

Fall 2015

IDX | OP

IDX FALL 2015

PILOT PLANT AT PORT TOWNSEND

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NARA is led by Washington State University and supported by the Agriculture and Food Research Initiative Competitive Grant no. 2011-68005-30416 from the USDA National Institute of Food and Agriculture.



INTRODUCTION

NARA Goals



1. Sustainable Biojet



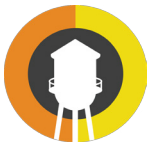
2. Value-added Polymer and Carbon Products from Lignin



3. Rural Economic Development



4. Regional Supply Chain Coalitions



5. Bioenergy Literacy



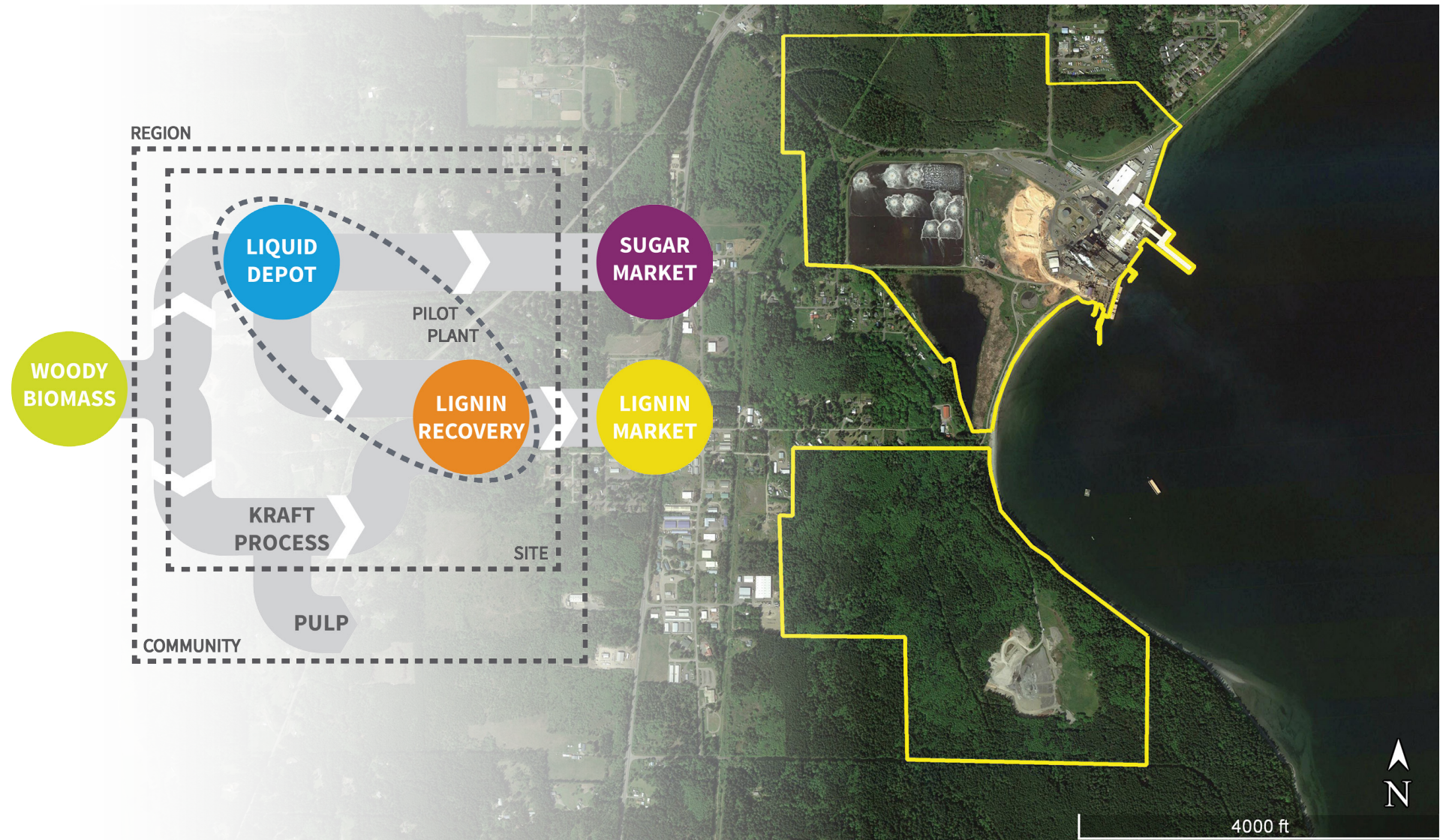
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IDX SUPPLY CHAIN ANALYSIS

