

Harborton 230 kV Alternatives Analysis

For:

Portland General Electric (PGE)

Portland, Oregon

Version 1

10/24/2022

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Introduction

Portland General Electric (PGE) seeks to reconfigure the Evergreen-St Marys-Trojan 230 kV transmission line and add an additional 230 kV source to its Harborton Substation. These upgrades increase resiliency and reliability of its electric transmission system. Operation of three-terminal transmission lines like Evergreen-St Marys-Trojan create larger outage vulnerabilities, since planned or unplanned outages on one section or terminal affect the other two lines and terminals.

The reconfiguration of the Harborton 230 kV system can also be achieved by either:

- A) utilizing the existing easement to construct the Harborton-St Marys 230 kV line on the existing double-circuit transmission line, tapping into the three-terminal line north of the preferred route, and constructing a double-circuit 230 kV line, or
- B) constructing two single-circuit 230 kV lines to Harborton Substation creating the Harborton-Trojan #1 230 kV line and the Harborton-Trojan #2 230 kV line.

PGE therefore proposes to reconfigure this three-terminal transmission line with three (3) two-terminal transmission lines. Those reconfigured lines will be Evergreen-Harborton 230 kV and Harborton-St Marys 230 kV, with a new Harborton-Trojan #2 230 kV. The existing three-terminal line runs near Harborton Substation, but new sections of 230 kV line must be constructed to complete the system reconfiguration.

Looping the Evergreen-St Marys-Trojan 230 kV line into Harborton Substation will mitigate NERC TPL-001-4 category P1, P6, and P7¹ outages identified in PGE's Annual Transmission Assessment. Constructing the three (3) two-terminal transmission lines is critical to meeting local and regional system reliability needs. Without completing this work, PGE system operators may be forced to shed load in the Portland area during hot summer conditions. As system load grows, the impact of outages to grid operations and customers from the existing vulnerabilities also increases.

The preferred route makes use of an existing easement to reach the Evergreen-St Marys-Trojan 230 kV junction located nearby in Forest Park. Forest Park is owned and administered by the City of Portland, extending several miles south of Harborton Substation and approximately half a mile to the north. The Willamette River borders the site immediately to the east. Considering this geography, no readily apparent alternate corridors exist for the project. Owing to the potential impact to natural resources in Forest Park, this study attempts to identify potential routes for the Harborton-Trojan #1 230 kV and Harborton-Trojan #2 230 kV system reconfiguration and assess impediments to route feasibility.

¹ NERC TPL-001-4 category P1 is an N-1 contingency that reconfigures the transmission system for the loss of any single line, transformer, or capacitor. Category P6 is an N-1-1 contingency that reconfigures the transmission system for the loss of a combination any two lines, transformers, or capacitors. Category P7 is an N-2 contingency that reconfigures the transmission system for the loss of any common transmission structures that may affect two or more lines.

Preferred Route

The preferred route is approximately 1,800 feet and uses a vacant corridor within an easement granted by the City of Portland to PGE in 1971 for transmission of electric power. The land is immediately across US Highway 30 from Harborton Substation and contains the Evergreen-St Marys-Trojan 230 kV junction. It lies within the City of Portland's Forest Park, which holds many public and natural resources. New construction in Forest Park may be subject to City-administered Natural Resources Management Plan requirements, which would be determined during land use and environmental reviews conducted by City staff and subject to public intervention.

PGE maintains a right-of-way (ROW) between the Evergreen-St Marys-Trojan 230 kV line and Harborton Substation that is wide enough to accommodate two (2) double-circuit 230 kV transmission lines. This ROW contains one (1) double-circuit transmission line which supports the Harborton-Trojan #2 230 kV and St Marys-Wacker 115 kV lines. The St Marys-Wacker 115 kV transmission line will be reconfigured as part of the Harborton Reliability Project. First, a new Harborton-Wacker 115 kV line will be constructed. Then, the section of the St Marys-Wacker 115 kV transmission line between the Evergreen-St Marys-Trojan 230 kV line and Harborton Substation will be permanently deenergized. This section of the St Marys-Wacker 115 kV line will then be repurposed as one of the three (3) two-terminal 230 kV lines. The other two (2) two-terminal 230 kV transmission lines can be constructed adjacent to the existing line in the ROW. This requires construction of approximately 1,800 feet of new transmission line. The preferred configuration contains NERC TPL-001-4 category P7 (common tower) contingencies, but these same contingencies already exist on the system. There is no significant new NERC reliability exposure created by construction of the short line segments proposed, and significant reliability improvements gained by eliminating the three-terminal line.

Methodology

For this alternatives analysis, a Project Area was defined, and distinct route alternatives were created to connect a termination point on the Trojan 230 kV ROW and Harborton Substation. Data for criteria that could be an impediment to securing a feasible route alternative was collected from various agencies or digitized from satellite imagery and street view photographs. A site visit with engineering and construction personnel was conducted to inform impediment classifications. Impediments to these criteria were classified as Mild, Moderate, or Severe Impediments.

