

ENVIRONMENTAL CHECKLIST

for the

Terminal 30 Substation Replacement Project

Port of Seattle SEPA File # 2021-08

prepared for

Port of Seattle

October 2021

EA Engineering, Science, and Technology, Inc., PBC

PREFACE

The purpose of this Environmental Checklist is to identify and evaluate probable environmental impacts that could result from the **Terminal 30 (T-30) Substation Replacement Project** and to identify measures to mitigate those impacts.

On November 29, 2020, the T-30 Central Substation failed and caused a power outage to a substantial portion of the terminal. Rental diesel generators were connected to provide emergency power. A temporary substation was subsequently installed to replace the diesel generators and supply power to T-30 uses until a permanent replacement substation can be constructed and connected. The proposed Permanent Substation is the subject of this SEPA Checklist.

The State Environmental Policy Act (SEPA)¹ requires that all governmental agencies consider the environmental impacts of a proposal before the proposal is decided upon. This Environmental Checklist has been prepared in compliance with the SEPA Rules, effective April 4, 1984, as amended (Chapter 197-11), Washington Administrative Code; and Port of Seattle SEPA Resolution No. 3650.

This document is intended to serve as SEPA review for site preparation work, demolition, construction, and operation of the proposed **T-30 Substation Replacement Project**. Analysis associated with the proposed project contained in this Environmental Checklist is based on plans for the project, which are on-file with the Port of Seattle. While not construction-level in detail, the schematic plans accurately represent the eventual size, location and configuration of improvements and are considered adequate for analysis and disclosure of environmental impacts.

This Environmental Checklist is organized into three major sections. *Section A* of the Checklist (starting on page 1) provides background information concerning the *Proposed Action* (e.g., purpose, proponent/contact person, project description, project location, etc.). *Section B* (beginning on page 9) contains the analysis of environmental impacts that could result from implementation of the proposed project, based on review of major environmental parameters. This section also identifies possible mitigation measures. *Section C* (page 27) contains the signature of the proponent, confirming the completeness of this Environmental Checklist.

Relevant project analyses that served as a basis for this Environmental Checklist include: the *Greenhouse Gas Emissions Worksheet* (EA, 2021). This report is on-file at the Port of Seattle and is included as an appendix to this SEPA Checklist.

¹ Chapter 43.21C. RCW

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PURPOSE

The State Environmental Policy Act (SEPA), Chapter 43.21 RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. The purpose of this checklist is to provide information to help identify impacts from the proposal (and to reduce or avoid impacts, if possible) and to help the Port of Seattle to make a SEPA threshold determination.

A. BACKGROUND

1. Name of Proposed Project:

Terminal 30 Substation Replacement Project (Port of Seattle SEPA File # 2021-08)

2. Name of Applicant:

Port of Seattle

3. Address and Phone Number of Applicant and Contact Person:

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Port of Seattle
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4. Date Checklist Prepared

October 15, 2021

5. Agency Requesting Checklist

Port of Seattle (the Port)

6. Proposed Timing or Schedule (including phasing, if applicable):

The Terminal 30 (T-30) Substation Replacement Project analyzed in this Environmental Checklist involves site preparation work, demolition, construction and operation. Site preparation and construction is expected to begin in Autumn 2022 with build-out and operation by Spring 2023.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

No other specific development is planned for the T-30 Substation Replacement Project site at this time.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal:

Past information used to prepare this SEPA Checklist include:

- *Declaration of Emergency; Emergency Repair Due to T-30 Electrical Equipment Failure Memo, Northwest Seaport Alliance, December 8, 2020.*

Studies prepared specifically for this SEPA Checklist include:

- *Greenhouse Gas Emissions Worksheet (EA 2021).*

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain:

There are no other applications that are pending approval for the T-30 Substation Replacement Project.

10. List any government approvals or permits that will be needed for your proposal, if known:

The following approvals or permits are anticipated to be required for proposed substation replacement at T-30.

Local Agencies

City of Seattle

Department of Construction and Inspections -- *permits/approvals associated with the proposed project, including:*

- *Demolition Permits*
- *Construction Permits*
- *Mechanical Permits*
- *Electrical Permits*

11. Give a brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page.

Existing Conditions

*Port of Seattle T-30 is located at 1901 East Marginal Way South in the city of Seattle, along the eastern edge of the East Duwamish Waterway. The T-30 Substation Replacement site is located on the eastern edge of T-30 immediately west of East Marginal Way South (see **Figure 1** and **Figure 2**).*

purchased the property in 1985, with the exception of the years between 2003 and 2008 when it operated as a cruise terminal. The upland Port-owned portion of the site consists of approximately 38 acres of marine cargo marshaling area, warehouse structures, repair and maintenance buildings, and operations facilities. It also contains a Port Police station and waterfront office.

The T-30 Central Substation connects with the Seattle City Light (SCL) electric grid and distributed electric power to T-30 uses. On November 29, 2020, the T-30 Central Substation failed and caused a power outage to a substantial portion of T-30, including: refrigerated containers, T-28 M & R shop, Port of Seattle police station, guard shack, yard lighting, and, other miscellaneous infrastructure. A subsequent inspection of the failed substation on November 30, 2020 found extensive equipment damage and general repairs were determined not to be feasible. Rental diesel generators were provided, connected and power was restored to T-30 uses on December 1, 2020.

A temporary substation, including enclosed electrical switch, was installed adjacent to the existing failed Central Substation to replace the diesel generators. The Temporary Substation, which connects to the Seattle City Light electrical grid, was connected in May 2021 and is intended to supply power to a number of T-30 uses until a new permanent substation is installed and connected.

Proposal

*The proposed T-30 Central Substation Replacement Project includes a new permanent substation to replace the existing Temporary Substation. Located on the site of the existing failed Central Substation, the proposed new permanent Substation would connect to the Seattle City Light electric power grid and distribute electric power to T-30 uses. **Figure 3** illustrates the overall system improvements associated with the T-30 Substation Replacement Project and **Figure 4** focuses on the site of the replacement substation.*

The following primary demolition and development elements are proposed:

Demolition

- *Existing T30 Central Substation and associated cables and conduits*
- *Existing reinforced concrete and asphalt concrete pad*

Replacement (new construction)

- *New reinforced concrete and asphalt concrete pad, with equipment anchoring*
- *New medium voltage switch.*
- *New secondary unit substation which includes:*
 - *Transformer*
 - *Secondary low voltage switchgear*
- *Electrical enclosure (36' x 15' x 14') to house new T30 Central Substation*
- *New electrical vaults*
- *New medium voltage cable from new T30 Central Substation switchgear*
- *New electrical grounding system*

Terminal 30 Substation Replacement Project Environmental Checklist



- Project Site
- Electrical Phasing Plan Area

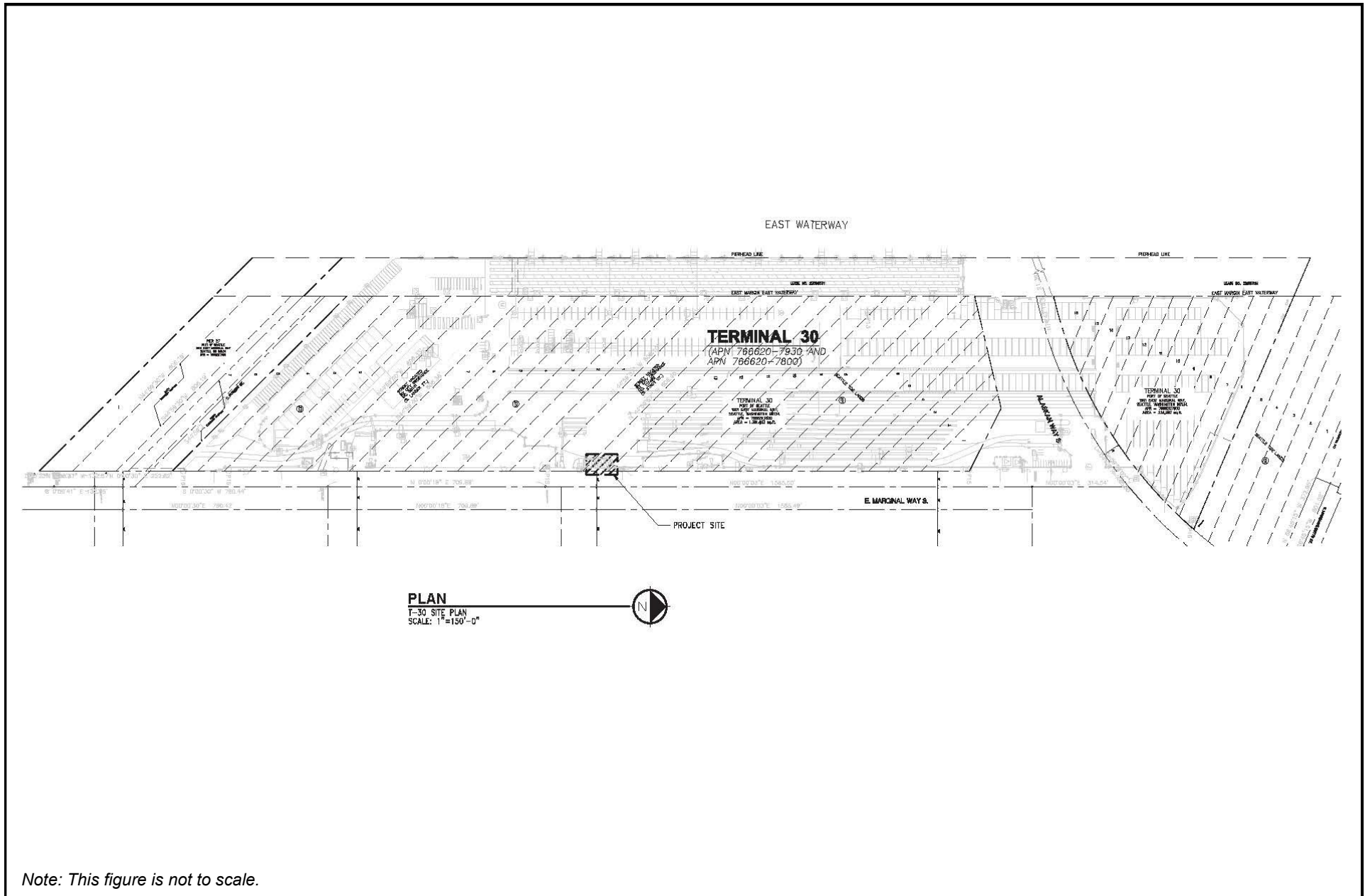
Note: This figure is not to scale.

