Eugene Water & Electric Board

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teamed with Good Company

Seneca Sustainable Energy Cogeneration Project:

Overview and Preliminary Sustainability Results

March 5, 2009

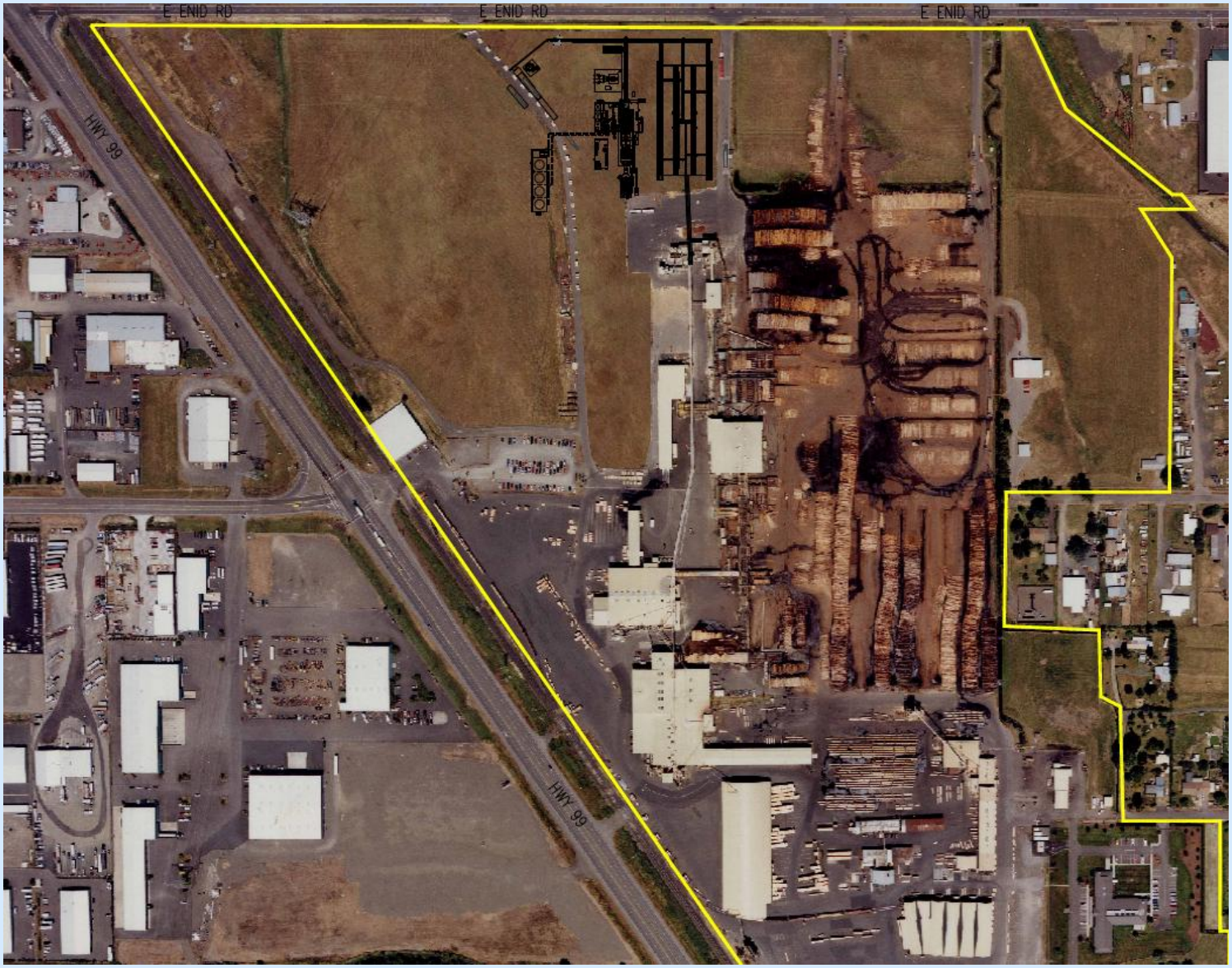
Agenda

- Background
- Sustainability analysis to date
- Economic, social and environmental summary
- Board discussion
- Next steps

Who is Seneca?

- Sawmill and timber company
- Over 50 years experience in industry
- Provides over 275 jobs
- 6th largest producing sawmill on one site in U.S.
- Member of the Sustainable Forestry Initiative
- Community involvement/engagement
- Efficiency practices

Seneca Biomass Power Facility



Seneca Biomass Power Facility

- Renewable energy facility
- Biomass cogeneration plant
- Sited adjacent to sawmill operations
- Wood-fired boiler, steam/turbine generator
- Fueled by 132,000 bone dry tons of wood by-products per year
- Produces 200,000 pounds of steam per hour
- Generates 18.8MW of firm power

QuickTime™ and a decompressor are needed to see this picture.

