



APPENDIX K:

ENERGY UTILITY ASSESSMENT AND PLANNING FOR BARLOW POINT

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Port of Longview
Energy Utilities Assessment
and Planning for Barlow Point

March 10, 2016

by
Douglas Bors, President, Sophometrics Inc.

Document Version

V1.4, 3/10/2016: Final Report.

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Change Log

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In 2010 the Port of Longview (Port) purchased the 275-acre property at Barlow Point for future Port industrial development. The Port acquired an additional 7.5 acres in 2012 bringing the site total to 282.5 acres. The property is located downstream of the current developed Port at approximately river mile 64 (RM 64), which is on the west side of the City of Longview, Washington (City). In order to better understand the full potential of the Barlow Point site, the Port determined that a comprehensive master planning process should occur. The first step in that process was to perform a due diligence study to assess the feasibility to develop the site into a marine terminal. A market analysis and conceptual site planning exercise were performed in late 2014 through early 2015 to identify possible types of use and site layouts. A decision was made to develop two main master-plan alternatives, each with space for three tenants. Two options resulted that focus on production and export of dry or liquid bulk commodities. Both options include industrial access for ships, trains, street trucks, and autos. Specific industry types were identified from the market analysis to be the basis to analyze demand and capacity requirements for Barlow Point. The dry bulk option (Option 1), includes potash (export only), urea (production and export), and wood pellets (export only). The liquid bulk option (Option 2), includes crude oil (export only), methanol (production and export), and biodiesel (production and export).

This report is written to assist a planning effort, which is presented as a series of discipline reports addressing feasibility, cost, and areas of concern for the Barlow Point property. Two potentially valuable issues are addressed herein, one being consideration of the use of a Bonneville Power Administration easement, and the other being the value of planning on-site manufacturing processes to avoid a New Large Single Load electrical service designation for one or more tenants.

Existing Conditions

The existing site is considered a Greenfield site located on the west side of the City approximately 8 miles west of I-5. The property is situated between State Route (SR) 432 to the north and the Columbia River to the south and is comprised of undeveloped farmland, with a sparse patch of trees. A levee, which is part of the greater City of Longview flood control system, runs along the entire southern border separating the site from the river. The western boundary of the site abuts similarly undeveloped farmland. The majority of the northern boundary is a shared ditch with the Mt. Solo Landfill. The shared ditch meanders forming oxbows which creates an atypical property boundary. A Bonneville Power Administration (BPA) easement occupies the eastern boundary of the site, which borders existing industrial property.

The existing BPA transmission lines span above the easement and the easement includes four individual foundations supporting BPA towers, three of which are located on the property

There is no significant electrical service connection to the property. A small power service is connected to the Consolidated Diking District #1 (CDID #1) Reynolds lift station, just off the property to the east.

An existing natural gas service line is located in the right-of-way of Industrial Way. That line terminates east of the intersection with Memorial Park Drive.

Existing fiber-optic communication cable runs along state Highway 432 across the face of the property. This line extends to Willow Grove Road then to Barlow point Road adjacent to the Barlow Point property on the north side. CenturyLink, Comcast, and Cascade Networks, Inc., among others, have franchise rights (i.e., street right-of-way {ROW} rights) within the City of Longview.

Bonneville Power Administration Easement Description

A Bonneville Power Administration (BPA) easement describes a triangle on the east side of the Barlow Point property. The easement is 900 feet wide – the full width of the easement occurs near the south property line. The east property line and the west boundary of the easement describe a triangle approximately 1650 feet north to south. An electrical easement (20 feet wide) and a ditch easement (100 feet wide for CDID#1) adjoin the east edge of this triangle.

Within the easement area there is a right triangle approximately 1000 feet north to south and 600 feet east to west that is not likely to be required for BPA tower access.

The transmission line above this easement is the first span after crossing the river. Therefore, staging for cable placement could require a mid-span access point in addition to the 50-foot access clearance required at the tower bases. The most likely mid-span access for this section is not on the Barlow Point property. Regardless, the Port must verify any change of surface use with BPA.