Source: Google Maps and EA Engineering, 2021



Figure 1
Aerial Vicinity Map

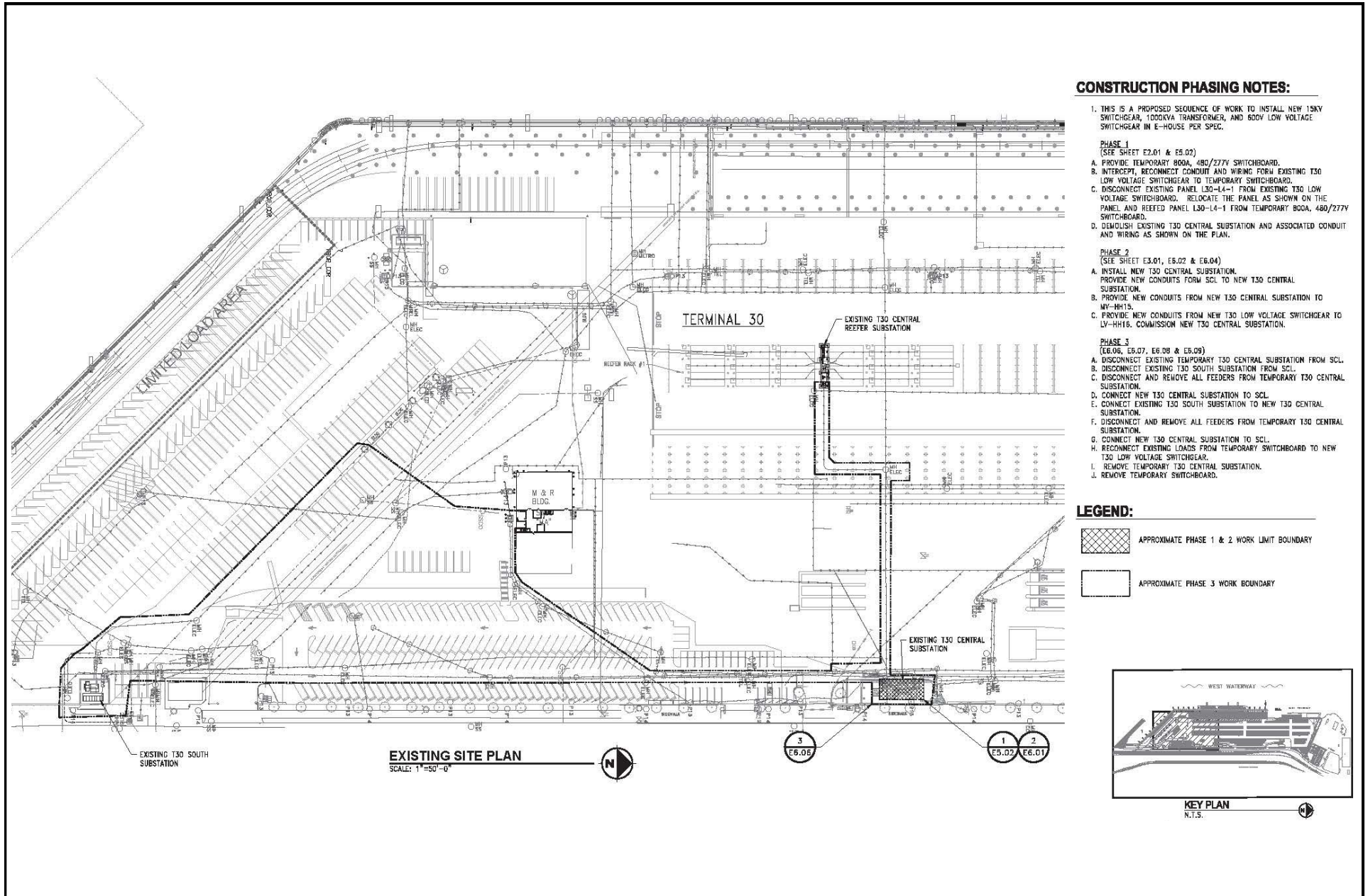
Terminal 30 Substation Replacement Project Environmental Checklist



Source: Port of Seattle, 2021

Figure 2
Existing Conditions

Terminal 30 Substation Replacement Project Environmental Checklist

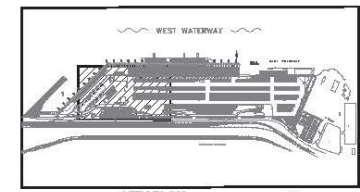


CONSTRUCTION PHASING NOTES:

1. THIS IS A PROPOSED SEQUENCE OF WORK TO INSTALL NEW 15KV SWITCHGEAR, 1000KVA TRANSFORMER, AND 600V LOW VOLTAGE SWITCHGEAR IN E-HOUSE PER SPEC.
- PHASE 1**
(SEE SHEET E3.01 & E5.02)
- A. PROVIDE TEMPORARY 800A, 480/277V SWITCHBOARD.
 - B. INTERCEPT, RECONNECT CONDUIT AND WIRING FOR EXISTING T30 LOW VOLTAGE SWITCHGEAR TO TEMPORARY SWITCHBOARD.
 - C. DISCONNECT EXISTING PANEL L30-L4-1 FROM EXISTING T30 LOW VOLTAGE SWITCHBOARD. RELOCATE THE PANEL AS SHOWN ON THE PANEL AND REFEED PANEL L30-L4-1 FROM TEMPORARY 800A, 480/277V SWITCHBOARD.
 - D. DEMOLISH EXISTING T30 CENTRAL SUBSTATION AND ASSOCIATED CONDUIT AND WIRING AS SHOWN ON THE PLAN.
- PHASE 2**
(SEE SHEET E3.01, E5.02 & E6.04)
- A. INSTALL NEW T30 CENTRAL SUBSTATION. PROVIDE NEW CONDUITS FROM SCL TO NEW T30 CENTRAL SUBSTATION.
 - B. PROVIDE NEW CONDUITS FROM NEW T30 CENTRAL SUBSTATION TO MY-HH15.
 - C. PROVIDE NEW CONDUITS FROM NEW T30 LOW VOLTAGE SWITCHGEAR TO LY-HH16. COMMISSION NEW T30 CENTRAL SUBSTATION.
- PHASE 3**
(E6.06, E6.07, E6.08 & E6.09)
- A. DISCONNECT EXISTING TEMPORARY T30 CENTRAL SUBSTATION FROM SCL.
 - B. DISCONNECT EXISTING T30 SOUTH SUBSTATION FROM SCL.
 - C. DISCONNECT AND REMOVE ALL FEEDERS FROM TEMPORARY T30 CENTRAL SUBSTATION.
 - D. CONNECT NEW T30 CENTRAL SUBSTATION TO SCL.
 - E. CONNECT EXISTING T30 SOUTH SUBSTATION TO NEW T30 CENTRAL SUBSTATION.
 - F. DISCONNECT AND REMOVE ALL FEEDERS FROM TEMPORARY T30 CENTRAL SUBSTATION.
 - G. CONNECT NEW T30 CENTRAL SUBSTATION TO SCL.
 - H. RECONNECT EXISTING LOADS FROM TEMPORARY SWITCHBOARD TO NEW T30 LOW VOLTAGE SWITCHGEAR.
 - I. REMOVE TEMPORARY T30 CENTRAL SUBSTATION.
 - J. REMOVE TEMPORARY SWITCHBOARD.

LEGEND:

- APPROXIMATE PHASE 1 & 2 WORK LIMIT BOUNDARY
- APPROXIMATE PHASE 3 WORK BOUNDARY



KEY PLAN
N.T.S.

Source: Port of Seattle, 2021

Figure 3
Electrical Phasing Plan

Terminal 30 Substation Replacement Project Environmental Checklist

LEGEND:



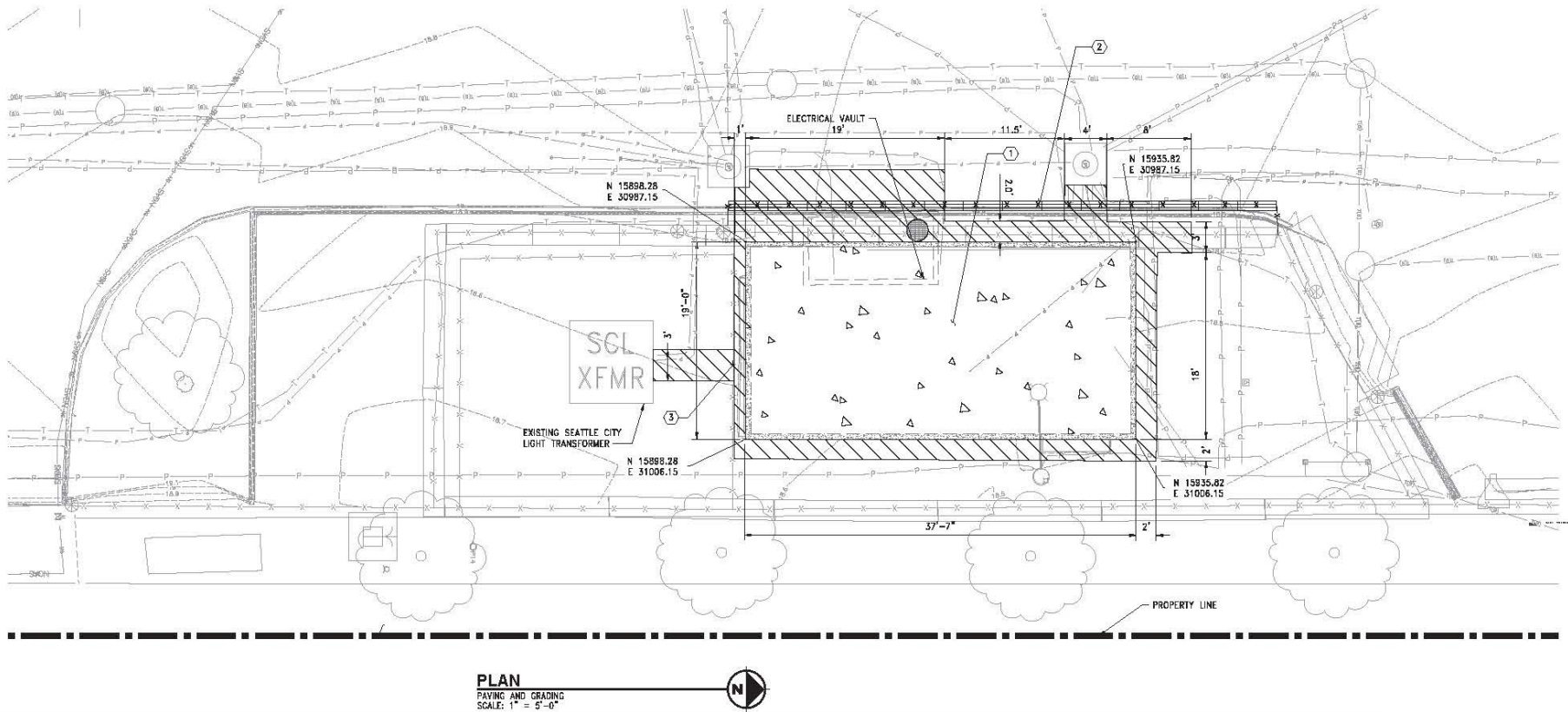
CEMENT CONCRETE PAVEMENT PAD, SEE SECTION H/SS.D1
 ASPHALT CONCRETE PAVEMENT RECONSTRUCTION, SEE DETAIL 4/C2.02