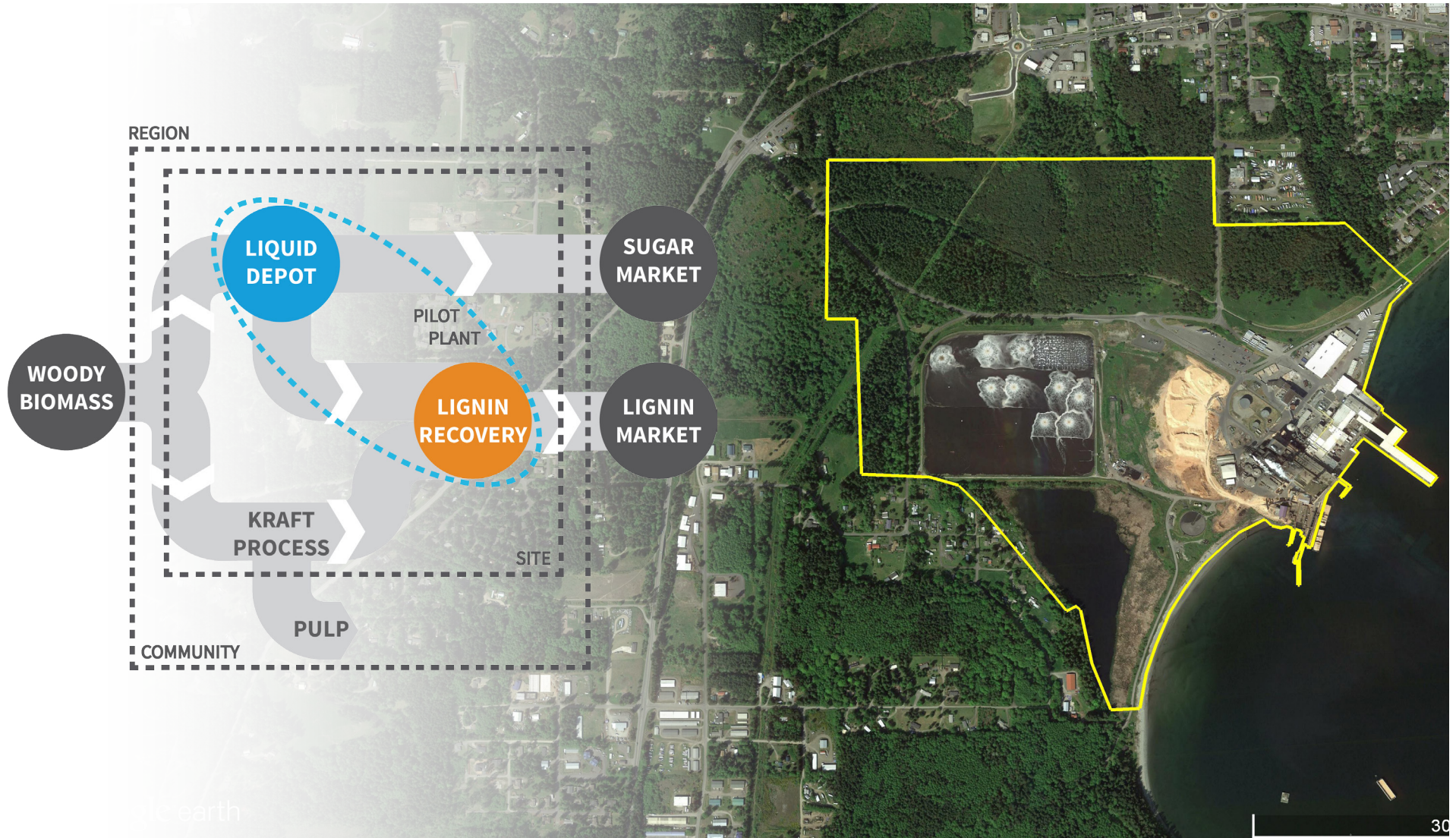


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LIQUIDS DEPOT



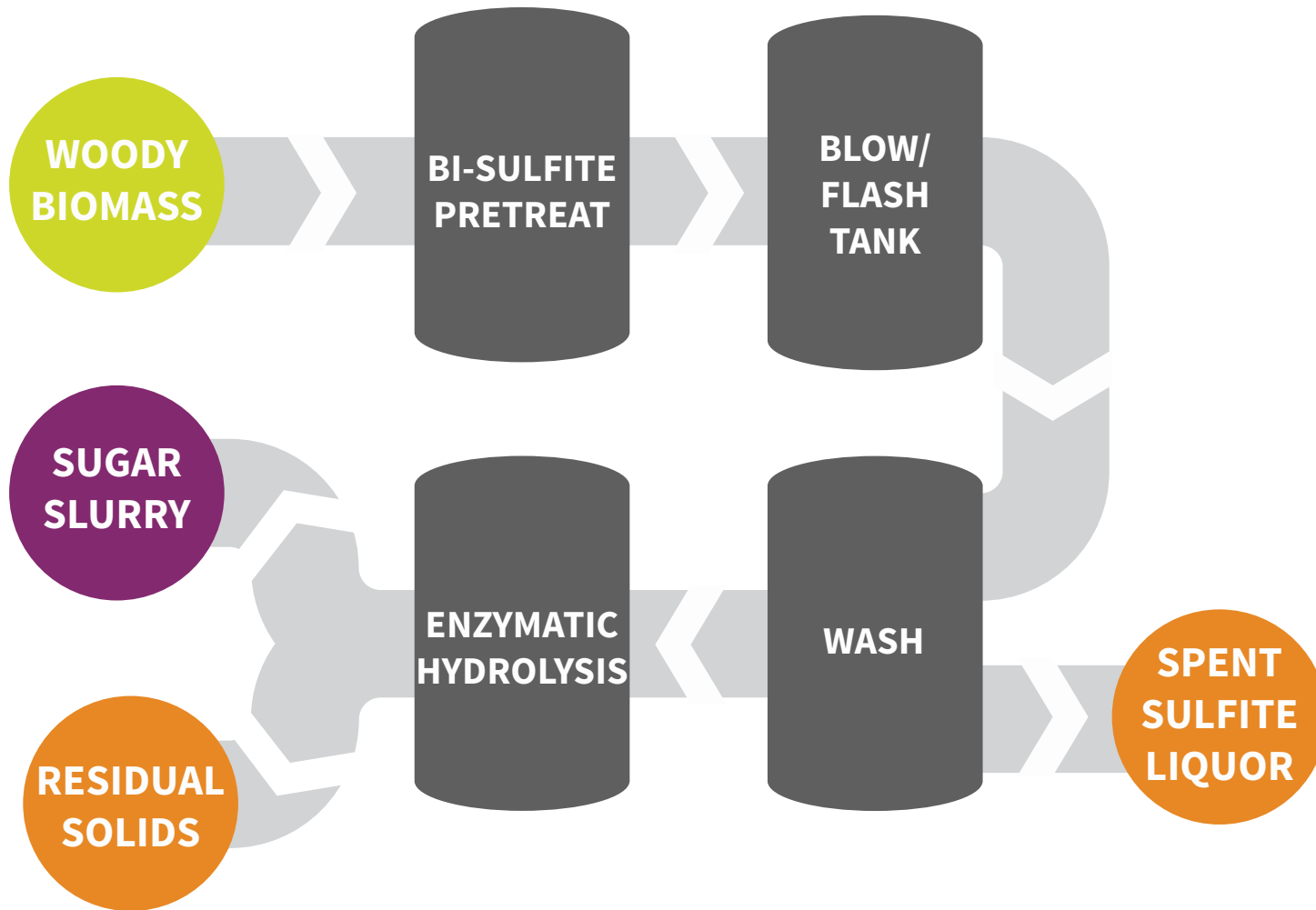
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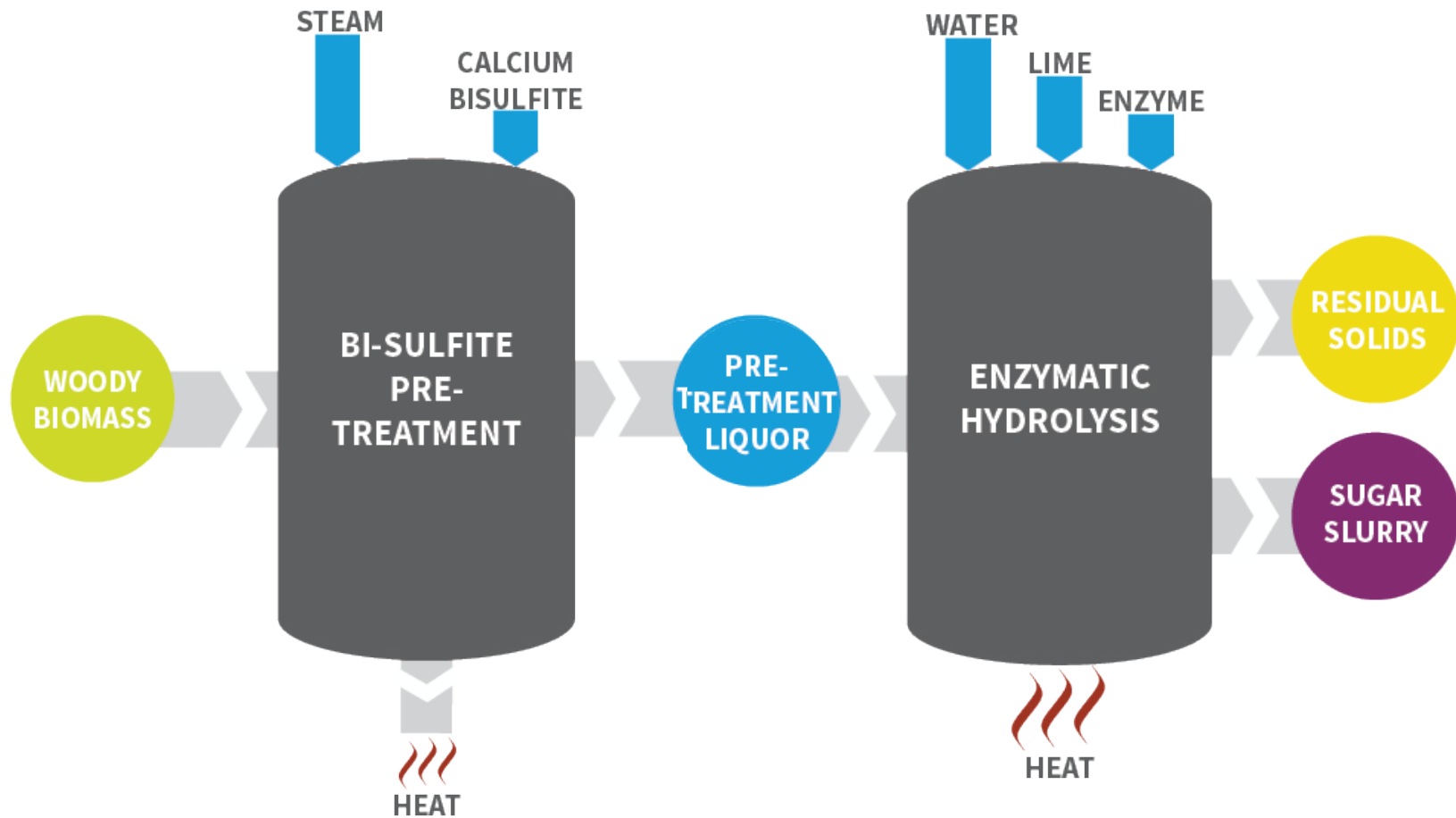
LIQUIDS DEPOT