Generally Allowed Uses

BPA publishes several guidelines describing the limitations of use for land under transmission lines. The guidelines improve safety and reliability while helping to reduce maintenance in the easement. Buildings and structures are not permitted. Vegetation is permitted, but trees are generally removed and tall-growing vegetation is not permitted to replace removals. In some cases, agricultural uses are allowed. Water is permitted. Surface water storage is permitted in special cases. Natural ponds and streams are common.

Guidelines are found at, <https://www.bpa.gov/news/pubs/GeneralPublications/lusi-Landowners-Guide-to-Compatible-Use-of-BPA-Rights-of-Way.pdf>.

Process for Defining Land Use

The BPA easement was identified as a possible location for stormwater or industrial water storage during potential development identified during the conceptual planning phase. Since increased water storage is a change of surface use, the investigation team is submitting an Application for Proposed Use of BPA Right-of-way (at the request for the Port).

The application will describe generic use of the BPA easement and, if granted, will allow coverage of a significant portion of the upper triangle with water storage. Once this is granted, planning can proceed with assurance that water storage is acceptable. Once the design progresses, a second application (including a vegetation plan) should be submitted to BPA. This will facilitate feedback related to vegetation maintenance.

Electric Power Procurement – Large Loads

Development Options for Barlow Point

Depending on the type of industrial tenant and service demand, electric power proposed for Barlow Point development options may fall into a New Large Single Load (NLSL) designation – that is, some development options may require an electric power service capacity greater than 10 average megawatts (aMW).

New Large Single Load service connections require involvement of Bonneville Power Administration (BPA), including a load study and approval for connection. This load study is performed by BPA to verify that existing transmission lines continue to operate within designed load limits.

Based on first-hand experience in their own Public Utility District (PUD), Cowlitz PUD has not experienced any cases where an electric service connection has been refused by BPA. However, the NLSL designation could shift the cost model for one or more utility customers (Port tenants). This report explores expected costs and does not anticipate any unusual development costs stemming from BPA; however, final verification of this report's finding is not available until the BPA load study is well underway.

Cowlitz PUD Schedule 62 (Direct Access Delivery Charge Transmission Voltage Delivery) identifies the NLSL rate and indicates that the power supply charge is specified in a Special Contract between the Customer and the District. The energy charge is determined in a block purchase made through Cowlitz PUD, or by market rates. Thus, electric energy for a NLSL is defined in Schedule 62 as a variable cost.

Other Barlow Point development options are supported by service connections smaller than 10 aMW. If a tenant defines a process that requires less than 10 aMW, then the electric service could fall under Schedule 8 (Large Commercial and Industrial Primary Voltage Delivery), or Schedule 9 (Large Commercial and Industrial Transmission Voltage Delivery) instead of Schedule 62. Both Schedule 8 and Schedule 9 provide fixed rate charges for energy consumption.

Most Likely Electric Service Arrangement

Cowlitz PUD has not completed a service study or engineering for a potential connection at the Barlow Point property. However, initial conversations with Cowlitz PUD suggest that a service connection to the property will involve a new transmission-level line starting at the Mint Farm Substation on Memorial Park Drive. This requires about 2 miles of transmission line, potentially installed along Memorial Park Drive and/or 38th Avenue, and along Industrial Way (SR 432) to the site. See Figure 1. This arrangement is presently the least cost option for providing service for the load capacities identified in this report.

The Mint Farm Substation was rebuilt in 2007 and has space for new equipment and for a new circuit connection, so this substation poses no significant challenges for the new connection.

An electric power service for the property at Barlow Point is likely to consist of one transmission-level, overhead line, connected to a sub-station on site. The on-site sub-station will likely house primary protection equipment, a transformer, secondary distribution-level switches, and several

meter sections. The rough area required for the substation is one acre and it should be located near the site service entrance, adjacent to SR 432. See Figure 1.