Project Area

The Project Area is bounded by the Multnomah Channel and Willamette River to the east, the PGE transmission river crossings to the south, the existing Harborton-Trojan #1 230 kV transmission line to the west, and the Sauvie Island Bridge and Knife River Angell Quarry to the north. This forms a narrow corridor ranging from 770 feet to 2,900 feet wide and 1.3 miles long. Within this Project Area, there is an existing PGE Harborton-St Helens 115 kV transmission line along the east side of NW Marina Way as depicted in Figure 1 below.

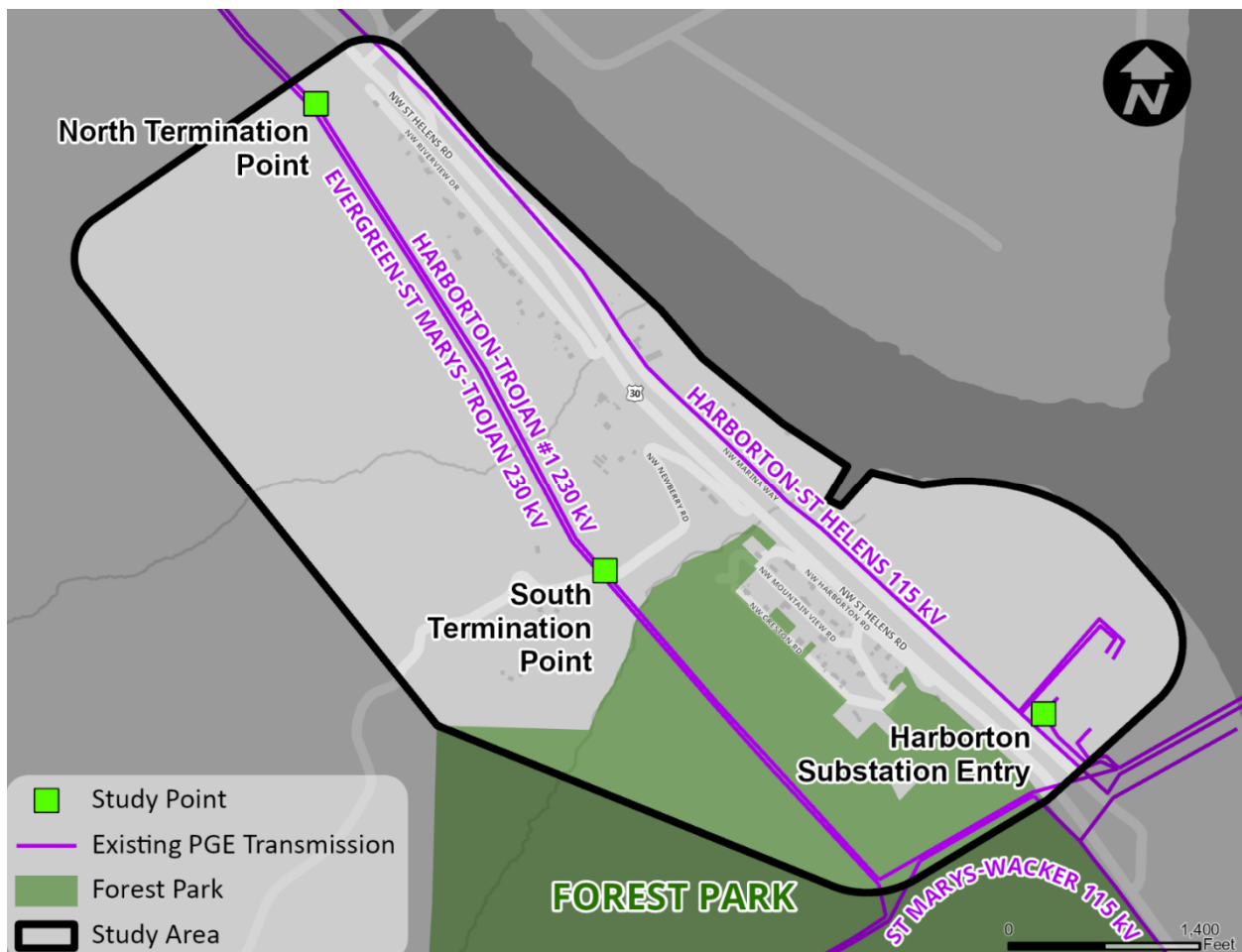


Figure 1: Existing Transmission Facilities

Route Alternative Creation

Besides the Preferred Route, eight (8) potential route alternatives were considered: four (4) alternatives with a termination point in the north and four (4) alternatives with a termination point in the south. For each termination point, the four (4) alternatives evaluate corridors in either private or public ROW on either the west side of Highway 30 or private or public ROW on the east side of Highway 30.