FLOW CHART



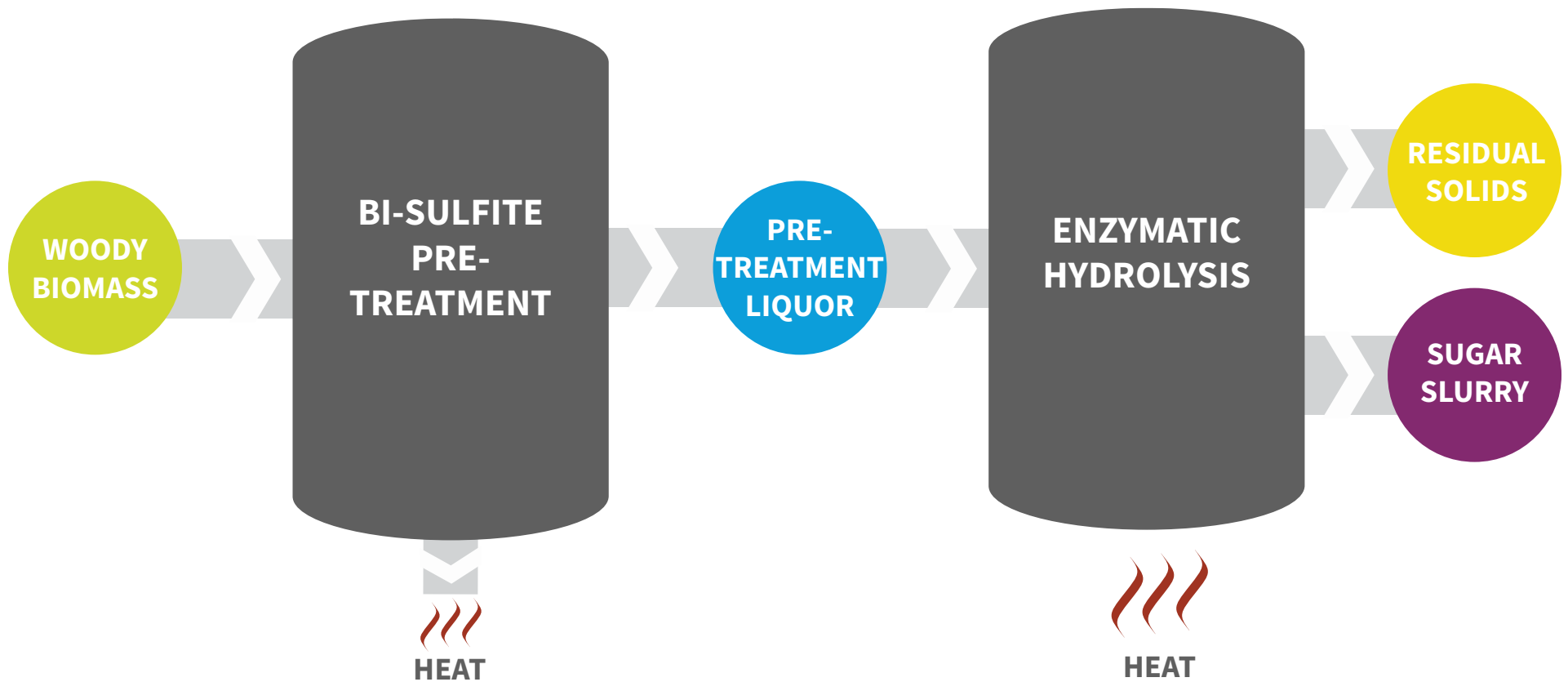
LIQUIDS DEPOT

FLOW CHART



LIQUIDS DEPOT

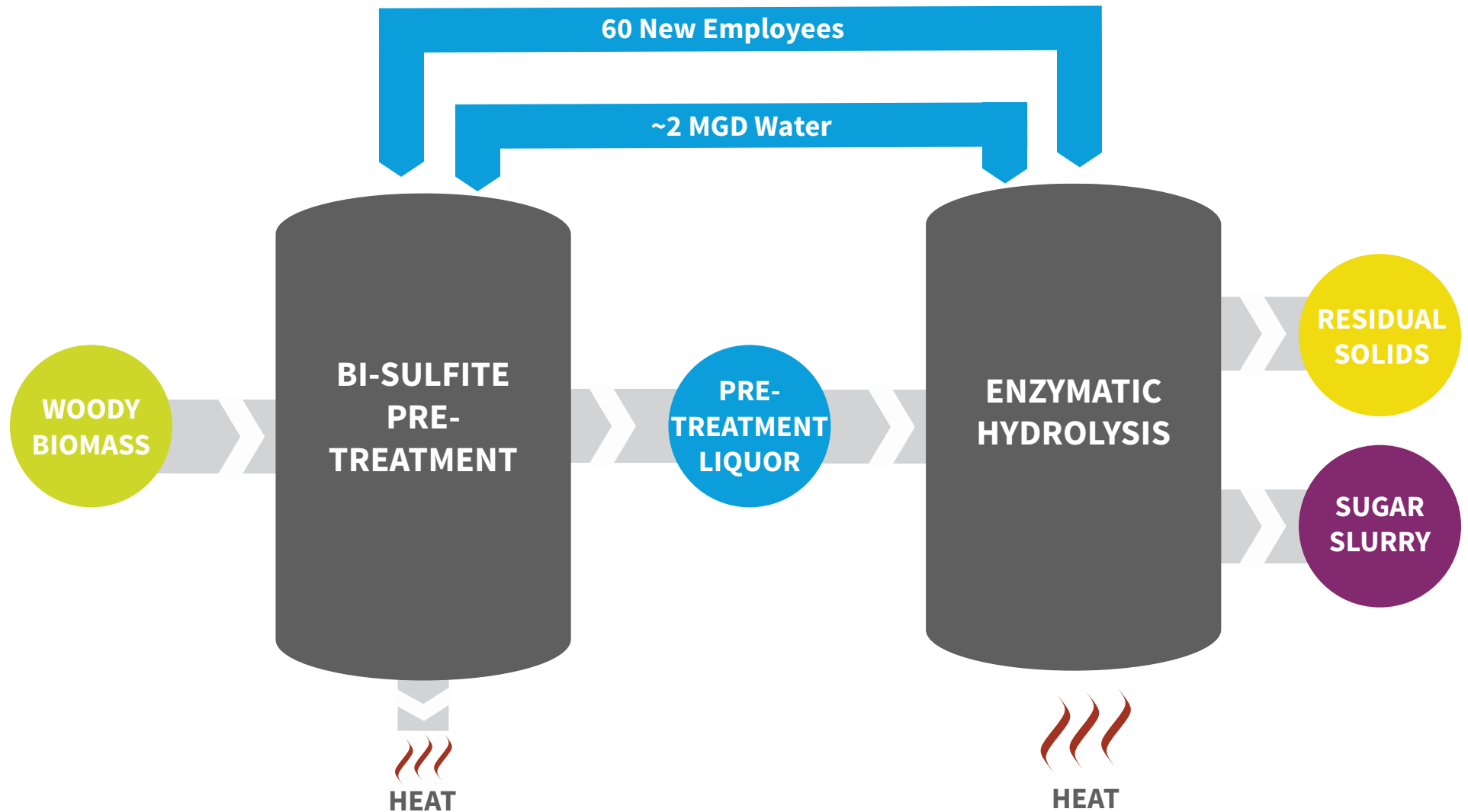
FLOW CHART



The diagram illustrates a two-stage process for woody biomass conversion. It begins with a yellow circle labeled "WOODY BIOMASS" on the left. An arrow points from this circle to a large grey vertical cylinder labeled "BI-SULFITE PRE-TREATMENT". Below this cylinder is a red flame icon with the word "HEAT" underneath. A blue arrow labeled "~2 MGD Water" points from the top of the first cylinder to the top of a second large grey vertical cylinder labeled "ENZYMATIC HYDROLYSIS". An arrow points from the "BI-SULFITE PRE-TREATMENT" cylinder to a blue circle labeled "PRE-TREATMENT LIQUOR", which then has an arrow pointing to the "ENZYMATIC HYDROLYSIS" cylinder. Below the second cylinder is another red flame icon with the word "HEAT" underneath. Finally, two arrows point from the right side of the "ENZYMATIC HYDROLYSIS" cylinder to two circles: a yellow one labeled "RESIDUAL SOLIDS" and a purple one labeled "SUGAR SLURRY".

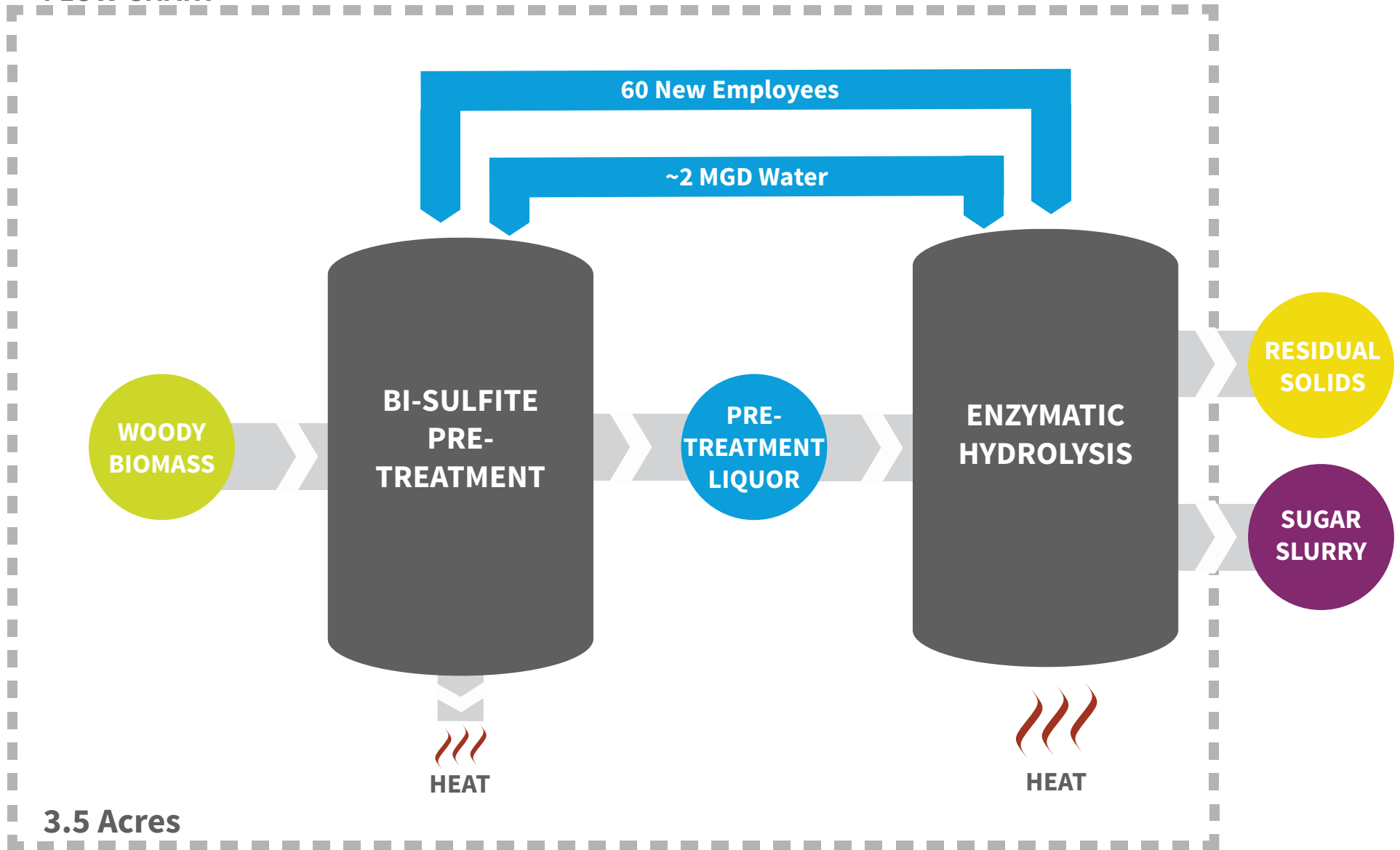
LIQUIDS DEPOT

FLOW CHART



LIQUIDS DEPOT

FLOW CHART



BIOMASS AVAILABILITY



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BIOMASS AVAILABILITY IN REGION