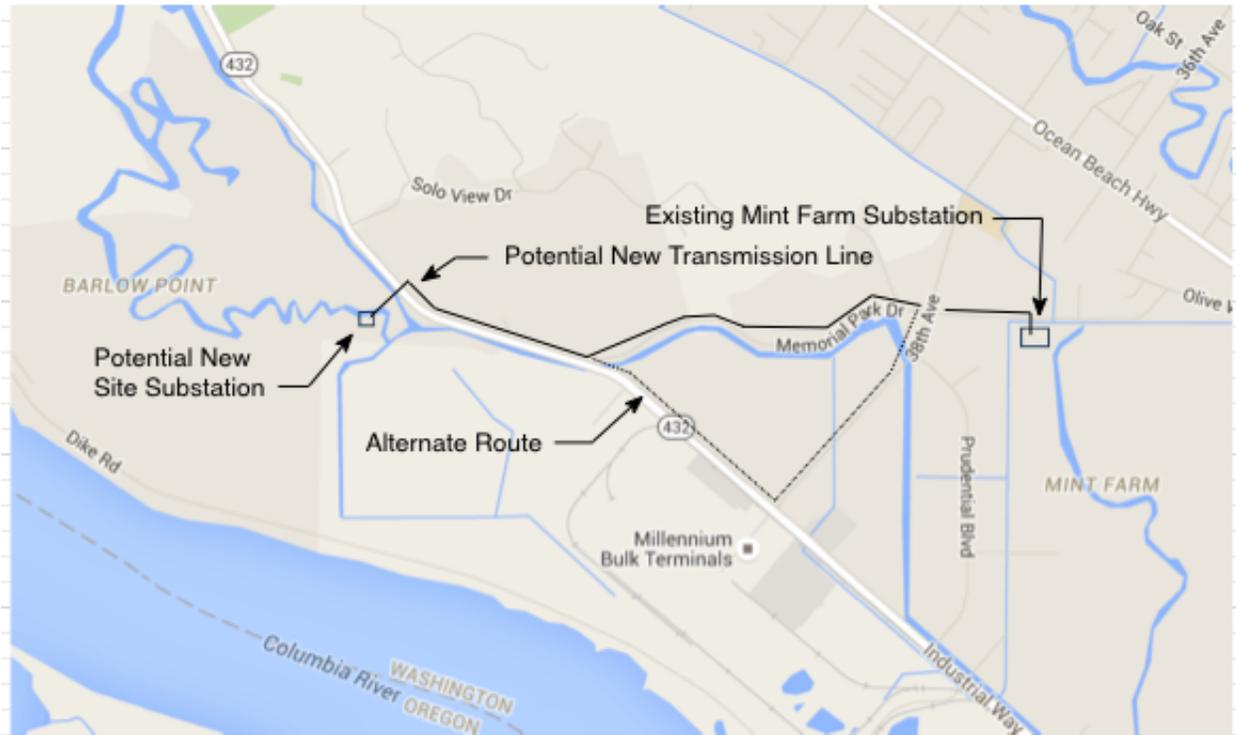


Figure 1. Route for Potential New Transmission Line for Most Likely Service Connection

Potential Redundant Electric Service Connection

A potential redundant electric service connection is available through Cowlitz PUD. A redundant service connection consists of a redundant service switching system located at the potential new site substation, an added route for a redundant transmission circuit, and connection at an alternate substation. The added route includes a transmission circuit along SR 432, heading west from the site, extending along Mt. Solo Road, heading north from the intersection. The alternate substation would be Bakers Corner Substation. See Figure 2.

Bakers Corner Substation would require expansion, including acquiring an adjacent property, and adding a switch section to connect to the potential new transmission circuit.

This report does not recommend for or against the implementation of a redundant service connection. Additional engineering effort is required to define the balance of advantages with cost. Specifically, a reliability analysis is required to establish probable improvements stemming from adding the possible redundant circuit route. The reliability analysis would help identify the decrease in unplanned power outages at the site. A utility maintenance plan analysis is required to establish how the number and timing of planned outages could be reduced at the site. After a maintenance plan is analyzed, each prospective tenant must evaluate the advantages of improved reliability and increased operating time. Finally, that value can be compared to the installation cost of the

redundant service connection. Since this engineering effort depends on the specific requirements of each prospective plant, it cannot be completed until a prospective tenant is planning their facilities.