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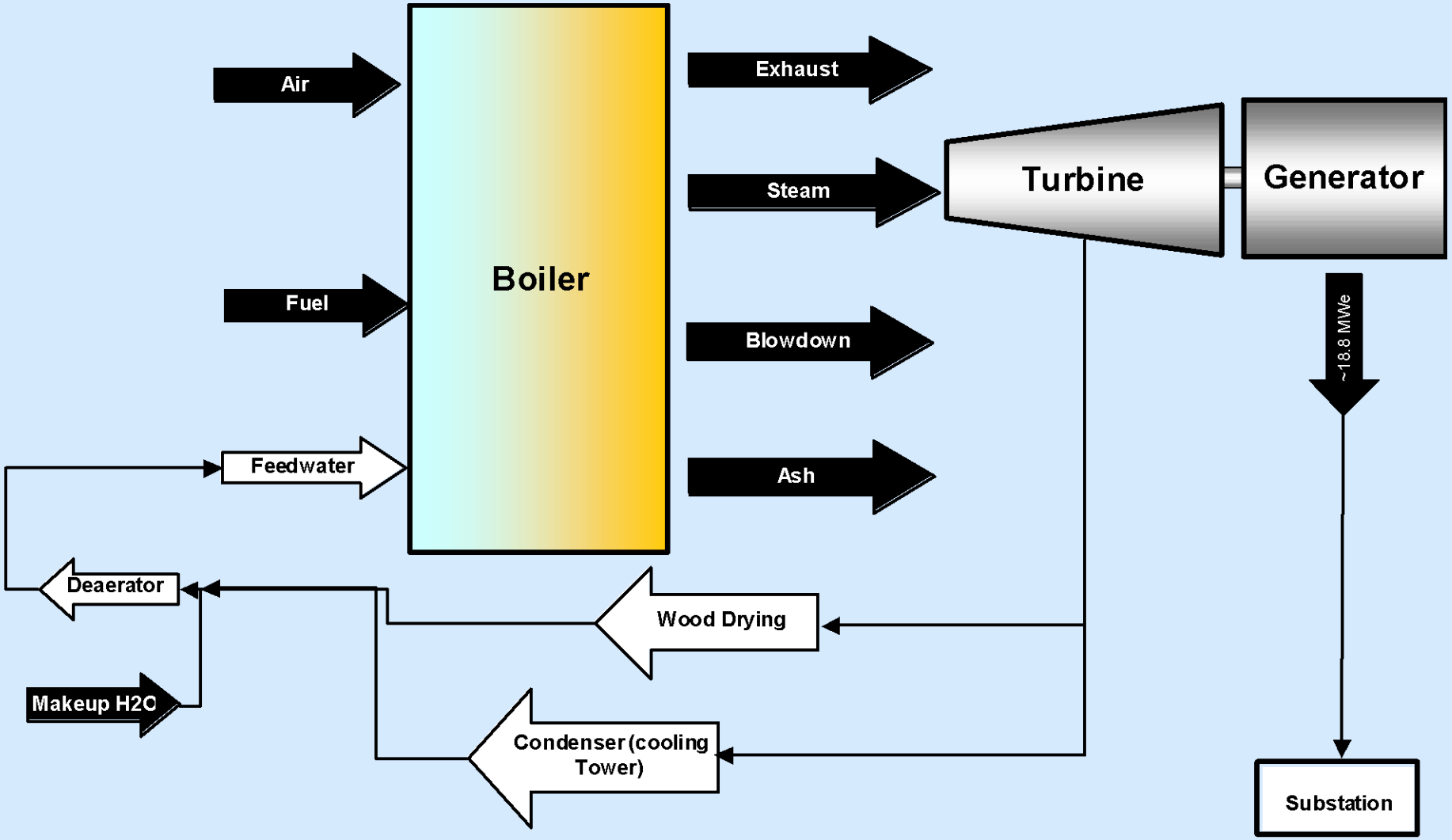
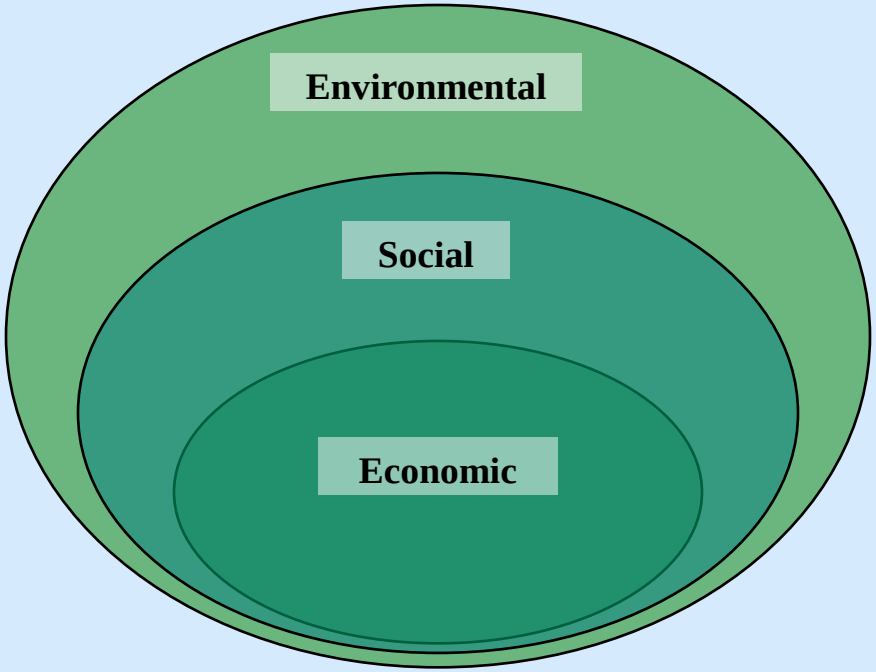
**3-field electrostatic precipitator (ESP) is shown to the right. A 4-field ESP will be used for emissions control in this project.*