KEYED NOTES:

- ① SET PAD ELEVATION AT 19.80
- ② REINSTALL REMOVED CONCRETE BARRIER WITH CHAIN LINK FENCE 3' FROM EDGE OF NEW SUBSTATION PAD. TIE BACK TO EXISTING BARRIER/FENCE.
- ③ REPAIR SEATTLE CITY LIGHT CHAIN LINK FENCE IN KIND.

NOTES:

- 1. SEE STRUCTURAL DRAWINGS FOR CONCRETE PAD DETAILS.
- 2. ASPHALT CONCRETE PAVING LIMITS SHOWN ARE APPROXIMATE. ACTUAL LIMITS WILL DEPEND ON CONTRACTORS OPERATIONS.



Source: Port of Seattle, 2021



Figure 4
Site Plan

*Subsequent to completion of the primary demolition and development associated with the proposed new Permanent T-30 Central Substation described above, electrical improvements to complete the system would be provided as illustrated in **Figure 3**. Electrical system improvements would be phased and would include: disconnect existing Temporary Substation from SCL; disconnect existing T-30 South Substation from SCL; remove feeders from Temporary Substation; connect the new Permanent T-30 Central Substation to SCL, including limited trenching for installation of new conduit; connect existing T-30 South Substation to the new Permanent T-30 Central Substation, and remove Temporary Substation and temporary switchboard.*

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any. If a proposal would occur over a range of area, provide the range or boundaries of the site(s).

*Port of Seattle T30 is located at 1901 East Marginal Way South in the City of Seattle, along the eastern edge of the East Duwamish Waterway. The electrical system portion of the proposed new permanent T-30 Central Substation Project is located in the central and southeastern portion of T-30, with the proposed new permanent T-30 Central Substation located on the eastern edge of T30, immediately west of East Marginal Way South (see **Figures 1 and 2**).*

The legal description of the site is on file with the Port of Seattle (SEPA File #2021-08)

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site (circle one):

Flat, rolling, hilly, steep slopes, mountainous, other:

The T-30 Substation Replacement site, including the existing failed Central Substation, is flat.

b. What is the steepest slope on the site (approximate percent slope)?

The site is flat, with a slope between approximately 0% to 3%.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

T30 is entirely paved, with the portion of the Terminal containing the T-30 Substation Replacement Project site constructed on fill former tidelands area of Elliott Bay and the Duwamish Waterway. Fill primarily consists of sediments dredged in the early 1900s from the previous tidelands.

No agricultural land of long-term commercial significance is present at the terminal.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

The Puget Sound region is a seismically active region; thus, the T-30 Substation Replacement site could experience seismic activity, which may cause surface rupture, liquefaction and subsidence and landslides. All of T30 is a Liquefaction Prone Area². Liquefaction Prone areas are environmentally critical areas usually associated with fill soils and/or a shallow groundwater table that lose substantial strength during earthquakes.

e. Describe the purpose, type, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

A limited amount of grading and site disturbance would be required for proposed substation replacement. Ground and site disturbance would take place in existing improved, impervious areas. Construction of the substation would require excavation to a depth of up to 16 feet for installation of the electrical vault and to a depth of up to 6 feet for electrical ductbanks. A total of approximately 64 cubic yards (cy) of excavation and 28 cy of fill would be required for installation of the substation. An approved source would be used for the fill necessary for site redevelopment.

A limited amount of trenching and subsequent backfill would be required for the proposed electrical system improvements, including approximately 400 square feet and 60 cubic yards (cy) excavation for new conduit installation.

² Seattle Department of Construction and Inspections (SDCI) GIS Map. <http://web6.seattle.gov/dpd/maps/dpdgis.aspx>.

- f. **Could erosion occur as a result of clearing, construction, or use? If so, generally describe.**

Erosion is possible in conjunction with any construction activity occurring on upland areas. Site work associated with pavement demolition, existing failed substation demolition, and new pavement/substation would expose soils and increase the potential for erosion. Implementation of a Temporary Erosion Sedimentation Control (TESC) plan would minimize potential impacts. Once the construction is complete, no erosion is anticipated because soils would not be exposed.

- g. **About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt, buildings)?**

As under existing conditions (failed Central Substation), approximately 100 percent of the T-30 Substation Replacement site under the proposal would be in impervious surfaces.

- h. **Proposed measures to reduce or control erosion, or other impacts to the earth, if any:**

Comprehensive Drainage Control Plans (including Construction Best Management Practices and Erosion and Sediment Control Plans) would be submitted as part of Construction and Grading Permit applications, in accordance with City of Seattle requirements.

2. Air

- a. **What type of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.**

The proposed project could result in localized increases in air emissions (primarily carbon monoxide and dust) due to construction vehicles, equipment, and activities.

To evaluate the climate change impacts of the proposed T-30 Substation Replacement Project, a Greenhouse Gas Emissions Worksheet was prepared to estimate the emissions footprint for the lifecycle of the project on a gross-level basis. The emissions estimates use the combined emissions from the following sources:

- *Embodied Emissions – extraction, processing, transportation, construction and disposal of materials and landscape disturbance;*
- *Energy-related Emissions – energy demands created by the development after it is completed; and*
- *Transportation-related Emissions – transportation demands created by the development after it is completed.*

*The Worksheet estimates are based on site use and substation size, but as mentioned above, the estimates also consider emissions associated with construction. The estimated lifespan emissions for the proposed substation replacement project would be approximately 1,890 MTCO₂e. Based on the average building lifespan listed in the worksheet (62.5 years), the estimated annual emissions would be approximately 30 MTCO₂e (see **Appendix A** to this Checklist for the Greenhouse Gas Emissions Worksheet).*

The proposed substation replacement project would be designed to conform to applicable regulations and standards of agencies regulating air quality in Seattle, including: the Environmental Protection Agency (EPA), Washington State Department of Ecology (DOE) and the PugetSound Clean Air Agency (PSCAA).

- b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.**

East Marginal Way South, Highway 99, and Burlington Northern SantaFe (BNSF) mainline and switching yard to the east are sources of emissions and odors in the area. There are no off-site sources of air emissions or odors that may affect the proposed project.

- c. Proposed measures to reduce or control emissions or other impacts to air, if any:**

The following mitigation measures could be implemented to control emissions and/or dust during construction:

- *Using well-maintained equipment would reduce emissions from construction equipment and construction-related trucks, as would avoiding prolonged periods of vehicle idling.*
- *Using electrically operated small tools in place of gas-powered small tools, wherever feasible.*
- *Trucking construction materials to and from the project site could be scheduled and coordinated to minimize congestion during peak travel times associated with adjacent roadways.*

3. Water

- a. Surface:**

- 1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.**

T-30 is located on the east side of the East Waterway, and immediately south of Elliott Bay. The proposed substation replacement is located on the east edge of T-30, approximately 500 feet east of the East Waterway shoreline. The westerly extent of the proposed electrical system improvements is located approximately 250 feet east of the East Waterway shoreline.

- 2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.**

The proposed T-30 Substation Replacement site is not located within 200 feet of the water, and the proposal includes no work over, in, or adjacent to water.

- 3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.**

The T-30 Substation Replacement Project does not include any fill or dredging within surface water or wetlands.

- 4) **Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.**

No surface water withdrawals or diversions are required for the proposed project.

- 5) **Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.**

The proposal does not lie within a 100-year floodplain. The west edge of T-30 (approximately 500 feet west of the site of the proposed substation and approximately 250 feet west of the westerly extent of the proposed electrical system improvements) is designated as a Flood Prone Area³.

- 6) **Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.**

No, the project does not involve discharge of waste materials to surface waters.

b. Ground:

- 1) **Will ground water be withdrawn, or will water be discharged to ground water? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.**

Groundwater is expected to be encountered between 8 and 10 feet below ground surface (bgs); dewatering may be necessary for deeper portions of the excavation work. Generated dewatering liquid/water is assumed to be contaminated and will require chemical profiling and appropriate handling and disposal procedures. Contractor will manage dewatering liquid collection and off-site treatment using a vacuum truck or similar equipment.

- 2) **Describe waste material that will be discharged into the ground from septic tanks or other sources; industrial, containing the following chemicals; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.**

Waste material would not be discharged into the ground from septic tanks or other sources. The proposed substation does not include restrooms or use potable water and would not connect to the city's wastewater conveyance systems.

³ Seattle Department of Construction and Inspections (SDCI) GIS Map

c. Water Runoff (including storm water):

- 1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.**

Stormwater from the T-30 Substation Replacement Project site is collected by existing catch basins which discharge to existing stormwater conveyance pipe and eventually to the East Waterway.