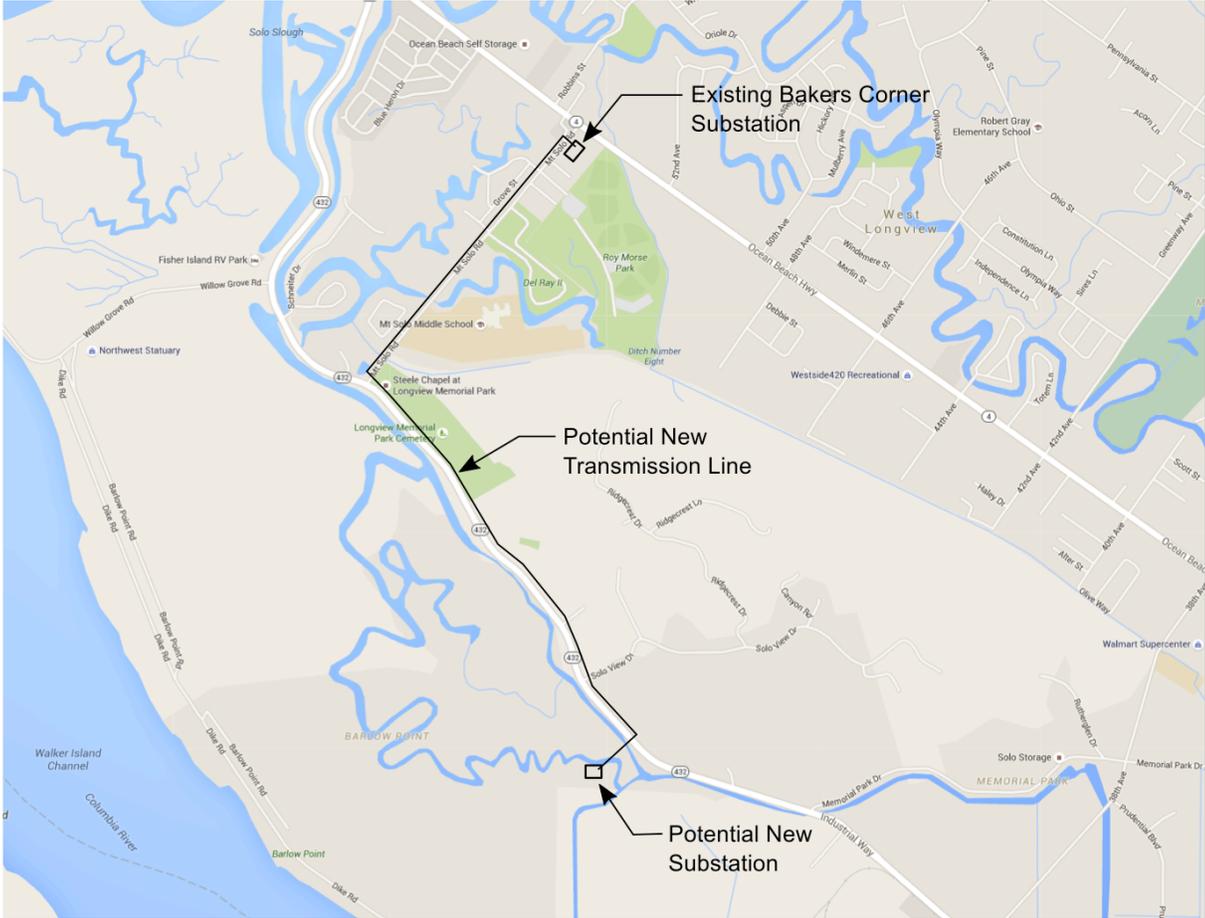


Figure 2. Route for Potential New Transmission Line for a Redundant Service Connection

Power Service Development Schedule

After one or more tenants are identified for the property, they must make a preliminary determination of process loads. The time required for a tenant to plan process loads precedes the schedule periods below:

- (1) BPA load study, 9 - 14 months
- (2) Cowlitz PUD utility engineering, 12 months (follows item 1)
- (3) Site substation engineering, 8 months (can begin during item 2)
- (4) Transmission line build off-site, 12 – 14 months (follows item 2)
- (5) Site substation and transformer procurement, 18 months (follows item 3)

The port should be involved with Cowlitz PUD to define an appropriate planning approach to prepare for additional tenants after the first tenant requests electric service.