QUANTITIES NEEDED

Existing Hog Fuel Boiler ~ 120,000 BDT/yr

Liquids Depot > 100,000 BDT/yr

Total ~ 220,000 BDT/yr



<http://invertedsky.net/wp-content/uploads/2013/06/wm-0158.jpg>



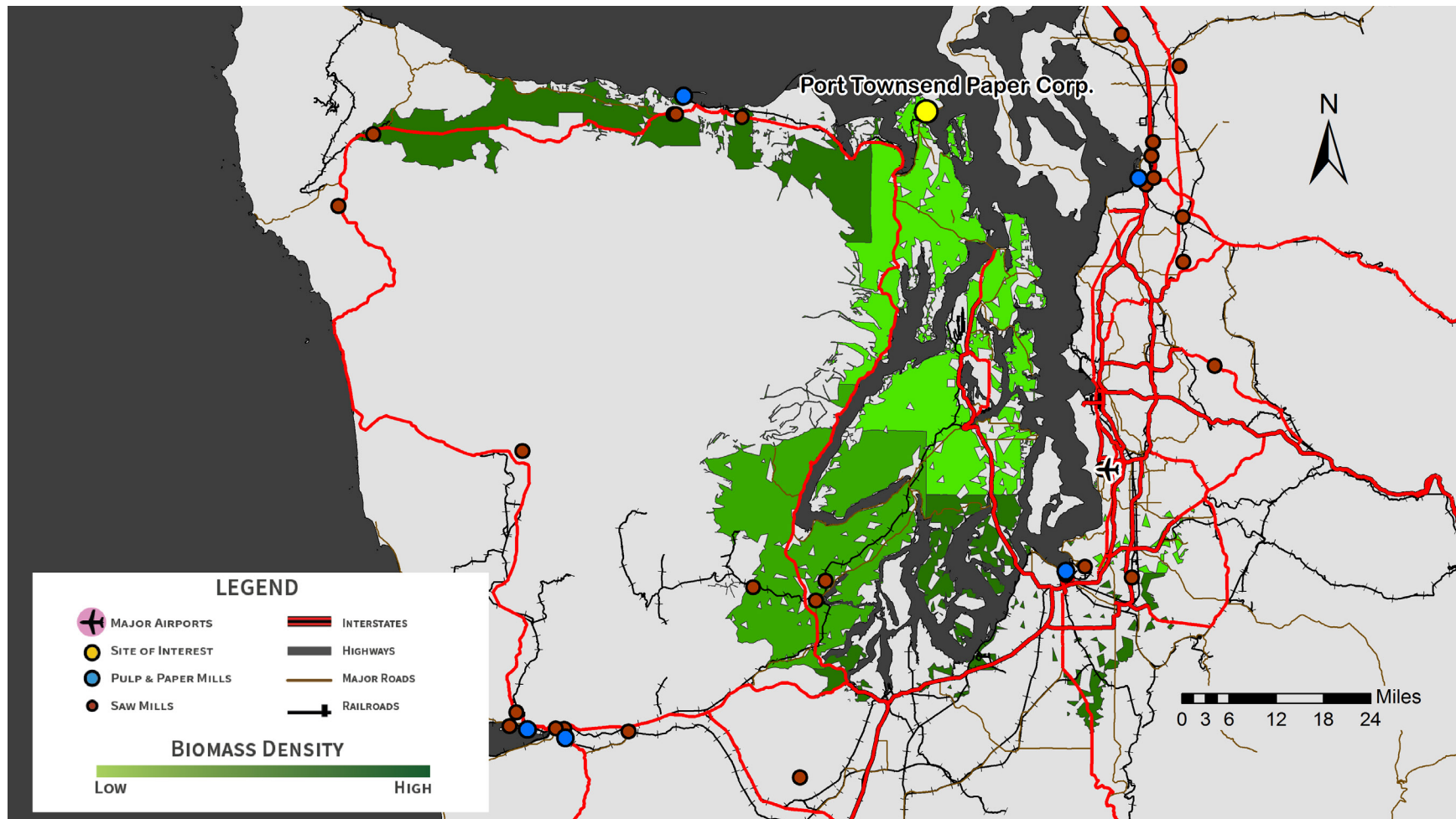
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BIOMASS AVAILABILITY IN REGION



BIOMASS AVAILABILITY IN REGION

METHODS AND ASSUMPTIONS

Methods

Quantities found using cost based network analyst tool in ArcGIS

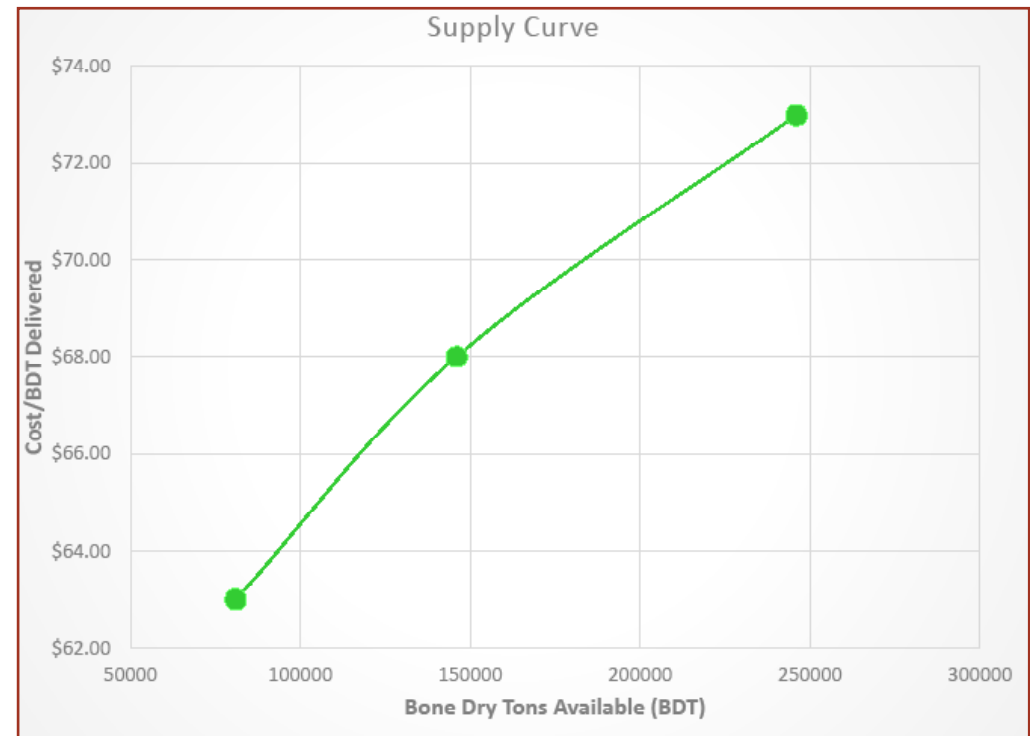
Assumptions

Fixed Costs

- Collection of residuals to landing \$15/BDT
- Grinding/loading of chips onto waiting truck \$21/BDT
- Truck wait time \$3.50/BDT

Total fixed cost \$39.50/BDT

Supply Curve for Port Townsend Paper Corporation



Network Analyst Created By Natalie Martinkus



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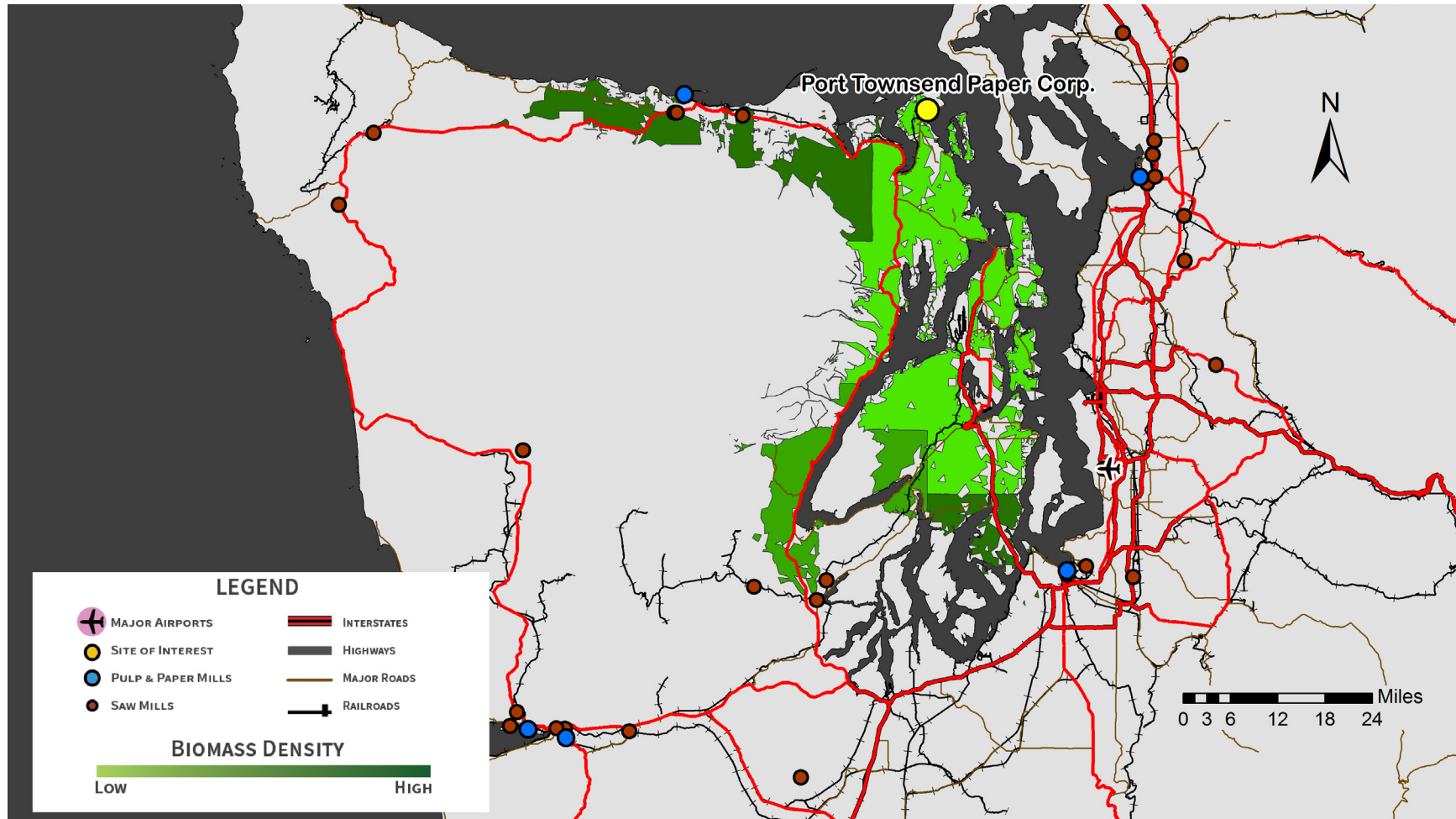
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BIOMASS AVAILABILITY IN REGION