- 2) Could waste materials enter ground or surface waters? If so, generally describe.**

No. Waste material would not be generated by the proposal and no waste material would enter ground or surface water.

- 3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.**

No, the project would not alter or otherwise affect drainage patterns in the site vicinity.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

All BMPs provided in the construction specifications regarding dewatering, and handling and disposing of groundwater will be followed by the contractor.

The T-30 Substation Replacement Project site is currently entirely in impervious surfaces and the proposal would not generate stormwater beyond current conditions. Measures to reduce stormwater runoff impacts are not proposed.

4. Plants

a. Check or circle types of vegetation found on the site:

deciduous tree

evergreen tree

shrubs

grass

pasture

crop or grain

wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other

water plants: water lily, eelgrass, milfoil, other

other types of vegetation:

The site is a Port terminal consisting entirely of paved impervious surface, and thus there is little to no vegetation located on the site.

b. What kind and amount of vegetation will be removed or altered?

No vegetation is located on the site and no vegetation will be removed for the proposed project.

- c. **List threatened or endangered species known to be on or near the site.**

There are no threatened or endangered plant species on or near the site.

- d. **Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:**

No landscaping is planned at the site, as it will remain in substation use in support of terminal uses for the Port of Seattle and its industrial tenants.

- e. **List all noxious weeds and invasive species known to be on or near the site.**

There are no noxious weeds or invasive plant species known to be on or near the site.

5. Animals

- a. **Circle (underlined) any birds and animals that have been observed on or near the site or are known to be on or near the site:**

birds: songbirds, hawk, heron, eagle, other: seagulls, pigeons. **mammals:** deer, bear, elk, beaver, other: small mammals. **fish:** bass, salmon, trout, herring, shellfish.

Birds and small mammals tolerant of urban conditions may use and may be present on and near the T-30 Substation Replacement Project site. Mammals likely to be present in the vicinity of the site include: eastern gray squirrel, mouse, rat, opossum, muskrat and feral cats.

Birds common to the area include: European starling, house sparrow, rock dove, American crow, seagull, western gull, Canada goose, American robin, and house finch.

- b. **List any threatened or endangered species known to be on or near the site.**

US Fish and Wildlife Service Information for Planning and Consultation database identifies Marbled Murrelet, Streaked Horned Lark, Yellow-billed Cuckoo, Bull Trout, and Monarch Butterfly as potential species near the project area. Based on the urban nature of the site and limited upland construction activities, Endangered Species Act (ESA)-listed species are not likely to be present in the project area. Critical habitat for Puget Sound Chinook salmon, bull trout, rockfish, and southern resident killer whales are present within Elliott Bay to the north and west.

- c. **Is the site part of a migration route? If so, explain.**

The entire Puget Sound area is within the Pacific Flyway, which is a major north-south flyway for migratory birds in America—extending from Alaska to Patagonia. Every year, migratory birds travel some or all this distance both in spring and in fall, following food sources, heading to breeding grounds or travelling to overwintering sites. The proposed substation would be of a similar height to the existing failed substation and adjacent structures; therefore, no impacts on the Pacific Flyway migration route or to migratory species are expected.

- d. **Proposed measures to preserve or enhance wildlife, if any:**

The project site is within an urban industrial area and would not affect any existing wildlife habit. No mitigation measures are proposed.

- e. List any invasive animal species known to be on or near the site.

Invasive species found in King County include European starling, house sparrow and eastern gray squirrel.

6. Energy and Natural Resources

- a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

The proposal is for a new permanent substation to replace an existing failed substation. Once operational, the proposed substation would provide electric power connection to multiple Port of Seattle and tenant uses on T-30.

- b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No. The proposed project would not affect adjacent properties use of solar energy.

- c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

There are no proposed mitigation measures to reduce energy impacts. The components of the proposed permanent replacement substation would be of newer design than the existing failed substation and would conform with energy efficiency standards updated since the failed substation was installed.

7. Environmental Health

- a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe.

The Port of Seattle does not maintain or store any hazardous materials on the project site as part of current substation operations. The proposed T-30 Substation Replacement Project would not store or maintain any hazardous materials or chemicals on the site.

- 1) Describe any known or possible contamination at the site from present or past uses.

T-30 is located along the East Waterway across from Harbor Island. The East Waterway is part of the Harbor Island Superfund Site and is regulated by the U.S. Environmental Protection Agency (EPA).

There is a Department of Ecology cleanup site at T-30, consisting of approximately 11 acres (one large area and one small area) in the north central portion of the T-30 property. The edge of the contaminated plume is approximately 150 to 200 feet northwest of the project.

Before the 1900s, the land where T-30 is located was part of the Elliot Bay tide flats. In

order to facilitate development in the area, the flats were filled with various materials including dredged soils. One of the first industrial operations on the site was the Standard Oil Company (now Chevron) bulk fuel terminal, located in the northern portion site in 1905.

In 1985, the Port of Seattle purchased the site from Chevron to develop it as a container terminal. The same year, the Port entered into an agreement with Ecology that established cleanup criteria. Contamination at this site is primarily due to its historic use as a fuel terminal. Leaks, spills, other discharges and releases of petroleum from above-ground petroleum storage tanks, piping and equipment resulted in contamination of the site's groundwater and soil.

In 1991, Ecology determined that the provisions of the Model Toxics Control Act (MTCA) required additional study and cleanup on the Site. Ecology and the Port of Seattle entered into a new legal agreement called an Agreed Order. The 1991 Agreed Order instructed the Port of Seattle to undertake additional remedial investigation and a feasibility study of remedial (cleanup) alternatives for the Site.

In 2013, Ecology amended the Agreed Order to include the requirement that the Port of Seattle prepare a draft Cleanup Action Plan for the site.

In 2017, Ecology issued a Consent Decree for these final cleanup actions: installation of an air-sparging and soil vapor extraction system and removal of free product. Cleanup actions were completed in 2019, and groundwater on the site is monitored per Ecology requirements.

An on-site stormwater management system treats stormwater runoff using oil/water separators and filters before discharging the water into the East Waterway. Contaminated groundwater does not enter the on-site stormwater system.

- 2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.**

As indicated under 7.A.1 above, cleanup actions at T-30 were completed in 2019 and no known hazardous chemicals/conditions are anticipated to affect the project.

- 3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.**

Hydraulic oil and fuel would be used and could be stored onsite during construction. If handled improperly, oil and fuel spills could occur during construction. No toxic or hazardous chemicals are anticipated to be produced or stored after the project is operational.

- 4) Describe special emergency services that might be required.**

No special emergency services are anticipated to be required because of the projects. As is typical of urban development, it is possible that normal fire, medical and other emergency services may, on occasion, be needed from the City of Seattle.

5) Proposed measures to reduce or control environmental health hazards, if any:

The following proposed mitigation measures apply to redevelopment at all the project site.

- *Spill prevention and response planning would be conducted prior to the start of construction to prevent and, if needed, respond to hydraulic oil or fuel spills.*
- *Conventional dust control measures would be implemented to minimize the exposure of workers and the immediate surrounding populations to construction-generated dust.*

b. Noise

1) What types of noise exist in the area that may affect your project (for example: traffic, equipment operation, other)?

Traffic noise associated with adjacent roads/highway is relatively high at certain times of day, particularly along East Marginal Way South and Highway 99. The project site is in a working maritime terminal and the vicinity contains numerous noise sources from both commercial/industrial uses, including Port tenants. The BNSF facility east of Highway 99 is also a source of noise. Existing noise sources are not expected to adversely affect the proposed project.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from site.

The project site is zoned for Industrial uses. Residential uses are generally considered the most sensitive potentially affected receivers for a project; however, the nearest residences are located approximately one mile to the north (on 1st Avenue S) and approximately one mile to the west (in West Seattle across Harbor Island and the Duwamish Waterway). Industrial/commercial uses in vicinity of the site include marine industrial uses to the south, west and north on T-30, marine industrial and Coast Guard use further to the north, and commercial uses to the east across East Marginal Way South, Highway 99 and the BNSF tracks.

Construction noise would be short-term and would occur during daytime hours. Typical construction noise activities would include demolition and substation construction and would employ equipment such as dump trucks, excavators, pavers, generators and compressors. This noise could be perceived by some people as intrusive and possibly annoying, but the low overall sound levels and compliance with Seattle's noise code would minimize the potential for significant impacts. The proposed project would comply with provisions of Seattle's Noise Code (SMC, Chapter 25.08); no noise variances are anticipated.

Once the substation is operational, no significant long-term noise impacts are anticipated; the substation would comply with provisions of the City of Seattle's Noise Ordinance.

3) Proposed measures to reduce or control noise impacts, if any:

The following proposed mitigation measure applies to redevelopment of the proposed project.

- *The project would comply with provisions of the City's Noise Ordinance (SMC*

25.08); specifically: construction hours would be limited to standard construction hours (non-holiday) from 7 AM to 10 PM and Saturdays and Sundays from 9 AM to 10 PM. If extended construction hours are necessary, the applicant would apply for a noise variance.

8. Land and Shoreline Use

- a. **What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.**

The Port of Seattle T-30 has been in service as a marine cargo terminal since the Port purchased the property in 1985, with the exception of the years between 2003 and 2008 when it operated as a cruise terminal. The upland Port-owned portion of the site consists of approximately 38 acres of marine cargo marshaling area, warehouse structures, repair and maintenance buildings, and operations facilities. It also contains a Port Police station and waterfront office.

Immediately south of T-30 is Port of Seattle Terminal 25 marine cargo terminal facility. Immediately north of T-30 is Jack Perry Memorial Viewpoint, developed by the Port to provide required public shoreline access. Additional marine industrial and other industrial facilities and operations on privately-owned sites are present west, south, and east of the T-30 site. These include: a Coast Guard facility to the north; and rail yards, manufacturing, distribution, and warehouses to the east and southeast

The proposed T-30 Substation Replacement Project site is located at the eastern edge of T-30. The approximately 1,060 sq. ft. (0.024-acre) substation site currently contains the failed Central Substation on a concrete slab.