The schedule above requires at least 26 months after a tenant determines it requires less than 10 aMW; or about 40 months after a tenant determines it requires greater than 10 aMW. If a tenant determines that a redundant route is desired, then 4 months must be added to each of the schedules above.

Case Studies Used to Estimate Lower Electrical Load Levels

The investigation team used electrical power numbers provided by manufacturers via the Port to establish high power utilization estimates. The team used a series of case studies describing proposed process plants to establish the low power estimates. The reference case studies generally discussed cases where reducing electrical energy use was the focus of the study.

The wide range of proposed electric loads suggests that plant electrical utilization intensity differs significantly among processes, that is, for the same product. The total electrical energy use is small compared to the stock materials, and small compared to the thermal energy available in natural gas (used as a stock material in several site development options). The value of variations in the effective use of chemical stock can outweigh the savings of alternatives designed to use less electrical energy. Thus, it may not be appropriate to expect each tenant to reach the same conclusion as the case studies regarding electric energy and material tradeoffs.

There were several case studies and papers reviewed. Two strong examples are listed here:

- A Process model to estimate biodiesel production costs, by Michael J. Haas, Andrew J. McAloon, Winnie C. Yee, Thomas A. Foglia, 17 March 2005.
- Haldor Topside Case Study presentation on alternate schemes for ammonia and urea production (presentation slide deck).

Electrical Power Requirements (Summary of High & Low Estimates)

The table below lists expected loads and preliminary utility planning loads:

Electrical Load Summary	8/7/15	
	Low Estimate	High Estimate
Description	(MW)	(MW)
<u>Option 1 Dry Bulk scenario</u>		
Urea Plant	10	30
Urea Conveyors	0.2	0.2
Urea Office	0.14	0.14
Potash load / unload	0.75	0.75
Potash offices	0.08	0.08
Wood Chips load / unload	0.75	0.75
Wood Chips offices	0.06	0.06
Site Lighting	1.6	3.2
Shore Power	1.2	1.2

Lift Stations and Water Treatment	1.25	1.25
Rail Signaling	0.3	0.3
Total of estimated loads:	16.33	37.93

Option 2 Liquid Bulk scenario

Crude Oil load / unload	1.5	1.5
Crude Oil offices (& biodiesel)	0.5	0.5
Biodiesel Plant	2.8	15
Methanol Plant	4.2	20
Methanol offices	0.28	0.28
Methanol load / unload	1.2	1.2
Site Lighting	1.6	3.2
Shore Power	1.5	1.5
Lift Stations and Water Treatment	1.25	1.25
Rail Signaling	0.3	0.3
Total of estimated loads:	15.13	44.73

	Low Estimate (MW)	High Estimate (MW)
Dry: demand (MW)	14	36
Dry: average (aMW)	12.5	30
Liquid: demand (MW)	13	42
Liquid: average (aMW)	7	21
Planning Capacity	20	50

The demand load (for both dry and liquid schemes) is the estimated one-hour demand for electric power for the entire terminal. The average load (aMW) is the expected average operating load for a 360 day/year, 24-hour operation of each plant.

High and low electric power estimates represent the extremes in variation of a series of plant design tradeoffs. The extremes were established by reviewing existing plant loads plus case studies for electrical energy savings (noted above). For example, slower processing in larger tanks might result in lower electric energy use. These tradeoffs are not appropriate for every manufacturer, depending on established practices. It will be up to each tenant to define the actual energy consumption requirements. The high and low estimates are presented here to reinforce a planning directive. If electric energy use is optimized, it is very likely that all individual tenant loads will fall below the NLSL threshold. If traditional plants are constructed, then one or two individual tenant loads in each scheme are likely to fall above the NLSL threshold.

Therefore, this report recommends that the Port invite prospective tenants to balance energy use and plant design early during each tenant's site-specific design process.

The "planning capacity" (above) is established to simplify early discussions with the power utility. In this case, the difference in the cost of an electric service connection serving a 20 MW capacity or a 50 MW capacity is small. Both connections utilize about the same utility switching, the same transmission line along the roadway, and require the same substation area on site. However, the difference in the development schedule and the cost of energy could be significant. Where a total planning capacity of 20 MW is shown serving multiple tenants, then it is likely that each connection falls below the NLSL threshold, but at the 50 MW capacity, it is likely that one or more connections will fall above the NLSL threshold.

