Biomass Fuel: Wood Chips
Max. Operation Hours [hrs/yr]: 8,200
Modeled Emissions Reduction: Urea Injection

Gasifier CHP - Emissions Factors	
Exahust Gas Production [Nm3/hr]	3,408
CO [mg/m3]	25
NOx [mg/m3]	278
VOC [mg/m3]	1.6
PM [mg/m3]	20

Gasifier CHP - Annual Estimated Emissions	
Exahust Gas Production [Nm3/yr]	27,945,600
CO [ton/yr]	0.77
NOx [ton/yr]	8.56
VOC [ton/yr]	0.05
PM [ton/yr]	0.62
Total Gasifier Emissions [ton/yr]	**10.00**