T-30, including the T-30 Substation Replacement Project site, is located within one of two designated Manufacturing/Industrial Centers in the City of Seattle – the Greater Duwamish Manufacturing/Industrial Center. These areas are home to the city’s industrial businesses and are designated as regional resources for retaining and attracting jobs and maintaining a diversified economy.

The following primary demolition and development elements are proposed:

Demolition

- *Existing conduits and electrical equipment associated with the existing failed Central Substation.*
- *Existing reinforced concrete and asphalt concrete pad.*

Replacement (new construction)

- *New ground conductor and cables.*
- *New reinforced concrete and asphalt concrete pad, with equipment anchoring.*
- *New switchgear vault.*
- *New substation including conduits, switchgear, breakers and transformer.*
- *New pre-fabricated protective external enclosure for substation equipment.*

The proposed substation replacement is intended to support existing and future uses on T-30. All existing and future uses on Terminal 30 are, or will be, consistent with the Terminal’s IGI U/85 zoning classification.

The proposed substation replacement would not change the use of the site and would not be

anticipated to impact any vicinity uses.

- b. Has the site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?**

No, the site has not been used as working farmlands or forest lands for over 100 years.

- 1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:**

No. The site is in an urban area and would not affect or be affected by working farm or forest land; no working farm or forest land near this urban site.

- c. Describe any structures on the site.**

The T-30 Substation Replacement Project site contains the existing failed Central Substation and supporting concrete pad.

- d. Will any structures be demolished? If so, what?**

Yes, all the structures on the T-30 Substation Replacement site would be demolished, including the existing failed Central Substation and supporting concrete pad.

- e. What is the current zoning classification of the site?**

The T-30 Substation Replacement Site is zoned Industrial General 1 Unlimited/85 (IG1 U/85). The site is also within the Greater Duwamish Manufacturing Industrial Center. As noted above, this is one of two designated Manufacturing/Industrial Centers in the City of Seattle. These areas are home to the city's thriving industrial businesses and are designated as important regional resources for retaining and attracting jobs and maintaining a diversified economy.

- f. What is the current comprehensive plan designation of the site?**

The Future Land Use Map in the Seattle Comprehensive Plan identifies the T-30 Substation Replacement Project site as a Manufacturing Industrial Center.

- g. If applicable, what is the current shoreline master program designation of the site?**

The T-30 Substation Replacement Project site is located over 200 feet from the shoreline and does not contain a Seattle Shoreline Master Program designation. The portion of T-30 within 200 feet of the shoreline is designated Urban Industrial (UI).

- h. Has any part of the site been classified as a critical area by the city or county? If so, specify.**

Based on the SDCI GIS mapping, the T-30 Substation Replacement Project site contains the following.

- Liquefaction Prone Area – the entire Terminal 30 and Duwamish area is classified as Liquefaction Prone Area.

Although not mapped at the T-30 Substation Replacement site, the western edge of Terminal 30 contains the following Environmentally Critical Areas designations:

- Flood Prone Area – the western edge of Terminal 30 is designated as Flood Prone Area, along with all over-water features along the Duwamish Waterway and Elliott Bay.
- Wildlife Habitat Area – the western edge of Terminal 30 is designated as Wildlife Habitat Area, along with much of the Duwamish Waterway and Elliott Bay shorelines.

i. Approximately how many people would reside or work in the completed project?

The project would not contain any residential units; therefore, no people would reside in the completed project. No direct employment is provided by the existing Central Substation or would be provided by the proposed substation replacement. Port of Seattle staff or Port tenants would provide periodic maintenance to the new replacement substation.

j. Approximately how many people would the completed project displace?

No direct employment is provided by the existing Central Substation and the completed development project would not displace any people on a temporary or permanent basis.

k. Proposed measures to avoid or reduce displacement impacts, if any:

No displacement impacts would occur and no mitigation measures are necessary.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The project is compatible with existing and projected land uses and plans, and no mitigation is necessary.

m. Proposed measures to ensure the proposal is compatible with nearby agricultural and forest lands of long-term commercial significance, if any:

The project site is not located near agricultural or forest lands and no mitigation measures would be necessary.

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

No housing units would be provided.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

No housing presently exists onsite and none would be eliminated.

c. Proposed measures to reduce or control housing impacts, if any:

No housing impacts would occur and no mitigation measures would be necessary.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Consistent with the site's IG1 U/85 zoning and Urban Industrial SMP designation, the proposed substation would be a similar height to the existing failed Central Substation on the site and would be approximately 13 feet in height.

The proposed new permanent substation design would be similar to the existing failed Central Substation and would include a metal enclosure.

b. What views in the immediate vicinity would be altered or obstructed?

The City of Seattle's public view protection codes (Seattle Municipal Code 25.05.675) are intended to "protect public views of significant natural and human-made features: Mount Rainier, the Olympic and Cascade Mountains, the downtown skyline, and major bodies of water including Puget Sound, Lake Washington, Lake Union and the Ship Canal, from public places consisting of specified viewpoints, parks, scenic routes and view corridors identified in Attachment 1 [to the SEPA code]".⁴ And it is City policy to protect public views of the Space Needle from designated public places. The T-30 Substation Replacement Project is not expected to result in significant impacts on views from City-designated public viewpoints, parks, scenic routes or view corridors of significant natural and human-made features; or views of the Space Needle from City-designated public places, as described below.

Designated Viewpoints and Designated Views of the Space Needle

The nearest City-designated viewpoints are Twelfth Avenue S Viewpoint approximately 1 mile to the east, Beacon Hill Playground approximately 1.1 mile to the northeast, Jose Rizal Park approximately 1.2 mile to the northeast, Waterfront Park approximately 1.1 mile to the north, and Victor Steinbrueck Park approximately 1.2 mile to the north. The nearest designated view of the Space Needle are from Seacrest Park and Hamilton View Park in West Seattle, approximately 1.5 mile west of the site. Views of water, mountains, or downtown skyline from these viewpoints would not change with the proposed T-30 Substation Replacement Project because the proposed substation replacement would be similar in scale to the existing failed Central Substation, and because of the distance from the viewpoints, topographic separation, and position of the site relative to the viewpoints.

Scenic Routes

City-designated scenic routes near the T-30 Substation Replacement Project site includes:

- *East Marginal Way South to the east.*

The proposed T-30 Substation Redevelopment Project would replace the existing failed

⁴ SMC Chap. 25.05.675 P.2.a.i.

Central Substation with a new replacement substation and would not be anticipated to affect protected views to the water from East Marginal Way South.

c. Proposed measures to reduce or control aesthetic impacts, if any:

No significant aesthetic/views impacts are anticipated with the proposed project and no mitigation measures are proposed.

11. Light and Glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

At times during the construction process, area lighting of the job site (to meet safety requirements) may be necessary, which will be noticeable proximate to the project site. In general, however, light and glare from construction of the proposed project is not anticipated to adversely affect adjacent land uses.

The existing light pole and fixtures on the site would remain, and the overall level of light and glare on the site is not expected to differ substantially from that presently occurring on the site and in the site vicinity.

Shadows

Seattle's SEPA policies aim to "minimize or prevent light blockage and creation of shadows on open spaces most used by the public."⁵ Areas of the City outside Downtown that are to be protected include:

- *publicly-owned parks;*
- *public school yards;*
- *private schools which allow public use of schoolyards during non-school hours; and*
- *publicly owned street ends in shoreline areas.*

There are no protected open space areas that are proximate to the T-30 Substation Replacement Project site where the project could block light or cast shadows.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

No light or glare safety hazards or view interferences are anticipated.

c. What existing off-site sources of light or glare may affect your proposal?

No off-site sources of light or glare are anticipated to affect the proposed T-30 Substation Replacement Project.

d. Proposed measures to reduce or control light and glare impacts, if any:

No significant long-term light or glare-related environmental impacts are anticipated, including for motorists on East Marginal Way South immediately east of the site because of the

⁵ SMC 25.05.675 Q2

proposed T-30 Substation Replacement Project, and no mitigation measures are necessary.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

Public recreational opportunities in the vicinity of the site include:

- *Jack Perry Public Access Park: Located immediately north of Terminal 30, this park includes 160 feet of shoreline, water access, landscaping, seating, and a hand-carry boat launch.*
- *Terminal 18 Public Shoreline Access: Located at the southwest corner of Harbor Island, this area includes 300 feet of shoreline access, landscaped area, picnic shelters, and a hand-carry boat launch.*
- *Seattle Marginal Way Skate Park on Hanford & Marginal — Located to the east of the site under Hwy. 99, this skate park is open 24-hours per day.*

b. Would the proposed project displace any existing recreational uses? If so, describe.

The project would not displace any existing recreational uses.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

No significant recreation impacts are anticipated, and no mitigation measures are necessary.

13. Historic and Cultural Preservation

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers located on or near the site? If so, specifically describe.

There are no buildings or structures on the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers.

The nearest identified resource eligible for listing on the National Register of Historic Places is the "First Service Station" site and historic marker indicated as located at Holgate Street and Alaskan Way. The marker is located within public right-of-way on the west side of East Marginal Way South approximately 300 feet north of the T-30 Substation Replacement Project site (immediately south of the Port Police Station).

There are no City of Seattle-designated landmarks in the immediate vicinity of the site. The nearest City-designated property is Fire Station #4 located approximately 0.65 mile to the southeast (3224 – 4th Avenue S.)

- b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or oldcemeteries. Are there any material evidence, artifacts, or areas ofcultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.**

Archaeological sites dating to the early to mid-Holocene (the Holocene began about 11,700 years before present) are more commonly found in the region. Human land use was generally structured around the value of natural resources available in the local environments, including fresh water, terrestrial and marine food resources, forests and suitable terrain. Terminal 30 is within the traditional territory of the Duwamish, a southern South Coast Salish people who spoke Southern Lushootseed; members of the Suquamish and Muckleshoot Tribes also used this vicinity.

The site area is pavement over fill material, and there are no cultural resources identified in the immediate vicinity of the T-30 Substation Replacement site. The Washington Department of Archaeology and Historic Preservation (DAHP) online database (Washington Information System for Architectural and Archaeological Records [WISAARD])predictive model indicates the site and vicinity (including much of the Seattle waterfront) as “Very High Risk” area to contain cultural resources. The project will require excavation to a depth of up to 16 feet for installation of the electrical vault, and to a depth of up to 6 feet for electrical ductbanks.