Shore Power

Shore power is currently a relatively low probability option for bulk vessels; and it is assumed such vessels equipped with shore power connections, will most likely be implemented one or two decades from now.

However, should the Port choose to support shore power at any future Barlow Point terminal, the additional loads would not require an electric service change, as loads for the proposed capacity bulk vessels runs between 400 and 500 kW each (for export / loading). This is a total connected load of 1.2 to 1.5 MW and will not change the utility circuit. Therefore, the investment would be in transformers (and frequency changers in the worst case) to establish the shipside connection voltage, plus safety switching and cabling to the dockside.

The investigation team recommends furnishing a pathway for cables (i.e., spare conduit) and a place for dockside transformers in the event shore power is implemented later.

Energy Efficiency Program

Cowlitz PUD provides an energy efficiency program that supports engineering and selective rebates for industrial applications. That program is initiated early in the design phase, after a tenant is identified. A tenant's design engineer should contact Cowlitz PUD directly.

Natural Gas Utilization for Process Applications

Several of the industrial processes identified in the market evaluation require a natural gas feedstock line to supply product for the production of bulk commodities. The scope of this report will be limited to natural gas for use in typical building applications. See the Civil Utilities report in Appendix J and the Environmental and Other Considerations report in Appendix D of the main report for further details.

Natural Gas Utilization for Building Applications

The investigation team reviewed the use of natural gas for building heating loads for occupied spaces. The loads involved are relatively small, serving between 25,000 and 75,000 square feet of occupied space. The range of floor space is based on Sophometrics' estimate of administrative buildings and spaces, plus an allowance for process control centers, described in the development options (see the Conceptual Planning report in Appendix B of the main report).

An option to furnish heating by using natural gas requires a new gas line, separate from the gas feedstock line, sized to serve administrative facilities, and operated at a lower pressure than feedstock. The cost of furnishing a direct-buried, unprotected natural gas line for the administrative facilities on the site is about \$75,000 not including off-site upgrades. Note that the separate line for administrative facilities might connect with the main gas line off-site on Industrial Way, or on site where the line enters the Barlow Point property. Thus, the cost of a separate line might be greater than \$75,000. On the other hand, the gas company will fund a portion of the gas service cost, based on the expected revenue as identified in Rule 8 submitted by Cascade Natural Gas Corporation to the Washington Utilities and Transportation Commission, so the installation cost charged to the Port will be somewhat less than \$75,000.

An option to furnish energy effective heating and cooling by using heat pumps implies an increase in cost for HVAC equipment (compared to standard HVAC equipment using gas heat) of a few thousand dollars (roughly between \$20,000 and \$50,000). This is a lower cost than the gas heating option, results in a simpler site infrastructure, and provides a more energy efficient system. Therefore, the investigation team is recommending against the use of natural gas for building heating applications at Barlow Point

Another option to furnish heating involves utilizing waste heat from one of the plants. The investigation team did not attempt to analyze this option because there are too many dependencies, including the nature of heat generation at tenant production facilities.

A natural gas line runs along Industrial Way, accessible just west of the intersection with Memorial Drive (reference the Civil Utilities report in Appendix J). The cost of extending this line to the property along WA 432 is significant. This report does not address the ROW work since this work relates to gas company infrastructure.

Power Generation

This report addresses potentially large process loads, including both large electrical loads and a significant natural gas supply. Often, this circumstance invites industrial- or utility-scale cogeneration investment. Thus, it could be appropriate to consider the implementation of one or more cogeneration or site-generation systems at Barlow Point.

It is common to investigate power generation options due to an overall energy efficiency advantage related to power generation and plant processes that might benefit from on-site heat transfer. For example, it is difficult to obtain electricity with a fuel efficiency above 60% at a stand-alone power plant, but, it is common for a cogeneration facility to utilize a fuel source at better than 80% efficiency (where the waste heat serves a purpose).

Sophometrics feels that the potential of two power generation options, cogeneration and on-site power generation, are sufficient reason to consider the technologies, but the success of both options depends, primarily, on the type of process plant and the relationship between the plant operator and the power utility.