AT COST OF UP TO \$63/BDT



81,000 Bone Dry Tons Available Yearly



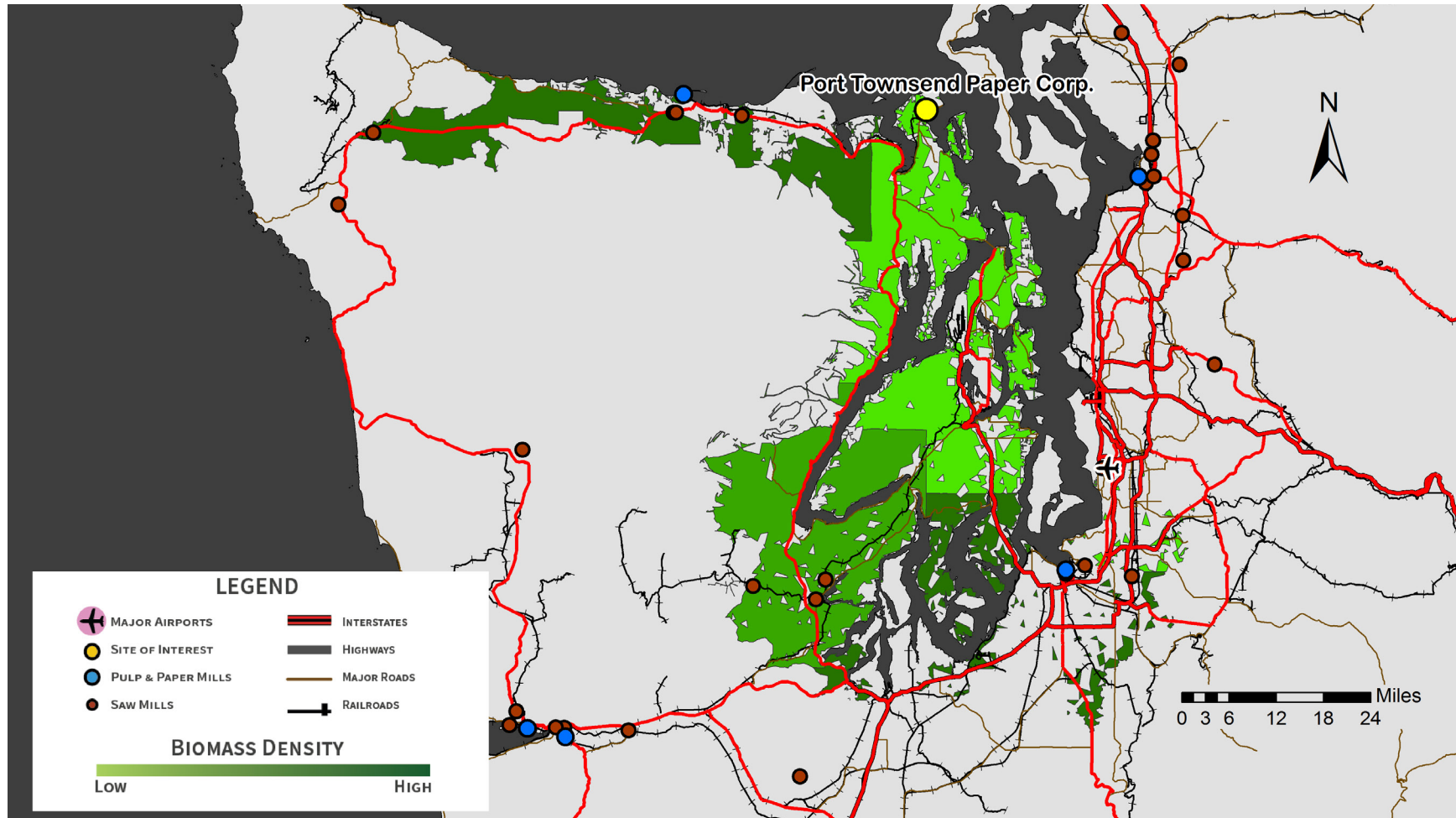
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BIOMASS AVAILABILITY IN REGION

AT COST OF UP TO \$68/BDT



146,000 Bone Dry Tons Available Yearly



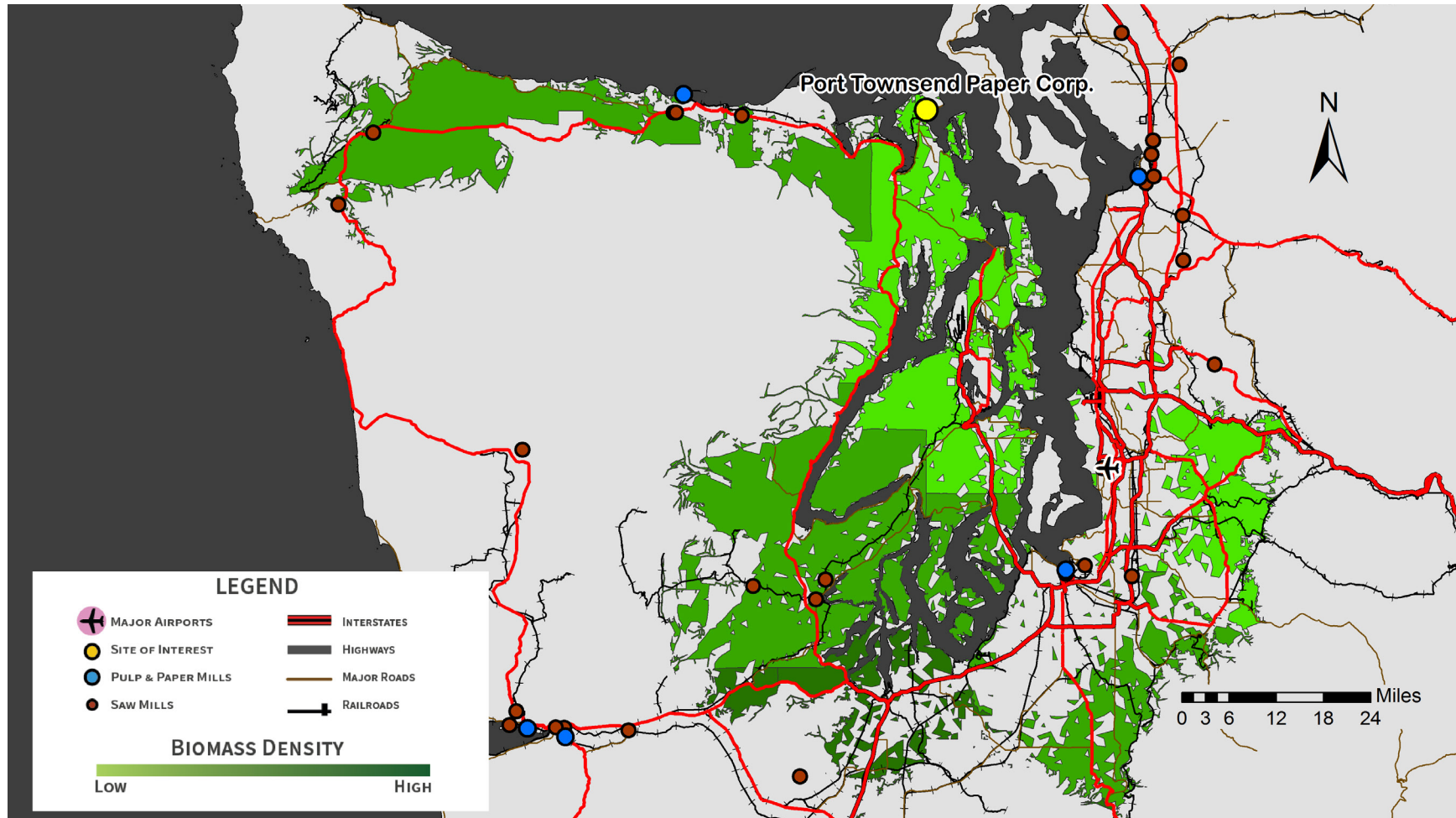
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BIOMASS AVAILABILITY IN REGION

AT COST OF UP TO \$73/BDT



246,000 Bone Dry Tons Available Yearly



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BIOMASS AVAILABILITY IN REGION