Placement on private property, either on land owned outright or within exclusive easements, is preferred. Transmission poles located on public ROW may still encumber private properties due to the required ROW width. Once the facilities are constructed, they can operate without modification for long periods of time. The public agencies responsible for public ROW can require a utility owner to move its facilities. Road widening and realignment projects are a typical cause for such a requirement. Besides the significant added expense of such work, relocations may require extended outages, impacting short-term reliability and modifying 230 kV bulk transmission grid components which exposes grid operations to risk.

For this study, a double-circuit 230 kV transmission line is assumed to require a ROW width of 80 feet. Single-circuit 115 kV transmission lines require a ROW width of 35 feet. The 115 kV corridor width is significant because PGE operates a 115 kV circuit in the Project Area. Two (2) of the route alternatives might utilize portions of this 115 kV corridor and may require relocating the 115 kV circuit to one of the other route alternatives.

Impediment Classification

Impediments to the route alternatives were classified as either Mild, Moderate, or Severe Impediments. Mild Impediments are those that pose no significant challenge to securing the necessary easements and permits to construct and energize a transmission line along the route alternative. Moderate Impediments pose challenges that may cause additional engineering, cost, or project delay and should be tracked throughout the detailed design and ROW acquisition phases. Severe Impediments are major challenges that are expected to block the success of the project based on industry experience. For any given route alternative and impediment criteria, classification as a Moderate or Severe Impediment are narratively described later in this report.

The presence of any unmitigated Severe Impediment renders a route alternative infeasible, as seen in the Summary entries in Table 1 and Table 2. If a mitigation is judged to be possible, a Severe or Moderate Impediment may be downgraded to a lower impediment classification. Tables 1 shows the results for each route alternative before potential mitigations are applied. Table 2 shows the results for each route alternative if the proposed mitigation can be achieved.

Description of Alternatives

North Termination Point Alternatives

The Trojan ROW runs closest to Highway 30 in this area. The North Termination Point was selected to optimize connecting segment length with several geographic and land use features. The shortest lateral distance is about 340 feet and occurs 1,200 feet north of the chosen termination point. That lateral distance is only marginally shorter, though, and reaching that point would entail a new overhead line crossing of the Sauvie Island Bridge. NW Riverview Drive is a long, dead-end road which runs parallel to and on the west side of Highway 30. It provides access to several residential properties. Placing the termination point any further south would entail crossing over residential properties and structures.