Due to the production of heat in each of the several potential processes, there does not appear to be a place to use heat produced by an electric power generation plant. Thus, the waste heat resulting from a cogeneration plant does not have a valued use at Barlow Point. If the excess heat cannot be effectively used, then the economics of a cogeneration plant in the Northwest do not work.

The reverse may be true – for some examples of potential processes suggested for the site, there is sufficient high-grade heat to support smaller power generation equipment (site generation as opposed to cogeneration). The investigation team discussed these options with Cowlitz PUD. Cowlitz PUD is not encouraging cogeneration as part of their energy efficiency program, and BPA has significant grid connection requirements for customer power generation equipment (site generation), so the investigation team was discouraged from pursuing cogeneration or site generation as likely applications at Barlow Point.

There is little or no economic case for cogeneration on site, but there may be an economic and energy-saving case for utilizing high-grade waste heat to partially drive on-site generation. The economic case stems, in part, from NLSL where the on-site generation is sized to serve a portion of the process electric power loads in order to stay below the NLSL limits. An approach to avoid the NLSL designation includes two constraints. First, the site generation must not furnish power to the grid. Instead, in the event of a utility outage, the site-generation must be halted. This is required to meet utility safety requirements in the PUD. Second, the plant is subject to an orderly shutdown if the site generation fails (i.e., fails to maintain operation below the NLSL load threshold).

Sophometrics suggests consideration of site-generation for any tenant with significant power generation experience.

CenturyLink, Comcast, and Cascade Networks, Inc., among others, have franchise rights (i.e., street ROW working permits) within the City of Longview.

Based on franchise agreements, both CenturyLink and Comcast should provide Internet service connections to tenants on site. The means for this includes service companies' work off-site along right of ways, plus potential charges for on-site distribution.

Sophometrics contacted both Comcast and CenturyLink, but neither company was able to verify the existence of communications distribution lines along Highway 432. Both companies indicated service would be provided if ordered.

Cascade Networks, Inc., presently manages fiber-optic communication cables that run along State Highway 432 in proximity to Barlow Point. These lines extend to Willow Grove Road then to Barlow Point Road and run adjacent to the Barlow Point property on the north side. Cascade Networks indicated that Internet service is readily available at the Barlow Point site. Further, Cascade Networks serves the existing Port of Longview property and can furnish direct fiber links as an optional service (instead of or in addition to Internet service). Direct fiber circuits would allow the Port significant control over the security and use the lines to carry network, telephone, security (including CCTV) etc. An economic analysis may be useful to compare the cost of installing and maintaining a direct fiber optic link, Vs the cost of network services (an IP link) from an ISP. Historically, the direct fiber link would have been less costly in the long run. However, current prices for high-bandwidth services suggest that the long-term costs are closer to the same and network services might be more flexible.

This report recommends installing an underground duct system to carry on-site communications cables. If a duct and manhole system were provided, Cascade Networks' on-site cable installation would be both economical and flexible. See Sophometrics' cost estimate in Appendix A.

Electric Power

In conclusion, regarding electric power:

- Cowlitz PUD has sufficient distribution capacity to furnish power to the site for any of the proposed tenant options.
- The development schedule for electric power service, including planning and implementation, is 26 months for smaller loads and 40 months if an individual tenant load exceeds 10 average megawatts (aMW).
- Due to the New Large Single Load (NLSL) policy at BPA, each prospective tenant should be informed of the NLSL limits and asked to develop an electric power strategy early (during project planning).
- There is no case for cogeneration on site, but there is a limited case for utilizing high-grade waste heat to drive on site generation. This case stems from NLSL where the on-site generation is sized to serve a portion of the process electric power loads in order to stay below the NLSL limits. This approach requires a tenant with significant power generation experience.

Other Considerations

Regarding other report topics:

- The range of development cost associated with electrical site work, acquiring the site power service, roadway lighting, and telecommunications lies between \$7,000,000 and \$9,500,000.
- The area under the BPA lines, on the BPA easement, is likely to be available for surface water storage, but must exclude all structures and tanks.
- It is not likely economical to install gas lines to serve building heating loads; instead, the use of electric-driven heat pumps is recommended.
- Network communications are available from three vendors in the City of Longview. One of the three vendors was able to verify a fiber cable route directly adjacent to the site. Service options include network connections and a direct fiber cable link to existing Port property.