DATA OVERVIEW AND NEXT STEPS

Minimum target of 220,000 BDT/yr is likely met which is very encouraging

Only 14% of easily accessible biomass on the Olympic Peninsula is marketed

Research biomass data to more accurately estimate available quantities



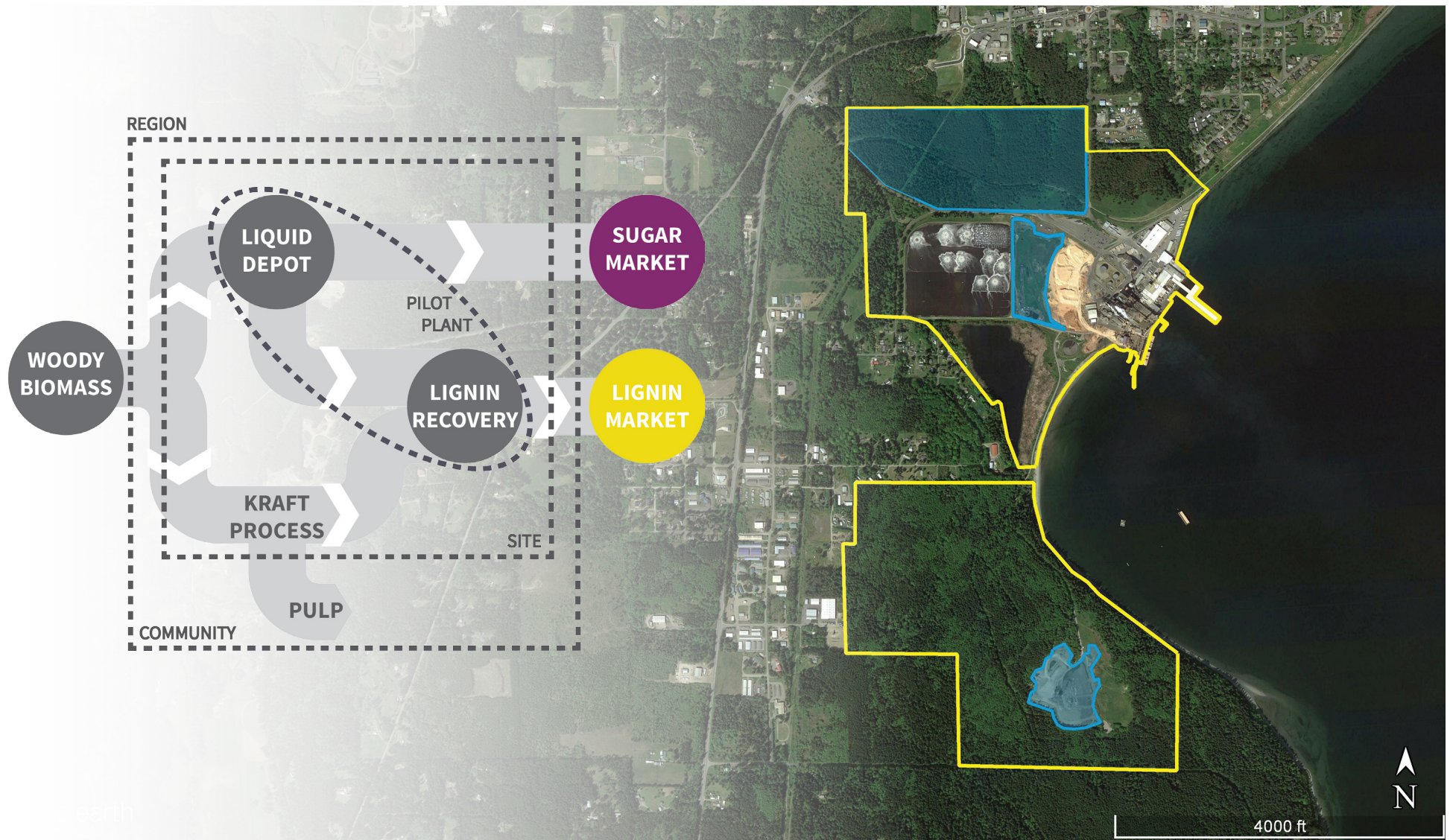
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SUGAR AND LIGNIN MARKETS



POTENTIAL MARKETS

SUGAR SLURRY

Sugar slurry is made from forest residuals

Overview-

Pilot Plant produces 4 BDT of glucose for every 100 BDT of biomass

Potential-

Isobutanol Producers

Livestock Feed

Substitute for wood molasses

Butanediol (BDO)

Market worth of \$9 Billion by 2019



<https://nararenewables.org/templates/hubbasic/images/press-kit/residuals/Forest-residuals-left-on-ground.jpg>

Marketsandmarkets. Application (THF, PBT, GBL, PU, and Others) - Global Trends & Forecasts to 2019. April 2015. <http://www.marketsandmarkets.com/Market-Reports/1-4-butanediol-market-685.html>



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POTENTIAL MARKETS

SUGAR SLURRY

Potential-

Isobutanol

NARA's main goal

Will be converted into jet fuel

Livestock Feed

Substitute for wood molasses

Cattle Ranches in WA

Butanediol (BDO)

Market worth of \$9 Billion by 2019

Bio-based alternative



<http://www.davidsons-vs.co.uk/cattle-1/blocks-3.html>

Marketsandmarkets. Application (THF, PBT, GBL, PU, and Others) - Global Trends & Forecasts to 2019. April 2015. <http://www.marketsandmarkets.com/Market-Reports/1-4-butanediol-market-685.html>



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POTENTIAL MARKETS

LIGNIN MARKET

Lignin is a co-product produced in our process

Overview-

- 50 Million tons of lignin is produced each year

- 2% of lignin is converted into products

- Typically used as a hog fuel in a boiler for energy

- Pilot plant outputs 40 BDT of lignin for every 100 BDT of biomass

Potential-

- Resins and Sealants

- Bio-plastics

- Activated Carbon



<http://www.wlumber.com/plywood/>



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PORT TOWNSEND PILOT PLANT IMPACT

An estimated 60 jobs created

The mill's average yearly salary is \$70,000

Average in Jefferson county: \$46,000

One half of the employees live in the city of
Port Townsend

Increased community tax revenue



http://www.ptleader.com/news/pt-paper-mill-sold-to-newly-created-crown-paper-group/article_57982090-b14f-11e4-834b-bfe9d4afa2e9.html



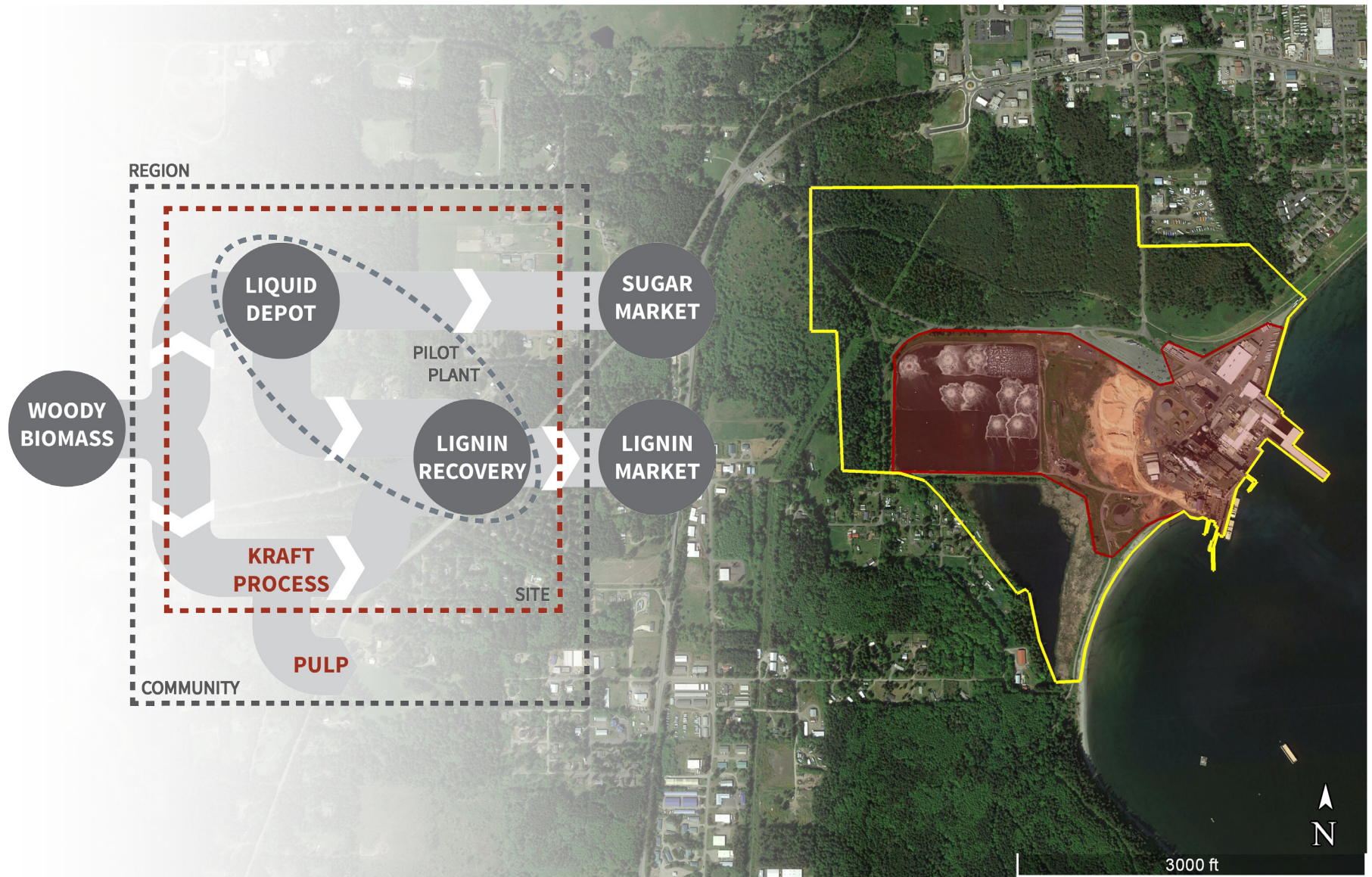
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EXISTING INFRASTRUCTURE