What is Biomass Cogeneration?



Sustainability Analysis of Project

- Comprehensive evaluation of environmental, social and economic attributes of a project or process
- Consideration of the life-cycle impacts and context of project
- Comparison to other alternatives
- Preliminary results presented today with comprehensive report to follow

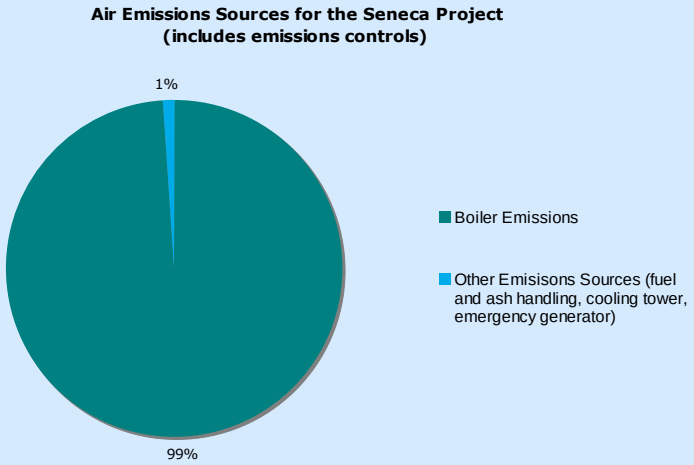


Environmental Considerations to Date

- Emissions and controls
- Water inputs and outputs
- Fuel sources and alternative uses

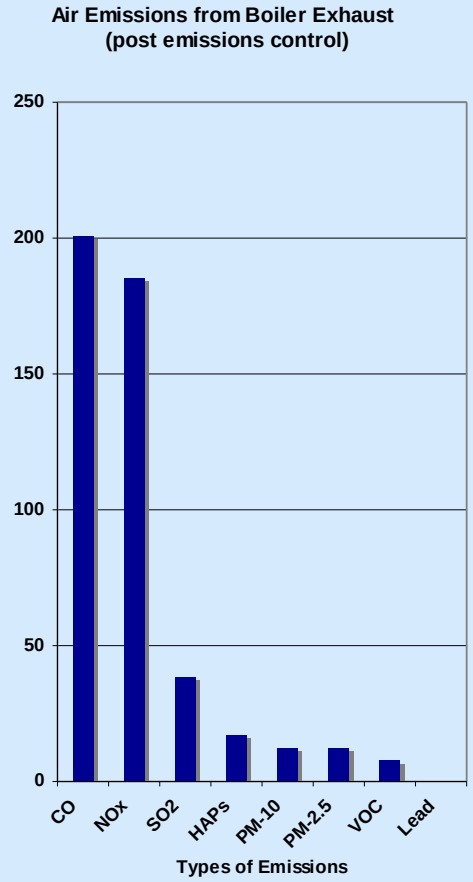
Seneca Project Emissions

- Criteria Air Pollutants (CAP)
  - Carbon monoxide (CO)
  - Particulate matter (PM2.5 and PM10)
  - Sulfur dioxide (SO_2)
  - Nitrogen oxides (NO_x)
  - Volatile Organic Compounds (VOC)
- Hazardous Air Pollutants (HAP)
  - Lead, hydrogen chloride, benzene, etc.
- Greenhouse Gases (GHG)
  - Carbon dioxide (CO_2)
  - Methane (CH_4)
- Reported emissions
  - LRAPA air quality permit and reporting required for current regulation
  - DEQ greenhouse gas emissions reporting required for 2009 emissions with potential future regulation



Boiler Emission Controls

- Carbon Monoxide (CO) and Volatile Organic Compounds (VOC)
  - Combustion management - temperature, oxygen, fuel content, maximizes energy recovery
- Nitrous Oxides (NO_x)
  - Selective non-catalytic reduction (SNCR) urea injection system
  - 45% reduction based on equipment guarantee
- Particulate Matter (PM)
  - Cyclonic separator (multicone)
  - 4-field electrostatic precipitator (ESP)
  - 99% reduction based on equipment guarantee
- Exhaust monitoring
  - Continuous emissions monitoring system (CEMS)
  - Temperature, exhaust flow rate, oxygen, NOx, opacity