Appendix A: Conceptual Cost Estimate

Electrical Power Service Connection

Furnished by Cowlitz PUD, but likely to be a direct cost to the Port, the estimated fee for off-site utility work and engineering is \$1,250,000. This value is based on conversations with Cowlitz PUD.

The estimated cost for a BPA load study is \$80,000 to \$120,000, with a significant portion prepaid.

Electrical Power Site Sub-Station

The on-site substation exhibits a wide range of costs -- \$1,500,000 for a utility grade substation and transformer, \$2,400,000 for an owner-operated specification grade transformer and switching center.

The estimated cost of engineering for the on-site substation runs from \$165,000 to \$220,000.

Electrical Power Site Distribution (Underground)

An underground duct-bank system to facilitate multiple feeders (serving several tenants) could be placed with or adjacent to a roadway system. For this estimate, backbone electrical duct 12,000 feet long, plus pier connections, is used --- this length includes an allowance for a pathway to piers, including spare ducts for shore power (see the conceptual plans in Appendix A of the main report). Sophometrics estimated the length of the duct system based off the conceptual plans in Appendix A of the main report and should be considered preliminary. A direct buried, plastic conduit system with manholes is estimated at \$1,230,000. A concrete encased duct system with manholes is estimated at \$1,860,000.

Port of Longview Service, Distribution, and Connections

The details of an electrical system have not been developed. This is a very rough order of magnitude cost estimate for electric power site distribution and connections for Port facilities, including three large lift stations, sanitary sewer lift station, miscellaneous power to the piers, excluding pier lighting: \$1,250,000.

Lighting (roadway), Security Gate

Lighting estimates are based off the conceptual plans in Appendix A of the main report and should be considered preliminary. Roadway lighting for 7,000 feet of illuminated roadway (including the entrance road and gate area) runs from \$250,000 to \$450,000 depending on the quality of light fixtures selected, the illumination level, and whether direct buried cable is used. Electric service connections for one gate, located near the site entrance, may cost \$25,000.

Telecommunications Conduit Distribution System

An underground duct-bank system to facilitate multiple communications pathways (serving several tenants) could be placed with or adjacent to a roadway system. For this estimate, backbone communications duct

12,000 feet long is used – this length includes an allowance for a pathway to piers. Sophometrics estimated the length of the duct system based off the conceptual plans in Appendix A of the main report and should be considered preliminary. The overall length matches the length of proposed roadways plus service entrances, assuming that a duct system installed under the roadways will serve each required structure.

A direct buried, plastic conduit system with manholes is estimated at \$600,000. A concrete encased duct system with manholes is estimated at \$950,000.

Telecommunications Service Installation

This report assumes that it is appropriate to install an underground duct system to carry on-site communications cables. If a duct and manhole system is provided, a communications vendor could install on-site fiber optic cable for three dollars a lineal foot or less (i.e., an upper limit of approximately \$36,000 for connections to all tenants on site). It is likely the charges for installation would be less but require further investigation and design of the site.

Appendix B: Sources for Utility Information

Sources for this Report (BPA)

The following parties were contacted by Sophometrics between May 20, 2015 and June 24, 2015. Their input contributed to the discussion herein.

Josh Warner, Acting Constituent Account Executive, Public Interest Organizations, BPA

Melanie Jackson, BPA Transmission Account Executive

Dawneen Dostert, Reality Specialist, BPA

Sources for this Report (Electric Power)

The following parties were contacted by Sophometrics between May 15, 2015 and July 13, 2015. Their input contributed to the discussion herein.

David Shepherd-Gaw, Energy Efficiency manager, Cowlitz PUD

Tim Johnston, Manager System Engineering, Cowlitz PUD

Ray Johnson, Director of Engineering, Cowlitz PUD

Sources for this Report (Telecommunications)

The following corporations were contacted by Sophometrics on December 9, 2015.

CenturyLink (800-603-6000)

Comcast (888-303-5790)

Cascade Networks Inc. (360-414-5990)