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PTPC SITE DETAILS



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PTPC SITE DETAILS

EXISTING INFRASTRUCTURE



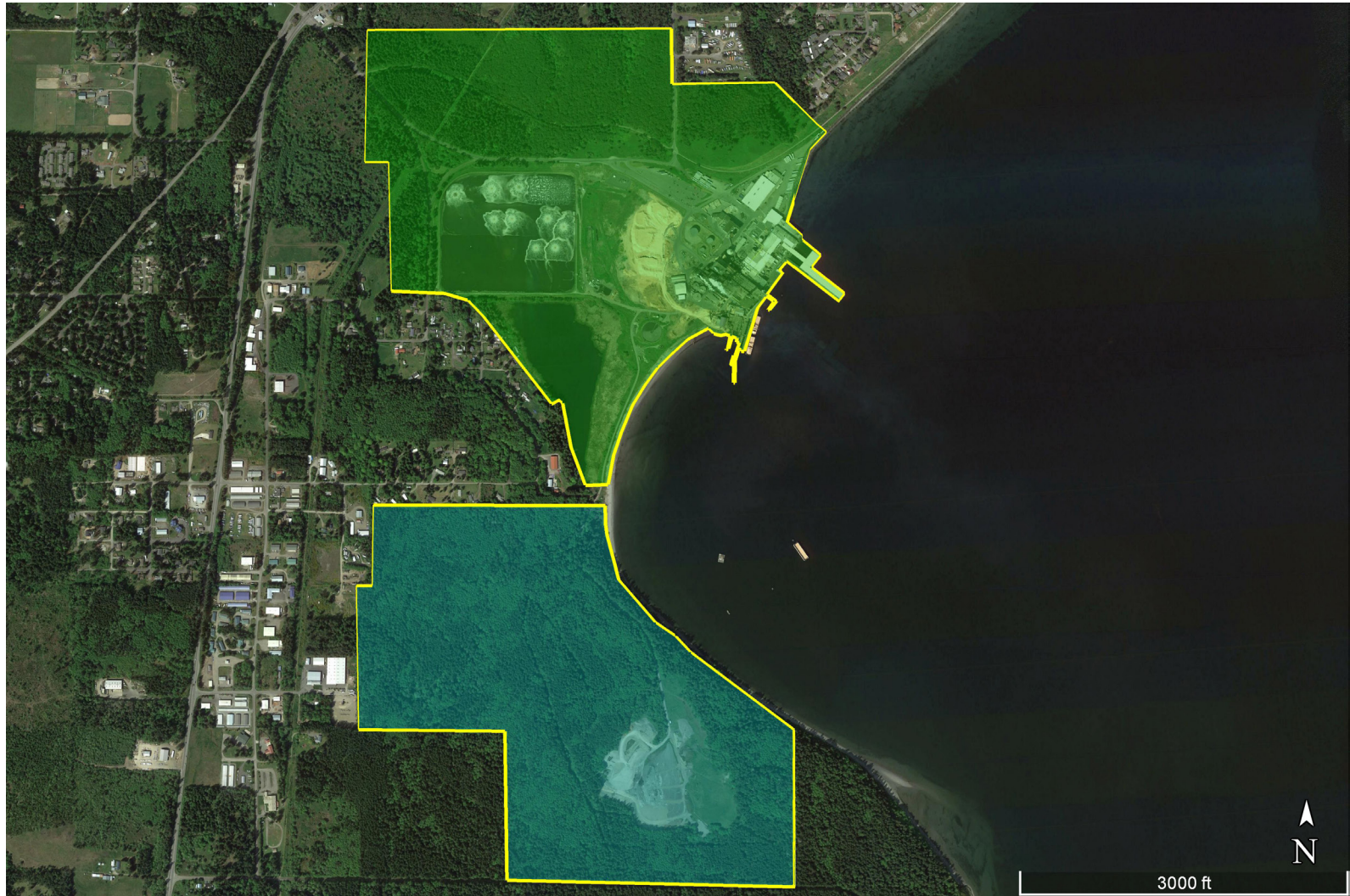
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PTPC SITE DETAILS

ZONING

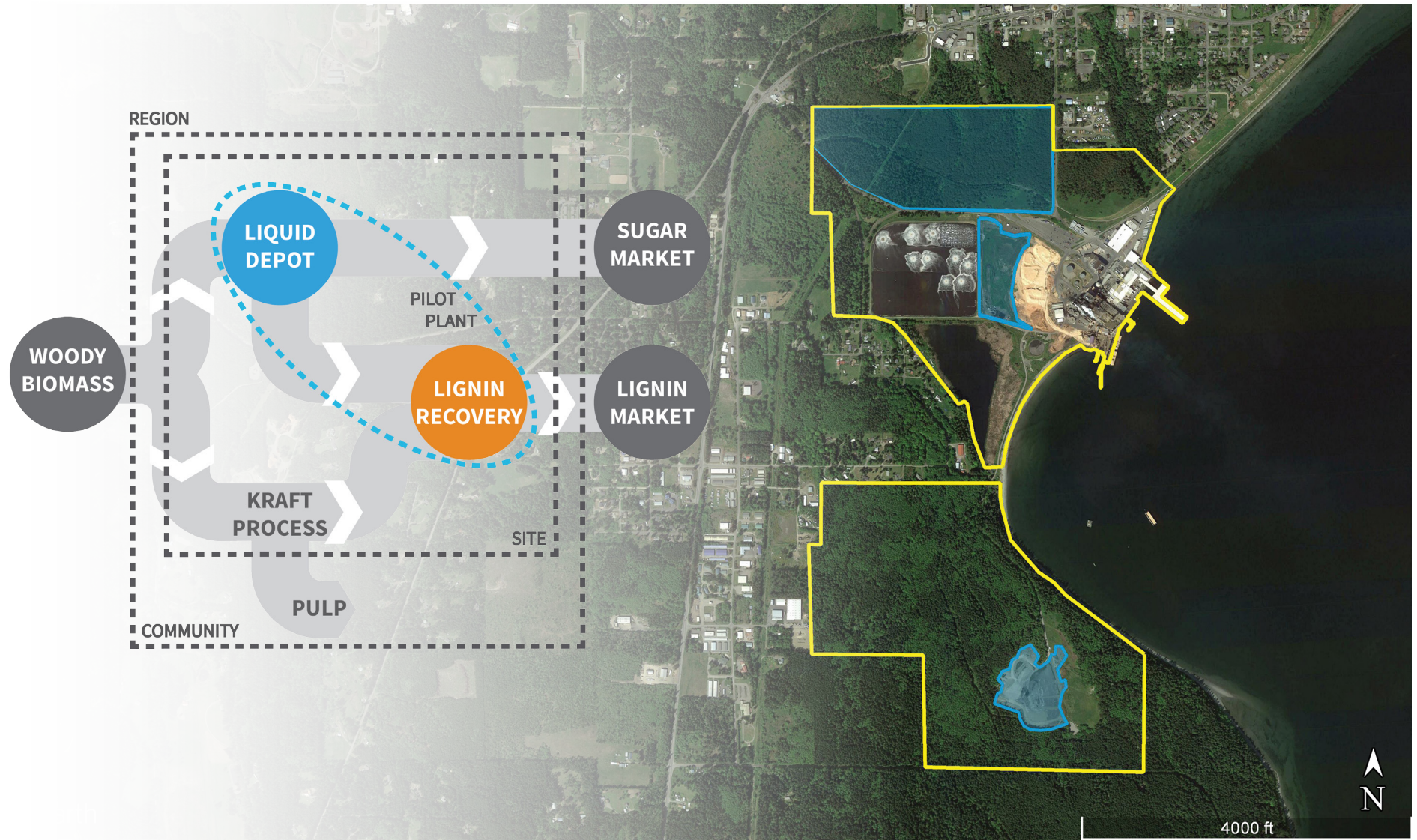


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POTENTIAL SITES



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PILOT PLANT SITING

POTENTIAL LOCATIONS







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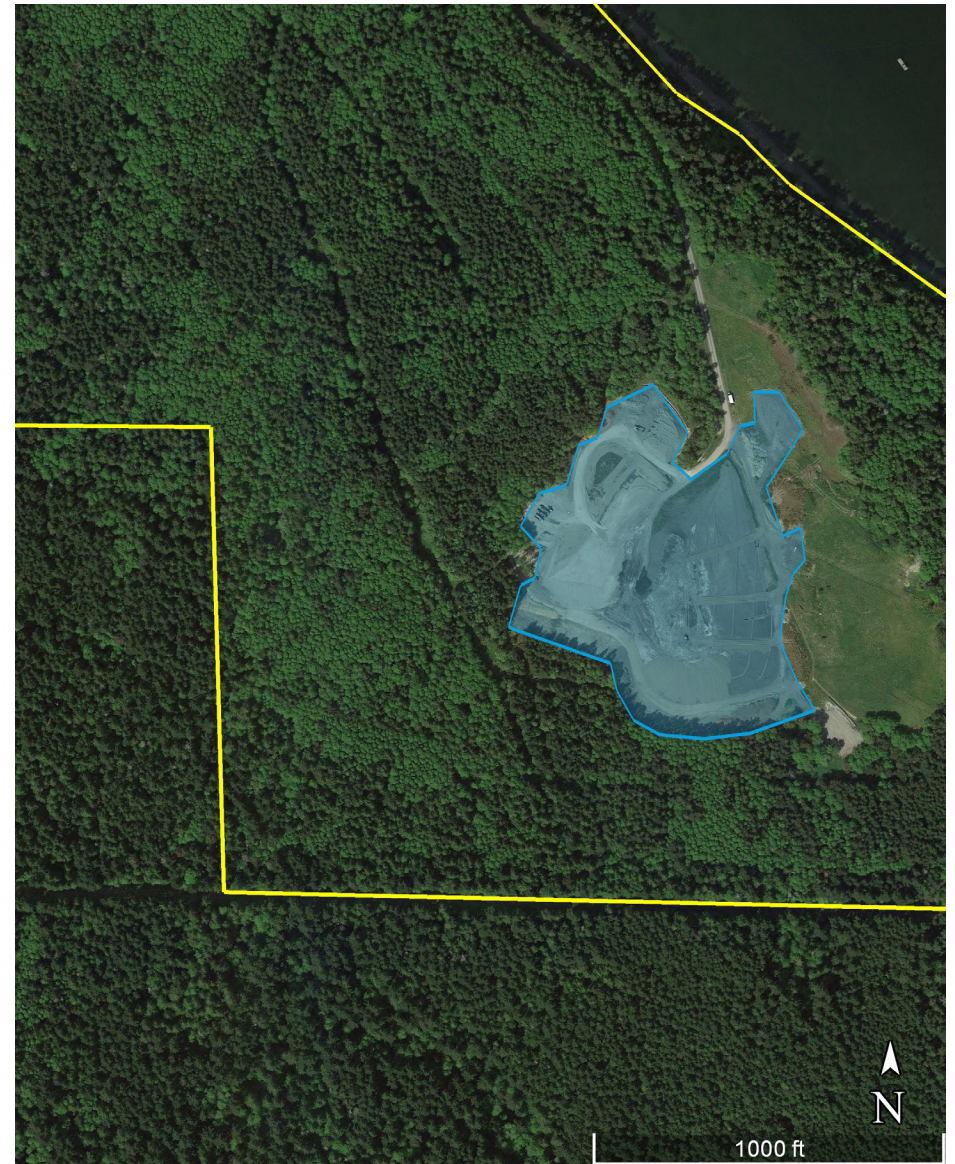
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PILOT PLANT SITING