- c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys,historic maps, GIS data, etc.**

Background research for the T-30 Substation Replacement Project included review of the Washington Department of Archaeology and Historic Preservation (DAHP) online database (Washington InformationSystem for Architectural and Archaeological Records [WISAARD]) for previous cultural resources studies, archaeological site records, cemetery records, and historic properties listed in the National Registerof Historic Places (NRHP) or the Washington Heritage Register (WHR)within the research radius. The statewide predictive model layer on WISAARD was reviewed for probability estimates for archaeological resources within the research radius. The City of Seattle Department of Neighborhoods Landmarks List was reviewed to identify City-designated landmarks.

- d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.**

The following proposed mitigation measure applies to proposedconstruction under the T-30 Substation Replacement Project.

- *The proposed project will remain within existing development area. If resources of potential archaeological significance are encountered during excavation, work would stop immediately, and City of Seattle DCI and the Washington State Archaeologistat the Washington Department of Archaeology and Historic Preservation (DAHP) would be notified. Project activities will abide by all regulations pertaining to discovery and*

excavation of archaeological resources, including but not limited to Chapters 27.34, 27.53, 27.44, 79.90 RCW and Chapter 25.48 WAC, as applicable, or their successors.

14. Transportation

- a. **Identify public streets and highways serving the site or affected geographic area and describe the proposed access to the existing street system. Show on site plans, if any.**

The T-30 Substation Replacement site is located at the east edge of Terminal 30. The site is located west of East Marginal Way South and Highway 99.

Vehicle access to the site is provided from the Terminal 30 entrance/exit on East Marginal Way South approximately 1,400 feet north of the site. Internal circulation within Terminal 30 is provided by a one-way loop drive. Access to the site with the T-30 Substation Replacement Project from the overall Seattle street grid would continue as under current conditions.

- b. **Is site or affected geographic area currently served by public transit? If not, what is the approximate distance to the nearest transit stop?**

Public transit routes associated with King County Metro are provided on East Marginal Way South to the east of the site; however, no transit stops are provided along the Terminal 30 frontage on East Marginal Way South. The Rapid Ride C Line is also located on the Highway 99 farther to the east of the site.

- c. **How many additional parking spaces would the completed project have? How many would the project or proposal eliminate?**

No parking spaces are currently provided in the site and no parking spaces are proposed. Ample parking is available on the terminal to accommodate periodic substation maintenance.

- d. **Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).**

The T-30 Substation Replacement Project would not include any improvements to existing roads, streets or pedestrian/bicycle facilities. The existing north/south drive aisle on the eastern portion of Terminal 30 would remain as currently configured.

- e. **Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.**

The proposal is intended to replace the existing failed Central Substation. Accordingly, the proposal is intended to support Port marine operations and use would occur in the immediate vicinity of water. The proposal would not use or interfere with rail or air transportation.

- f. **How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?**

Proposed use and activity on the site under the T-30 Substation Replacement Project would be similar to previous conditions (i.e. conditions prior to substation failure), and the number of vehicle trips associated with proposed permanent substation would not change from previous conditions.

- g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.**

The project would not interfere or be affected by the movement of agricultural and forest products on the roadway network near the site area.

- h. Proposed measures to reduce or control transportation impacts, if any.**

No impacts are anticipated and no mitigation is proposed.

15. Public Services

- a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.**

No. The project would not result in an increased need for public services.

- b. Proposed measures to reduce or control direct impacts on public services, if any.**

Proposed use and activity on the site under the T-30 Substation Replacement Project would be similar to previous conditions (i.e. conditions prior to substation failure), and the demand for emergency public services would not be anticipated to change. It is anticipated that adequate service capacity is available within the area and city as a whole to preclude the need for additional public facilities/services.

16. Utilities

- a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.**

The proposed T-30 Substation Replacement Project includes a new permanent substation to replace the existing Temporary Substation. Located on the site of the existing failed Central Substation, the proposed new permanent Substation would connect to the Seattle City Light electric power grid and distribute electric power to T-30 uses.

- b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in immediate vicinity that might be needed.**

Water, sewer, natural gas and refuse/recycling utilities are available to T-30 and the T-30 Substation Replacement site.

The proposed T-30 Substation Replacement Project, once operational, would not require or connect to water, sewer or natural gas systems at Terminal 30. The proposed new permanent Substation would connect to the Seattle City Light electric power grid and distribute electric power to T-30 uses.

C. SIGNATURES

The above answers are true and complete to the best of my knowledge.
I understand the lead agency is relying on them to make its decision.

Signature:

Danielle R. Butsick

Danielle Butsick, Senior Environmental Management Specialist

Date submitted:

October 15, 2021

Appendix A

GHG EMISSIONS WORKSHEET

City of Seattle Department of Planning and Development
SEPA GHG Emissions Worksheet
Version 1.7 12/26/07

Introduction

The Washington State Environmental Policy Act (SEPA) requires environmental review of development proposals that may have a significant adverse impact on the environment. If a proposed development is subject to SEPA, the project proponent is required to complete the SEPA Checklist. The Checklist includes questions relating to the development's air emissions. The emissions that have traditionally been considered cover smoke, dust, and industrial and automobile emissions. With our understanding of the climate change impacts of GHG emissions, the City of Seattle requires the applicant to also estimate these emissions.

Emissions created by Development

GHG emissions associated with development come from multiple sources:

- The extraction, processing, transportation, construction and disposal of materials and landscape disturbance (Embodied Emissions)
- Energy demands created by the development after it is completed (Energy Emissions)
- Transportation demands created by the development after it is completed (Transportation Emissions)

GHG Emissions Worksheet

This GHG Emissions Worksheet has been developed to assist applicants in answering the SEPA Checklist question relating to GHG emissions. The worksheet was originally developed by King County, but the City of Seattle and King County are working together on future updates to maintain consistency of methodologies across jurisdictions.

The SEPA GHG Emissions worksheet estimates all GHG emissions that will be created over the life span of a project. This includes emissions associated with obtaining construction materials, fuel used during construction, energy consumed during a buildings operation, and transportation by building occupants.

Using the Worksheet

1. Descriptions of the different residential and commercial building types can be found on the second tabbed worksheet ("Definition of Building Types"). If a development proposal consists of multiple projects, e.g. both single family and multi-family residential structures or a commercial development that consists of more than one type of commercial activity, the appropriate information should be estimated for each type of building or activity.

2. For paving, estimate the total amount of paving (in thousands of square feet) of the project.
3. The Worksheet will calculate the amount of GHG emissions associated with the project and display the amount in the "Total Emissions" column on the worksheet. The applicant should use this information when completing the SEPA checklist.
4. The last three worksheets in the Excel file provide the background information that is used to calculate the total GHG emissions.
5. The methodology of creating the estimates is transparent; if there is reason to believe that a better estimate can be obtained by changing specific values, this can and should be done. Changes to the values should be documented with an explanation of why and the sources relied upon.
6. Print out the "Total Emissions" worksheet and attach it to the SEPA checklist. If the applicant has made changes to the calculations or the values, the documentation supporting those changes should also be attached to the SEPA checklist.

Terminal 30 Substation Replacement Project

Section I: Buildings

Type (Residential) or Principal Activity (Commercial)	# Units	Square Feet (in thousands of square feet)	Emissions Per Unit or Per Thousand Square Feet (MTCO ₂ e)			Lifespan Emissions (MTCO ₂ e)
			Embodied	Energy	Transportation	
Single-Family Home.....	0		98	672	792	0
Multi-Family Unit in Large Building	0		33	357	766	0
Multi-Family Unit in Small Building	0		54	681	766	0
Mobile Home.....	0		41	475	709	0
Education		0.0	39	646	361	0
Food Sales		0.0	39	1,541	282	0
Food Service		0.0	39	1,994	561	0
Health Care Inpatient		0.0	39	1,938	582	0
Health Care Outpatient		0.0	39	737	571	0
Lodging		0.0	39	777	117	0
Retail (Other Than Mall).....		0.0	39	577	247	0
Office		0.0	39	723	588	0
Public Assembly		0.0	39	733	150	0
Public Order and Safety		0.0	39	899	374	0
Religious Worship		0.0	39	339	129	0
Service		0.0	39	599	266	0
Warehouse and Storage		0.0	39	352	181	0
Other		1.2	39	1,278	257	1889
Vacant		0.0	39	162	47	0

Section II: Pavement.....

Pavement.....		0.00				0
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Total Project Emissions:

1889

Definition of Building Types

Type (Residential) or Principal Activity (Commercial)	Description
Single-Family Home.....	Unless otherwise specified, this includes both attached and detached buildings
Multi-Family Unit in Large Building	Apartments in buildings with more than 5 units
Multi-Family Unit in Small Building	Apartments in building with 2-4 units
Mobile Home.....	
Education	Buildings used for academic or technical classroom instruction, such as elementary, middle, or high schools, and classroom buildings on college or university campuses. Buildings on education campuses for which the main use is not classroom are included in the category relating to their use. For example, administration buildings are part of "Office," dormitories are "Lodging," and libraries are "Public Assembly."
Food Sales	Buildings used for retail or wholesale of food.
Food Service	Buildings used for preparation and sale of food and beverages for consumption.
Health Care Inpatient	Buildings used as diagnostic and treatment facilities for inpatient care.
Health Care Outpatient	Buildings used as diagnostic and treatment facilities for outpatient care. Doctor's or dentist's office are included here if they use any type of diagnostic medical equipment (if they do not, they are categorized as an office building).
Lodging	Buildings used to offer multiple accommodations for short-term or long-term residents, including skilled nursing and other residential care buildings.
Retail (Other Than Mall).....	Buildings used for the sale and display of goods other than food.
Office	Buildings used for general office space, professional office, or administrative offices. Doctor's or dentist's office are included here if they do not use any type of diagnostic medical equipment (if they do, they are categorized as an outpatient health care building).
Public Assembly	Buildings in which people gather for social or recreational activities, whether in private or non-private meeting halls.
Public Order and Safety	Buildings used for the preservation of law and order or public safety.
Religious Worship	Buildings in which people gather for religious activities, (such as chapels, churches, mosques, synagogues, and temples).
Service	Buildings in which some type of service is provided, other than food service or retail sales of goods
Warehouse and Storage	Buildings used to store goods, manufactured products, merchandise, raw materials, or personal belongings (such as self-storage).
Other	Buildings that are industrial or agricultural with some retail space; buildings having several different commercial activities that, together, comprise 50 percent or more of the floorspace, but whose largest single activity is agricultural, industrial/ manufacturing, or residential; and all other miscellaneous buildings that do not fit into any other category.
Vacant	Buildings in which more floorspace was vacant than was used for any single commercial activity at the time of interview. Therefore, a vacant building may have some occupied floorspace.