Other Emission Controls

- Cooling tower
  - Additional drift eliminators to reduce PM emissions
  - Water treatment chemicals - reduce corrosion - do not contain chromium or other HAPs
- Fuel handling
  - Fully-enclosed conveyors, fuel storage facility and truck dumping area
  - Bag house and covered transfer points to reduce PM emissions
  - 99.9% removal efficiency
- Emergency generator
  - Fueled with ultra-low sulfur diesel (ULSD)
- Ash handling
  - Wet ash handling to reduce PM or dust
  - Plant water discharge used

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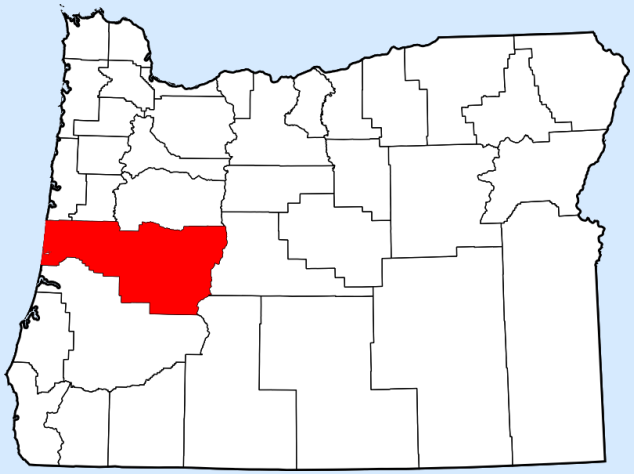
Emissions in Tons per Year					
Emissions	Boiler	Fuel Handling	Cooling Tower	Emergency Generator	Total
PM-10	12.36	0.54	0.34	0.00	13.24
PM-2.5	12.30	0.51	0.34	0.00	13.15
NOx	185.43	0.00	0.00	0.18	185.61
CO	200.88	0.00	0.00	0.01	200.89
VOC	7.73	0.00	0.00	0.00	7.73
SO2	38.63	0.00	0.00	0.00	38.63
Lead	0.01	0.00	0.00	0.00	0.01
HAPs	16.92	0.00	0.00	0.00	16.92

Project Emissions in Context

Emissions	Total Annual Project Emissions (Tons/Year)	Total 2002 Annual Lane County Emissions (Tons/Year)	Project Represents x% of Lane County Emissions	Context of Project Relating to Other Lane County Sources
PM-10	13.24	25,575	0.05%	0.6% of emissions from residential wood combustion
PM-2.5	13.15	244	5.39%	12% of emissions from road dust
NOx	185.61	15,659	1.19%	2% of emissions from on-road vehicles
CO	200.89	150,075	0.13%	1% of emissions from residential wood combustion
VOC	7.73	30,657	0.03%	0.1% of emissions from on-road vehicles
SO2	38.63	1,691	2.28%	12% of emissions from on-road vehicles
Lead	0.01	0.84	0.59%	5% of emissions from industrial processes
HAPs	16.92	7,724	0.22%	Specifics are not available

* Based on 2002 Lane County data from EPA Air Emissions Sources Website



Water Inputs and Outputs

- Existing well to feed the plant
- Annual use and water right for new groundwater well to feed plant as a back-up
- Water use is 24/7 for full year
- Water input: 21,000 gal/hr
- Water discharge: 2,400 gal/hr
  - Discharge water to be cooled and used on site
- Annual use: 184 million gallons
  - Equivalent to water use of 1,444 average households
  - Assuming average household uses 127,400 gallons according to the American Water Works Association

Potential Transportation Impacts

- 25% of fuel source (forest reside/slash) available within 50-mile radius of cogeneration plant in Lane and Douglas County
- Transportation decrease
  - Fewer truck loads of wood by-products delivered to customers
- Transportation increase
  - Increase in truck loads of slash delivered to facility
  - Increase in truck loads of ash by-product to customers
- Net decrease in truck loads - truck miles may be considered in final report

Fuel Sources

- 75% of feedstocks - onsite wood by-products
  - Sawdust, bark, shavings
  - 50% of current wood by-products to cogeneration facility

- 25% of feedstocks - offsite slash
  - Treetops, branches, etc.
  - Timberlands in Lane and Douglas County
  - Slash trade similar to log trade
  - Using slash in cogeneration plant with emission controls = avoided open burning of slash with no emission controls
- Fuel will only be sourced from wood by-products and forest residue

Comparison of Fuel Paths

Wood By-Products and Forest Residue ~ 132,000 bone dry tons of biomass

equivalent to 280,000 tons, 45% moisture

Base Case:
Burn as Fuel at Typical Biomass Power Plant

Pollutants
PM
SOx
NOx
CO
CH4
CO2

Open Burning of Biomass without Emission Controls

QuickTime™ and a decompressor are needed to see this picture.