SOUTHERN CLEARING

-  **Strengths**
 - Site is graded/prepared
 - Large (14 acres)
 - Out of the way of current mill operations
-  **Weaknesses**
 - Land is residential zoned
-  **Opportunities**
 - Not highly visible
-  **Threats**
 - Far from existing mill infrastructure



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PILOT PLANT SITING

NORTHERN PROPERTY

Strengths

Large (75 acres)

Land is zoned heavy industrial

Weaknesses

Land is potentially too steep

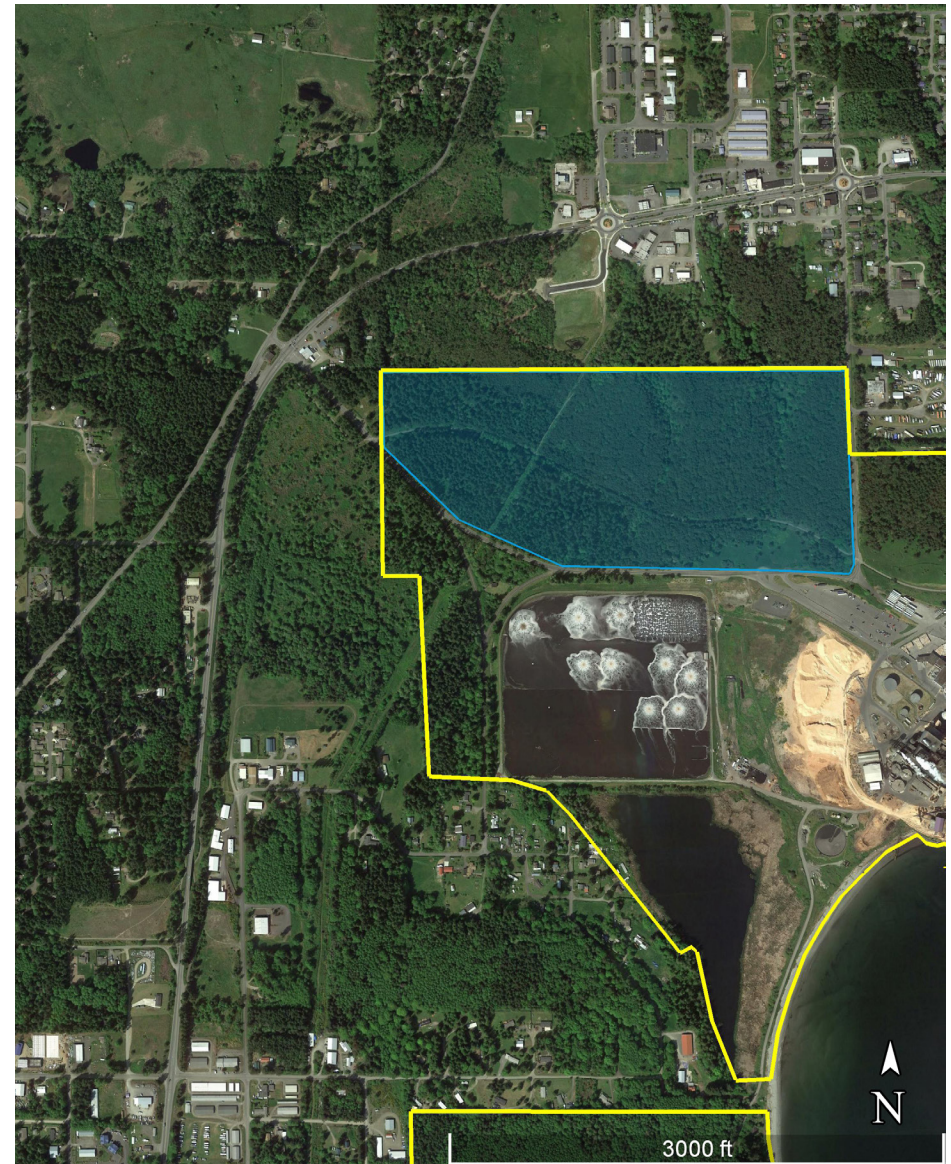
Opportunities

Close to existing facilities

Threats

Pacific Northwest/Larry Scott Trail runs through the site

May be visible to community



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PILOT PLANT SITING

WEST OF CHIPYARD

Strengths

- Large (12 acres)
- Land is zoned heavy industrial
- Land could easily be developed

Weaknesses

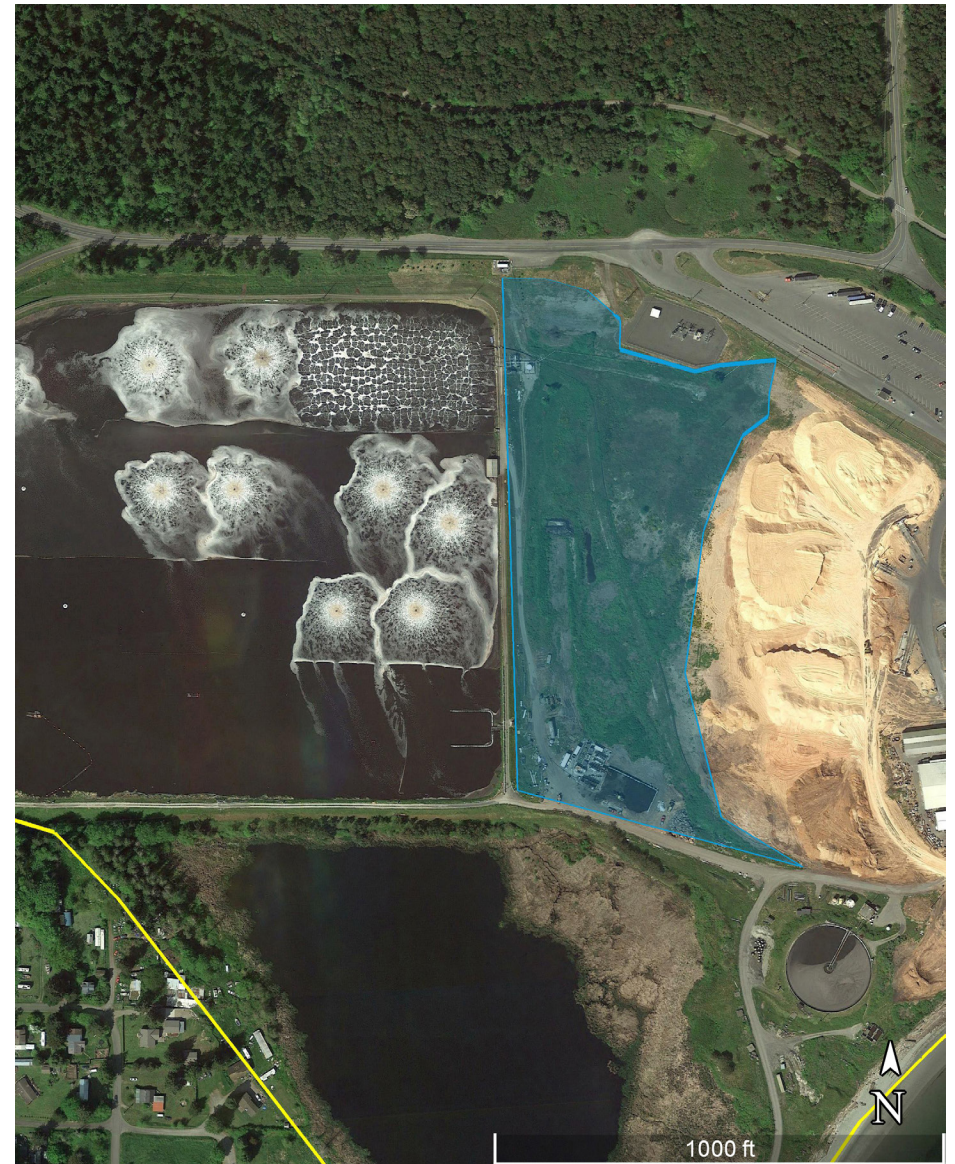
- May not be completely unused

Opportunities

- Proximity to chipyard and wastewater treatment is ideal

Threats

- Mill may have future plans for land



IDX SUPPLY CHAIN ANALYSIS