Sources:

Residential 2001 Residential Energy Consumption Survey
 Square footage measurements and comparisons
<http://www.eia.doe.gov/emeu/recs/sqft-measure.html>

Commercial Commercial Buildings Energy Consumption Survey (CBECS),
 Description of CBECS Building Types
<http://www.eia.doe.gov/emeu/cbeecs/pba99/bldgtypes.html>

Embodied Emissions Worksheet

Section I: Buildings

Type (Residential) or Principal Activity (Commercial)	# thousand sq feet/ unit or building	Life span related embodied GHG missions (MTCO2e/ unit)	Life span related embodied GHG missions (MTCO2e/ thousand square feet) - See calculations in table below
Single-Family Home	2.53	98	39
Multi-Family Unit in Large Building	0.85	33	39
Multi-Family Unit in Small Building	1.39	54	39
Mobile Home	1.06	41	39
Education	25.6	991	39
Food Sales	5.6	217	39
Food Service	5.6	217	39
Health Care Inpatient	241.4	9,346	39
Health Care Outpatient	10.4	403	39
Lodging	35.8	1,386	39
Retail (Other Than Mall)	9.7	376	39
Office	14.8	573	39
Public Assembly	14.2	550	39
Public Order and Safety	15.5	600	39
Religious Worship	10.1	391	39
Service	6.5	252	39
Warehouse and Storage	16.9	654	39
Other	21.9	848	39
Vacant	14.1	546	39

Section II: Pavement

All Types of Pavement				50
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	Columns and Beams	Intermediate Floors	Exterior Walls	Windows	Interior Walls	Roofs	Total Embodied Emissions (MTCO2e)	Total Embodied Emissions (MTCO2e/ thousand sq feet)
Average GWP (lbs CO2e/sq ft): Vancouver, Low Rise Building	5.3	7.8	19.1	51.2	5.7	21.3		
Average Materials in a 2,272-square foot single family home	0.0	2269.0	3206.0	285.0	6050.0	3103.0		
MTCO2e	0.0	8.0	27.8	6.6	15.6	30.0	88.0	38.7

Sources

All data in black text King County, DNRP. Contact: Matt Kuharic, matt.kuharic@kingcounty.gov

Residential floorspace per unit 2001 Residential Energy Consumption Survey (National Average, 2001)
 Square footage measurements and comparisons
<http://www.eia.doe.gov/emeu/recs/sqft-measure.html>

Floorspace per building EIA, 2003 Commercial Buildings Energy Consumption Survey (National Average, 2003)
 Table C3. Consumption and Gross Energy Intensity for Sum of Major Fuels for Non-Mall Buildings, 2003
http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003excel/c3.xls

Average GWP (lbs CO2e/sq ft): Vancouver, Low Rise Building
 Athena EcoCalculator
 Athena Assembly Evaluation Tool v2.3- Vancouver Low Rise Building
 Assembly Average GWP (kg) per square meter
<http://www.athenasmi.ca/tools/ecocalculator/index.html>
 Lbs per kg 2.20
 Square feet per square meter 10.76

Average Materials in a 2,272-square foot single family home
 Buildings Energy Data Book: 7.3 Typical/Average Household
 Materials Used in the Construction of a 2,272-Square-Foot Single-Family Home, 2000
http://buildingsdatabook.eren.doe.gov/?id=view_book_table&TableID=2036&t=xls
 See also: NAHB, 2004 Housing Facts, Figures and Trends, Feb. 2004, p. 7.

Average window size Energy Information Administration/Housing Characteristics 1993
 Appendix B, Quality of the Data. Pg. 5.
<ftp://ftp.eia.doe.gov/pub/consumption/residential/rx93hcf.pdf>

Embodied GHG Emissions.....Worksheet Background Information

Buildings

Embodied GHG emissions are emissions that are created through the extraction, processing, transportation, construction and disposal of building materials as well as emissions created through landscape disturbance (by both soil disturbance and changes in above ground biomass).

Estimating embodied GHG emissions is new field of analysis; the estimates are rapidly improving and becoming more inclusive of all elements of construction and development.

The estimate included in this worksheet is calculated using average values for the main construction materials that are used to create a typical family home. In 2004, the National Association of Home Builders calculated the average materials that are used in a typical 2,272 square foot single-family household. The quantity of materials used is then multiplied by the average GHG emissions associated with the life-cycle GHG emissions for each material.

This estimate is a rough and conservative estimate; the actual embodied emissions for a project are likely to be higher. For example, at this stage, due to a lack of comprehensive data, the estimate does not include important factors such as landscape disturbance or the emissions associated with the interior components of a building (such as furniture).

King County realizes that the calculations for embodied emissions in this worksheet are rough. For example, the emissions associated with building 1,000 square feet of a residential building will not be the same as 1,000 square feet of a commercial building. However, discussions with the construction community indicate that while there are significant differences between the different types of structures, this method of estimation is reasonable; it will be improved as more data become available.

Additionally, if more specific information about the project is known, King County recommends two online embodied emissions calculators that can be used to obtain a more tailored estimate for embodied emissions: www.buildcarbonneutral.org and www.athenasmi.ca/tools/ecoCalculator/.

Pavement

Four recent life cycle assessments of the environmental impacts of roads form the basis for the per unit embodied emissions of pavement. Each study is constructed in slightly different ways; however, the aggregate results of the reports represent a reasonable estimate of the GHG emissions that are created from the manufacture of paving materials, construction related emissions, and maintenance of the pavement over its expected life cycle. For specifics, see the worksheet.

Special Section: Estimating the Embodied Emissions for Pavement

Four recent life cycle assessments of the environmental impacts of roads form the basis for the per unit embodied emissions of pavement. Each study is constructed in slightly different ways; however, the aggregate results of the reports represent a reasonable estimate of the GHG emissions that are created from the manufacture of paving materials, construction related emissions, and maintenance of the pavement over its expected life cycle.

The results of the studies are presented in different units and measures; considerable effort was undertaken to be able to compare the results of the studies in a reasonable way. For more details about the below methodology, contact matt.kuharic@kingcounty.gov.

The four studies, Meil (2001), Park (2003), Stripple (2001) and Treolar (2001) produced total GHG emissions of 4-34 MTCO₂e per thousand square feet of finished paving (for similar asphalt and concrete based pavements). This estimate does not include downstream maintenance and repair of the highway. The average (for all concrete and asphalt pavements in the studies, assuming each study gets one data point) is ~17 MTCO₂e/thousand square feet.

Three of the studies attempted to thoroughly account for the emissions associated with long term maintenance (40 years) of the roads. Stripple (2001), Park et al. (2003) and Treolar (2001) report 17, 81, and 68 MTCO₂e/thousand square feet, respectively, after accounting for maintenance of the roads.

Based on the above discussion, King County makes the conservative estimate that 50 MTCO₂e/thousand square feet of pavement (over the development's life cycle) will be used as the embodied emission factor for pavement until better estimates can be obtained. This is roughly equivalent to 3,500 MTCO₂e per lane mile of road (assuming the lane is 13 feet wide).

It is important to note that these studies estimate the embodied emissions for roads. Paving that does not need to stand up to the rigors of heavy use (such as parking lots or driveways) would likely use less materials and hence have lower embodied emissions.

Sources:

Meil, J. A Life Cycle Perspective on Concrete and Asphalt Roadways: Embodied Primary Energy and Global Warming Potential. 2006. Available: [http://www.cement.ca/cement.nsf/eee9ec7bbd630126852566c40052107b/6ec79dc8ae03a782852572b90061b914/\\$FILE/ATTK0WE3/athena%20report%20Feb.%202%202007.pdf](http://www.cement.ca/cement.nsf/eee9ec7bbd630126852566c40052107b/6ec79dc8ae03a782852572b90061b914/$FILE/ATTK0WE3/athena%20report%20Feb.%202%202007.pdf)

Park, K, Hwang, Y., Seo, S., M.ASCE, and Seo, H. , "Quantitative Assessment of Environmental Impacts on Life Cycle of Highways," Journal of Construction Engineering and Management , Vol 129, January/February 2003, pp 25-31, (DOI: 10.1061/(ASCE)0733-9364(2003)129:1(25)).

Stripple, H. Life Cycle Assessment of Road. A Pilot Study for Inventory Analysis. Second Revised Edition. IVL Swedish Environmental Research Institute Ltd. 2001. Available: <http://www.ivl.se/rappporter/pdf/B1210E.pdf>

Treolar, G., Love, P.E.D., and Crawford, R.H. Hybrid Life-Cycle Inventory for Road Construction and Use. Journal of Construction Engineering and Management. P. 43-49. January/February 2004.