Pollutants	Factor Ratio
PM	33
SOx	1
NOx	3
CO	20
CH4	32
CO2	0.9

Biomass Used for Composting or Spreading

Pollutants	Factor Ratio
PM	0
SOx	0
NOx	0
CO	0
CH4	132 Š 520
CO2	0.5 Š 0.9

*These ratios are from a 1999 National Renewable Energy Laboratory study titled *The Value of the Benefits of U.S. Biomass Power*

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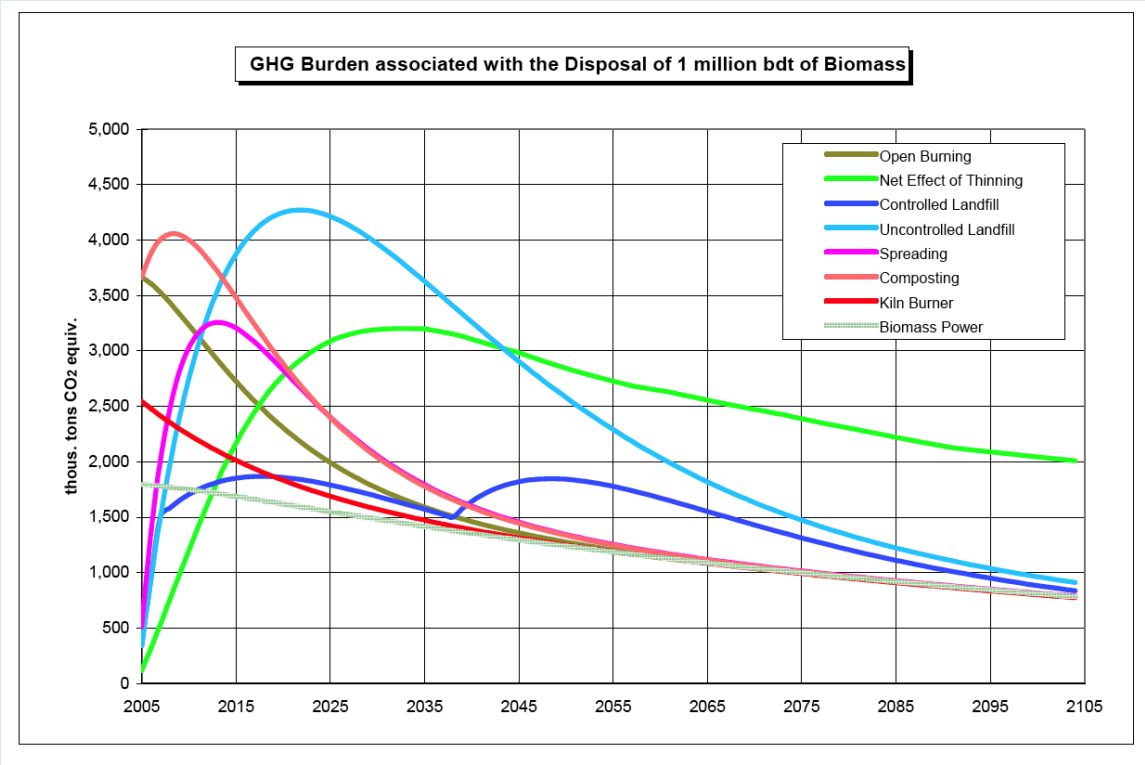
Greenhouse Gas Emissions for Potential Fuel Paths



*Graph from *Bioenergy and Greenhouse Gases*, a 2008 report prepared by the Green Power Institute (renewable energy program of the Pacific Institute)

Plant Production

- Electricity
  - 100% of 18.8 MW of electricity generated will be sold to the grid via net metering
- Steam
  - Some of steam will displace 767,292 therms of natural gas in wood drying kiln
- Ash
  - 5,262 tons of annual ash by-product
  - Sold to customers for soil amendment when possible
  - Water sprayed on ash during handling - reduce PM emissions

Sustainability Considerations Summary

Characteristics	Economic and Social Considerations	Environmental Considerations
• Base load • Qualifies for Oregon RPS • 93-96% capacity factor	• Firm power source • Energy independence and emergency power to community • Eliminates regional transmission constraints and need for additional development • A hedge against hydroelectric generation volatility • A hedge against fossil fuel generation volatility in pricing • EWEB's investment in this source would keep money in our service community • Creation of 11 ongoing local family-wage jobs for plant and 90 construction craftspeople jobs during construction of the plant • Renewable energy credit value • Reduces risk of future carbon costs for EWEB • Current generation power prices are higher than current non-renewable power prices • Local versus regional human health concerns with concentrated urban air emissions, especially NOx and CO	• Carbon emissions within biosphere carbon cycle • Forest residue or slash and wood by-products and their highest level use • Large reduction in overall air emissions compared to open burning of forest slash • Air emissions in urban area, such as NOx and CO • Water usage for steam production and cooling