Energy Emissions Worksheet

Type (Residential) or Principal Activity (Commercial)	Energy consumption per building per year (million Btu)	Carbon Coefficient for Buildings	MTCO2e per building per year	Floorspace per Building (thousand square feet)	MTCE per thousand square feet per year	MTCO2e per thousand square feet per year	Average Building Life Span	Lifespan Energy Related MTCO2e emissions per unit	Lifespan Energy Related MTCO2e emissions per thousand square feet
Single-Family Home.....	107.3	0.108	11.61	2.53	4.6	16.8	57.9	672	266
Multi-Family Unit in Large Building	41.0	0.108	4.44	0.85	5.2	19.2	80.5	357	422
Multi-Family Unit in Small Building	78.1	0.108	8.45	1.39	6.1	22.2	80.5	681	489
Mobile Home.....	75.9	0.108	8.21	1.06	7.7	28.4	57.9	475	448
Education	2,125.0	0.124	264.2	25.6	10.3	37.8	62.5	16,526	646
Food Sales	1,110.0	0.124	138.0	5.6	24.6	90.4	62.5	8,632	1,541
Food Service	1,436.0	0.124	178.5	5.6	31.9	116.9	62.5	11,168	1,994
Health Care Inpatient	60,152.0	0.124	7,479.1	241.4	31.0	113.6	62.5	467,794	1,938
Health Care Outpatient	985.0	0.124	122.5	10.4	11.8	43.2	62.5	7,660	737
Lodging	3,578.0	0.124	444.9	35.8	12.4	45.6	62.5	27,826	777
Retail (Other Than Mall).....	720.0	0.124	89.5	9.7	9.2	33.8	62.5	5,599	577
Office	1,376.0	0.124	171.1	14.8	11.6	42.4	62.5	10,701	723
Public Assembly	1,338.0	0.124	166.4	14.2	11.7	43.0	62.5	10,405	733
Public Order and Safety	1,791.0	0.124	222.7	15.5	14.4	52.7	62.5	13,928	899
Religious Worship	440.0	0.124	54.7	10.1	5.4	19.9	62.5	3,422	339
Service	501.0	0.124	62.3	6.5	9.6	35.1	62.5	3,896	599
Warehouse and Storage	764.0	0.124	95.0	16.9	5.6	20.6	62.5	5,942	352
Other	3,600.0	0.124	447.6	21.9	20.4	74.9	62.5	27,997	1,278
Vacant	294.0	0.124	36.6	14.1	2.6	9.5	62.5	2,286	162

Sources

All data in black text

King County, DNRP. Contact: Matt Kuharic, matt.kuharic@kingcounty.gov

Energy consumption for residential buildings

2007 Buildings Energy Data Book: 6.1 Quad Definitions and Comparisons (National Average, 2001)
 Table 6.1.4: Average Annual Carbon Dioxide Emissions for Various Functions
<http://buildingsdatabook.eren.doe.gov/>
 Data also at: http://www.eia.doe.gov/emeu/recs/recs2001_ce/ce1-4c_housingunits2001.html

Energy consumption for commercial buildings and Floorspace per building

EIA, 2003 Commercial Buildings Energy Consumption Survey (National Average, 2003)
 Table C3. Consumption and Gross Energy Intensity for Sum of Major Fuels for Non-Mall Buildings, 2003
http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003excel/c3.xls

Note: Data in plum color is found in both of the above sources (buildings energy data book and commercial buildings energy consumption survey).

Carbon Coefficient for Buildings

Buildings Energy Data Book (National average, 2005)
 Table 3.1.7. 2005 Carbon Dioxide Emission Coefficients for Buildings (MMTCE per Quadrillion Btu)
http://buildingsdatabook.eere.energy.gov/?id=view_book_table&TableID=2057
 Note: Carbon coefficient in the Energy Data book is in MTCE per Quadrillion Btu.
 To convert to MTCO2e per million Btu, this factor was divided by 1000 and multiplied by 44/12.

Residential floorspace per unit

2001 Residential Energy Consumption Survey (National Average, 2001)
 Square footage measurements and comparisons
<http://www.eia.doe.gov/emeu/recs/sqft-measure.html>

average life span of buildings,
estimated by replacement time method

	Single Family Homes	Multi-Family Units in Large and Small Buildings	All Residential Buildings
New Housing Construction, 2001	1,273,000	329,000	1,602,000
Existing Housing Stock, 2001	73,700,000	26,500,000	100,200,000
Replacement time:	57.9	80.5	62.5

(national average, 2001)

Note: Single family homes calculation is used for mobile homes as a best estimate life span.
 Note: At this time, KC staff could find no reliable data for the average life span of commercial buildings.
 Therefore, the average life span of residential buildings is being used until a better approximation can be ascertained.

Sources:

New Housing Construction,
 2001 Quarterly Starts and Completions by Purpose and Design - US and Regions (Excel)
http://www.census.gov/const/quarterly_starts_completions_cust.xls
 See also: <http://www.census.gov/const/www/newresconstindex.html>

Existing Housing Stock,
 2001 Residential Energy Consumption Survey (RECS) 2001
 Tables HC1:Housing Unit Characteristics, Million U.S. Households 2001
 Table HC1-4a. Housing Unit Characteristics by Type of Housing Unit, Million U.S. Households, 2001
 Million U.S. Households, 2001
http://www.eia.doe.gov/emeu/recs/recs2001/hc_pdf/housunits/hc1-4a_housingunits2001.pdf

Transportation Emissions Worksheet

Type (Residential) or Principal Activity (Commercial)	# people/ unit or building	# thousand sq feet/ unit or building	# people or employees/ thousand square feet	vehicle related GHG emissions (metric tonnes CO2e per person per year)	MTCO2e/ year/ unit	MTCO2e/ thousand square feet	Average Building Life Span	Life span transportation related GHG emissions (MTCO2e/ per unit)	Life span transportation related GHG emissions (MTCO2e/ thousand sq feet)
Single-Family Home.....	2.8	2.53	1.1	4.9	13.7	5.4	57.9	792	313
Multi-Family Unit in Large Building	1.9	0.85	2.3	4.9	9.5	11.2	80.5	766	904
Multi-Family Unit in Small Building	1.9	1.39	1.4	4.9	9.5	6.8	80.5	766	550
Mobile Home.....	2.5	1.06	2.3	4.9	12.2	11.5	57.9	709	668
Education	30.0	25.6	1.2	4.9	147.8	5.8	62.5	9247	361
Food Sales	5.1	5.6	0.9	4.9	25.2	4.5	62.5	1579	282
Food Service	10.2	5.6	1.8	4.9	50.2	9.0	62.5	3141	561
Health Care Inpatient	455.5	241.4	1.9	4.9	2246.4	9.3	62.5	140506	582
Health Care Outpatient	19.3	10.4	1.9	4.9	95.0	9.1	62.5	5941	571
Lodging	13.6	35.8	0.4	4.9	67.1	1.9	62.5	4194	117
Retail (Other Than Mall).....	7.8	9.7	0.8	4.9	38.3	3.9	62.5	2394	247
Office	28.2	14.8	1.9	4.9	139.0	9.4	62.5	8696	588
Public Assembly	6.9	14.2	0.5	4.9	34.2	2.4	62.5	2137	150
Public Order and Safety	18.8	15.5	1.2	4.9	92.7	6.0	62.5	5796	374
Religious Worship	4.2	10.1	0.4	4.9	20.8	2.1	62.5	1298	129
Service	5.6	6.5	0.9	4.9	27.6	4.3	62.5	1729	266
Warehouse and Storage	9.9	16.9	0.6	4.9	49.0	2.9	62.5	3067	181
Other	18.3	21.9	0.8	4.9	90.0	4.1	62.5	5630	257
Vacant	2.1	14.1	0.2	4.9	10.5	0.7	62.5	657	47

Sources

All data in black text

King County, DNRP. Contact: Matt Kuharic, matt.kuharic@kingcounty.gov

people/ unit

Estimating Household Size for Use in Population Estimates (WA state, 2000 average)
 Washington State Office of Financial Management
 Kimpel, T. and Lowe, T. Research Brief No. 47. August 2007
<http://www.ofm.wa.gov/researchbriefs/brief047.pdf>
 Note: This analysis combines Multi Unit Structures in both large and small units into one category; the average is used in this case although there is likely a difference

Residential floorspace per unit

2001 Residential Energy Consumption Survey (National Average, 2001)
 Square footage measurements and comparisons
<http://www.eia.doe.gov/emeu/recs/sqft-measure.html>

employees/thousand square feet

Commercial Buildings Energy Consumption Survey commercial energy uses and costs (National Median, 2003)
 Table B2 Totals and Medians of Floorspace, Number of Workers, and Hours of Operation for Non-Mall Buildings, 2003
http://www.eia.doe.gov/emeu/cbeccs/cbeccs2003/detailed_tables_2003/2003set1/2003excel/b2.xls

Note: Data for # employees/thousand square feet is presented by CBECS as square feet/employee.
 In this analysis employees/thousand square feet is calculated by taking the inverse of the CBECS number and multiplying by 1000.

vehicle related GHG emissions

Estimate calculated as follows (Washington state, 2006)_

56,531,930,000 2006 Annual WA State Vehicle Miles Traveled
Data was daily VMT. Annual VMT was 365*daily VMT.
<http://www.wsdot.wa.gov/mapsdata/tdo/annualmileage.htm>

6,395,798 2006 WA state population
<http://quickfacts.census.gov/qfd/states/53000.html>

8839 vehicle miles per person per year

0.0506 gallon gasoline/mile

This is the weighted national average fuel efficiency for all cars and 2 axle, 4 wheel light trucks in 2005. This includes pickup trucks, vans and SUVs. The 0.051 gallons/mile used here is the inverse of the more commonly known term "miles/per gallon" (which is 19.75 for these cars and light trucks).
Transportation Energy Data Book. 26th Edition. 2006. Chapter 4: Light Vehicles and Characteristics. Calculations based on weighted average MPG efficiency of cars and light trucks.

http://cta.ornl.gov/data/tedb26/Edition26_Chapter04.pdf

Note: This report states that in 2005, 92.3% of all highway VMT were driven by the above described vehicles.

http://cta.ornl.gov/data/tedb26/Spreadsheets/Table3_04.xls

24.3 lbs CO2e/gallon gasoline

The CO2 emissions estimates for gasoline and diesel include the extraction, transport, and refinement of petroleum as well as their combustion.

Life-Cycle CO2 Emissions for Various New Vehicles. RENew Northfield.

Available: <http://renewnorthfield.org/wpcontent/uploads/2006/04/CO2%20emissions.pdf>

Note: This is a conservative estimate of emissions by fuel consumption because diesel fuel, with a emissions factor of 26.55 lbs CO2e/gallon was not estimated.

2205

4.93 lbs/metric tonne

vehicle related GHG emissions (metric tonnes CO2e per person per year)

average life span of buildings, estimated
by replacement time method

See Energy Emissions Worksheet for Calculations

Commercial floorspace per unit

EIA, 2003 Commercial Buildings Energy Consumption Survey (National Average, 2003)
Table C3. Consumption and Gross Energy Intensity for Sum of Major Fuels for Non-Mall Buildings, 2003
http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003excel/c3.xls