Comparison to Similar Base Load Power

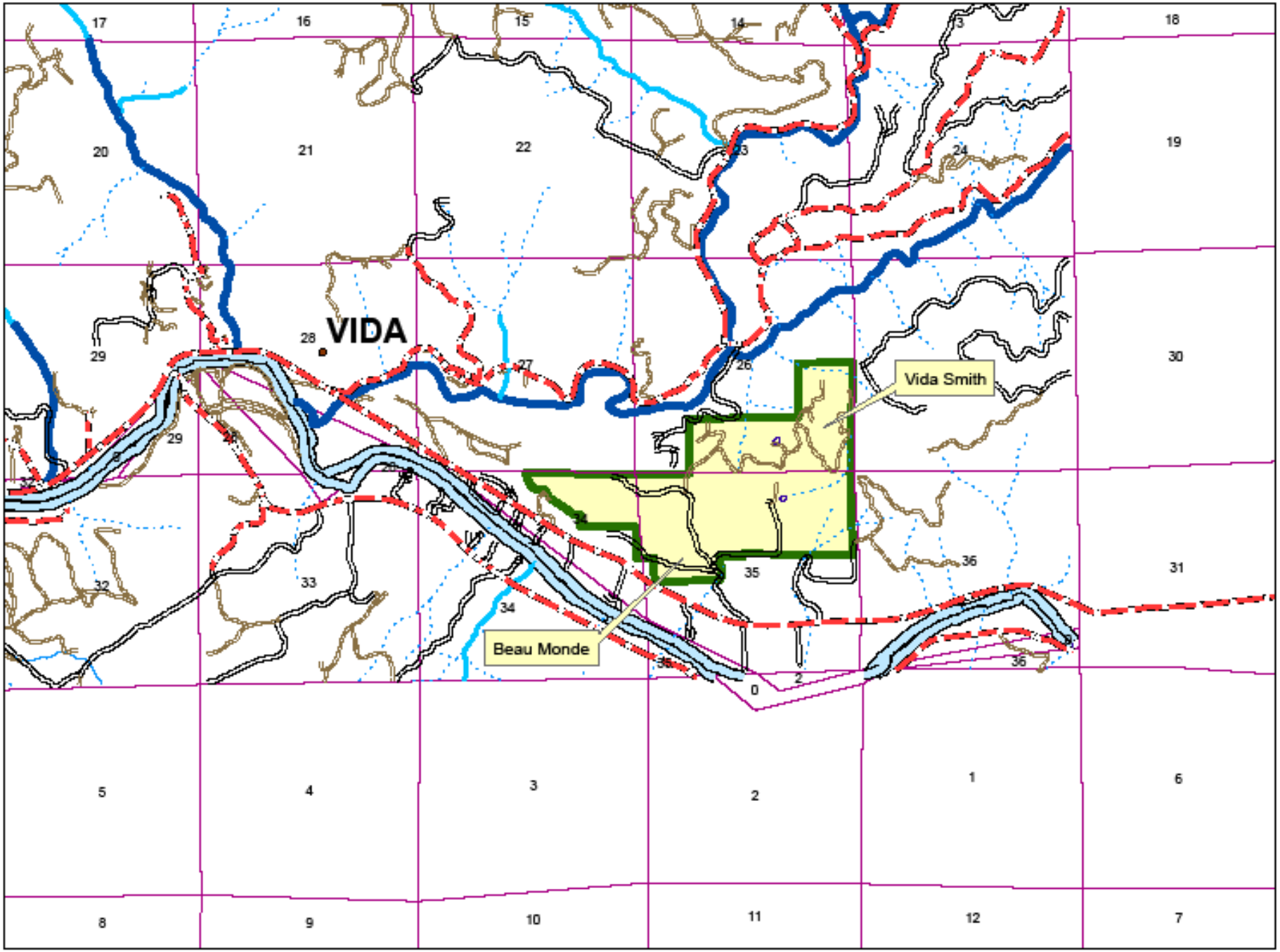
Resource	Characteristics	Economic	Social	Environmental
Geothermal (Regional)	• Base load • Qualifies for Oregon RPS • 86-95% capacity factor	***Advantages:*** • Provides reliable on-demand power ***Disadvantages:*** • None identified	***Advantages:*** • Reliable power • Regional energy independence • A few ongoing jobs ***Disadvantages:*** • None identified	***Advantages:*** • Zero local air emissions • Considered to be carbon neutral and a renewable energy resource ***Disadvantages:*** • High water usage for steam production and cooling • Vegetation management for transmission corridor • Potential groundwater contamination from drilling wells • Potential sinking of land at the surface if water is not re-injected into the well
Gas Cogeneration Combined Cycle (Regional)	• Base load • Regulated carbon emissions under future cap-and-trade system • 30-35% capacity factor	***Advantages:*** • Provides reliable on-demand power • Lowest levelized energy cost including the costs of the plant, transmission and losses ***Disadvantages:*** • Future carbon costs for EWEB	***Advantages:*** • Reliable power ***Disadvantages:*** • Local emissions from plant	***Advantages:*** • Natural gas burns much cleaner than coal and could displace the use of coal ***Disadvantages:*** • Introduces new carbon to biosphere • Migration corridor disruption and soil contamination in mining • Water usage for steam production and cooling
Nuclear (Regional)	• Base load • Does not qualify as renewable for Oregon RPS • Nuclear power production is banned in some states likes Oregon • 90% capacity factor	***Advantages:*** • Provides reliable power • Low levelized energy cost including the costs of the plant, transmission and losses • Reduces risk of future carbon costs for EWEB ***Disadvantages:*** • Risk management costs • High capital for development and construction • High cost of hazard waste management • High cost for decommissioning a plant	***Advantages:*** • Reliable power • Regional energy independence • Jobs ***Disadvantages:*** • Requires cool water to operate Š drought and heat-waves can disrupt production • Human health and safety risks in another region	***Advantages:*** • No emissions from power generation • 95% of spent uranium fuel can be reprocessed ***Disadvantages:*** • Emissions from mining and transport of uranium. • Water usage for steam production and cooling • Water discharge contains pollutants such as heavy metals and salts • Radioactive waste from fission process • Nuclear power is not renewable because uranium is not a renewable source

Thank you

Capacity Factor of Sources

- Assuming the full efficiency of each system
- Table shows installed capacity required for each source to generate an average of 18.8 MW based on each source's capacity factor

Energy Source Category	Capacity Factor	Installed Capacity (Size of System) to Generate 18.8 MW
Seneca Biomass Cogeneration Plant	93 – 96%	19.6 – 20.2 MW
Geothermal	86 – 95%	19.8 – 21.9 MW
Nuclear	90%	20.9 MW
Biomass	83%	22.7 MW
Coal	71%	26.5 MW
Wind	25 – 40%	47 – 75.2 MW
Hydropower	30 – 35%	53.7 – 62.7 MW
Natural Gas Combustion/Turbine	30 – 35%	53.7 – 62.7 MW
Solar	24 – 33%	57 – 78.3 MW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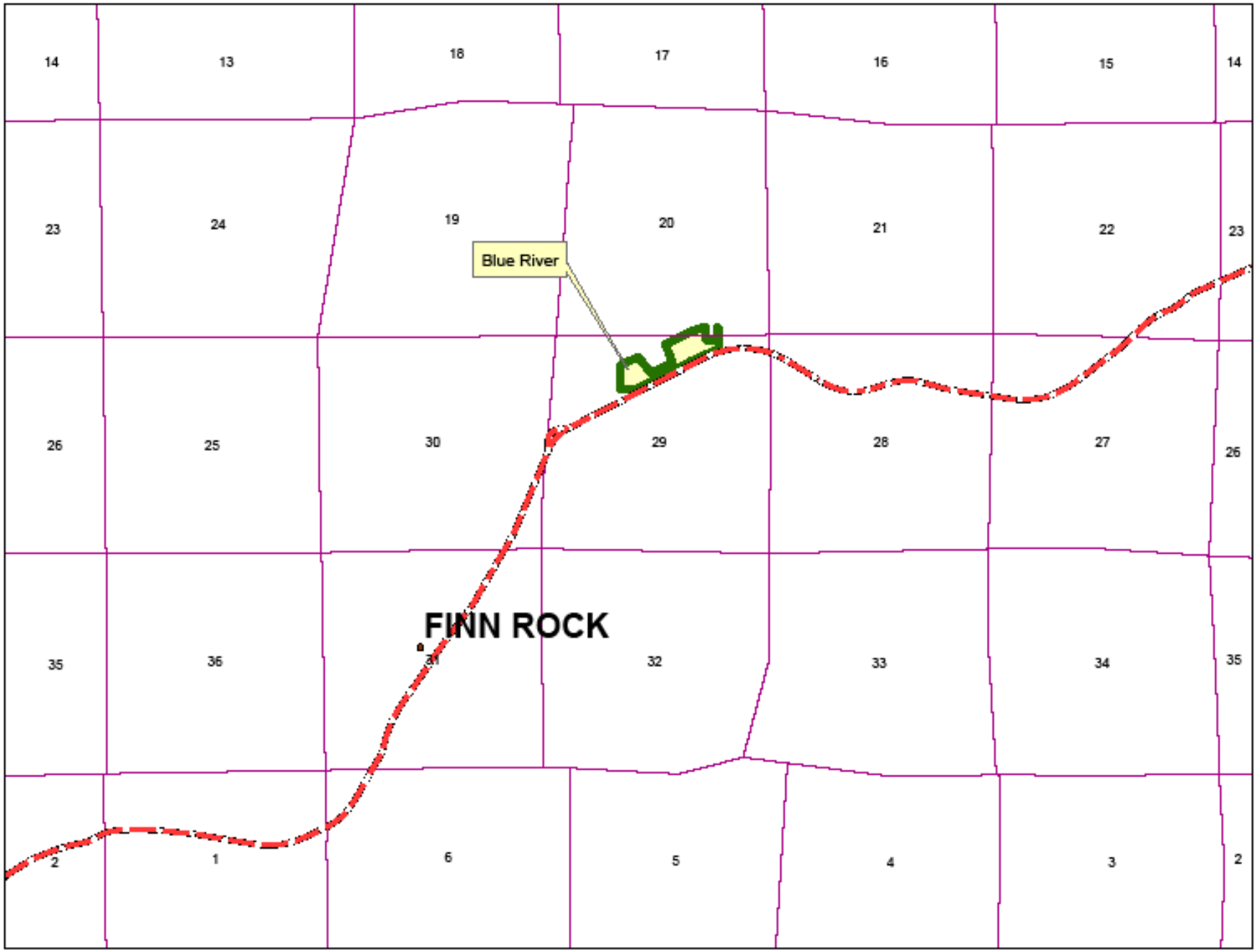
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Blue River
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FINN ROCK
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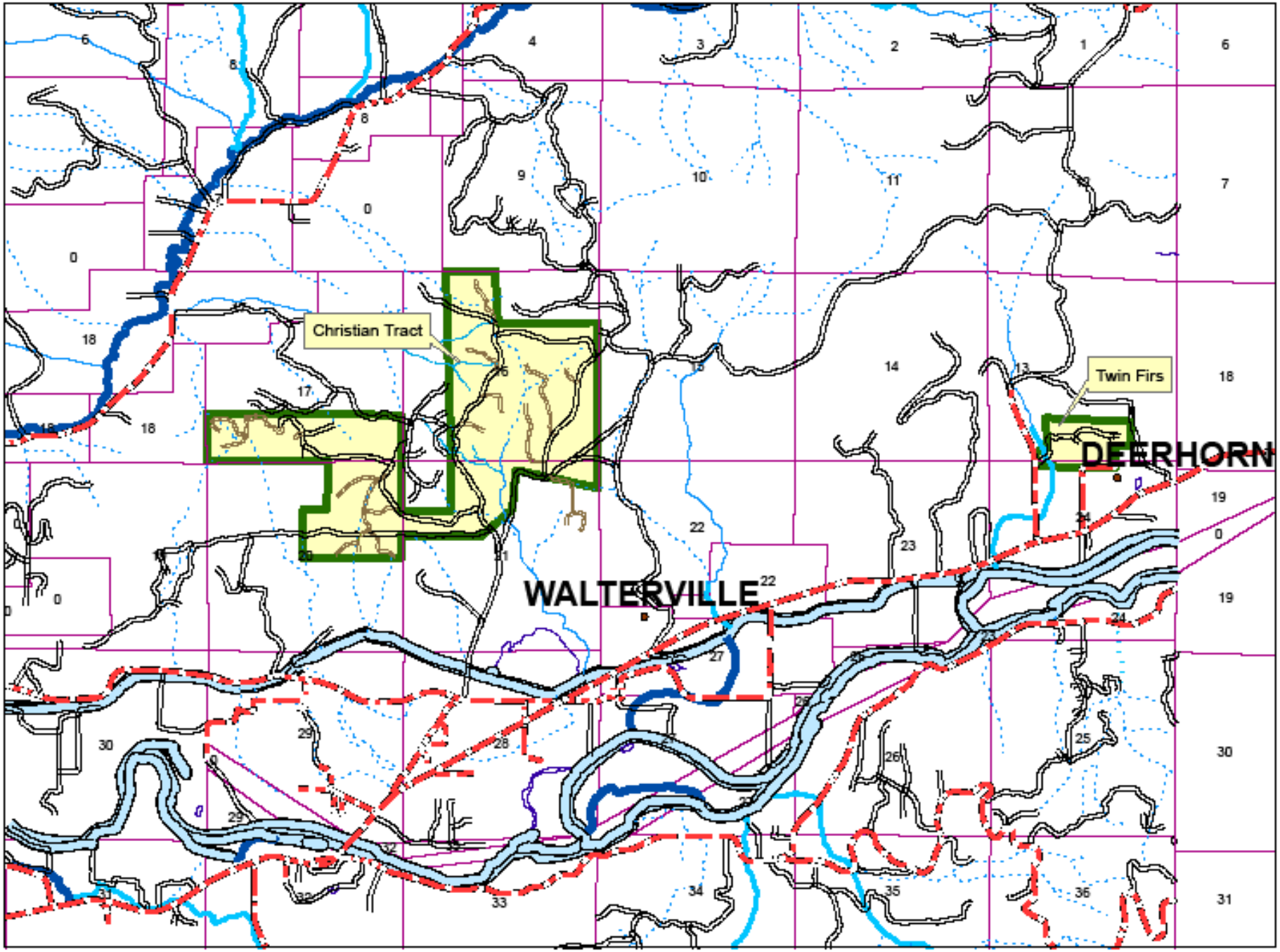
Christian Tract
Twin Firs
DEERHORN
WALTERVILLE