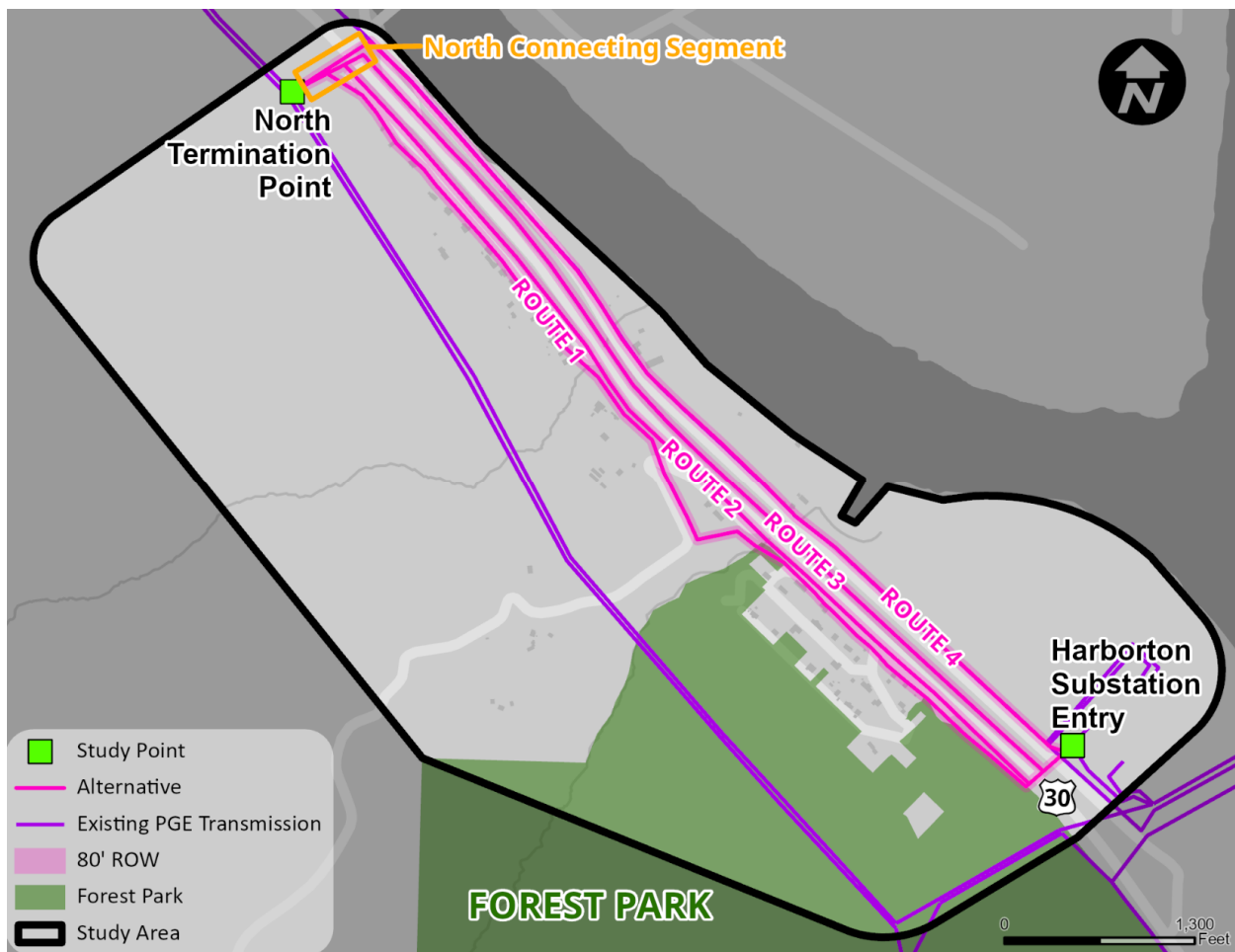


Figure 2: Route Alternatives Originating from North Termination Point

North Connecting Segment

The following Alternatives 1 through 4 are all dependent on a transmission line segment from the North Termination Point to the Highway 30 area while going approximately 440 feet across country (see Figure 2). This termination point was selected due to its proximity to Highway 30 and avoiding a transmission line crossing the Sauvie Island bridge. This connecting segment is described separately here so as to not repeat its narrative for each of the four (4) route alternatives that originate at the North Termination Point – its length is included in Alternatives 1 through 4.

Alternative 1

Private ROW, West of Highway 30, North + South

Alternative 1 connects to the Evergreen-St Marys-Trojan 230 kV transmission line near Sauvie Island Bridge. The route follows the west side of Highway 30 but transmission poles would be placed on private property outside of the public ROW. Near Harborton Substation, Alternative 1 crosses Highway 30, the railroad, and NW Marina Way to terminate in Harborton Substation. Alternative 1 is 1.46 miles in length and affects forty-seven (47) parcels, including the North Connecting Segment.

Alternative 2

Public ROW, West of Highway 30, North + South

Alternative 2 connects to the Evergreen-St Marys-Trojan 230 kV transmission line near Sauvie Island Bridge. The route follows the west side of Highway 30 predominantly using public ROW controlled by the Oregon Department of Transportation (ODOT). Near Harborton Substation, Alternative 2 crosses Highway 30, the railroad, and NW Marina Way to terminate in Harborton Substation. Alternative 2 is 1.44 miles in length and affects thirteen (13) parcels, including the North Connecting Segment.

Alternative 3

Public ROW, East of Highway 30, North + South

Alternative 3 connects to the Evergreen-St Marys-Trojan 230 kV transmission line near Sauvie Island Bridge and then crosses over Highway 30 to the east side. The route follows Highway 30 in the public ROW controlled by the ODOT. Alternative 3 avoids railroad property, as the owner would likely not grant permission for a transmission line running parallel to the tracks with so little lateral separation. Near Harborton Substation, Alternative 3 crosses the railroad and NW Marina Way to terminate in Harborton Substation. Alternative 3 is 1.44 miles in length and affects nine (9) parcels, including the North Connecting Segment.

Alternative 4

Private ROW, East of Highway 30, North + South

Alternative 4 connects to the Evergreen-St Marys-Trojan 230 kV transmission line near Sauvie Island Bridge and crosses Highway 30, and the railroad to the east side of NW Marina Way. Alternative 4 follows NW Marina Way along its east side but transmission poles would be placed on private property outside of the public ROW. This route alternative is co-located with PGE's Harborton-St Helens 115 kV transmission line. Use of this route alternative would require finding a separate route for the Harborton-St Helens 115 kV transmission line. Alternative 4 is 1.42 miles in length and affects eighteen (18) parcels, including the North Connecting Segment.

South Termination Point Alternatives

The Trojan ROW crosses NW Newberry Rd near the South Termination Point. The South Termination Point was chosen to avoid Forest Park but connect back to the Trojan ROW with as little new line length as practical. The park boundary is near but south of NW Newberry Road. There are many residential properties both north and south of NW Newberry, but sufficient undeveloped, albeit heavily forested, land exists for the 80-foot-wide study corridor between Highway 30 and the South Termination Point.

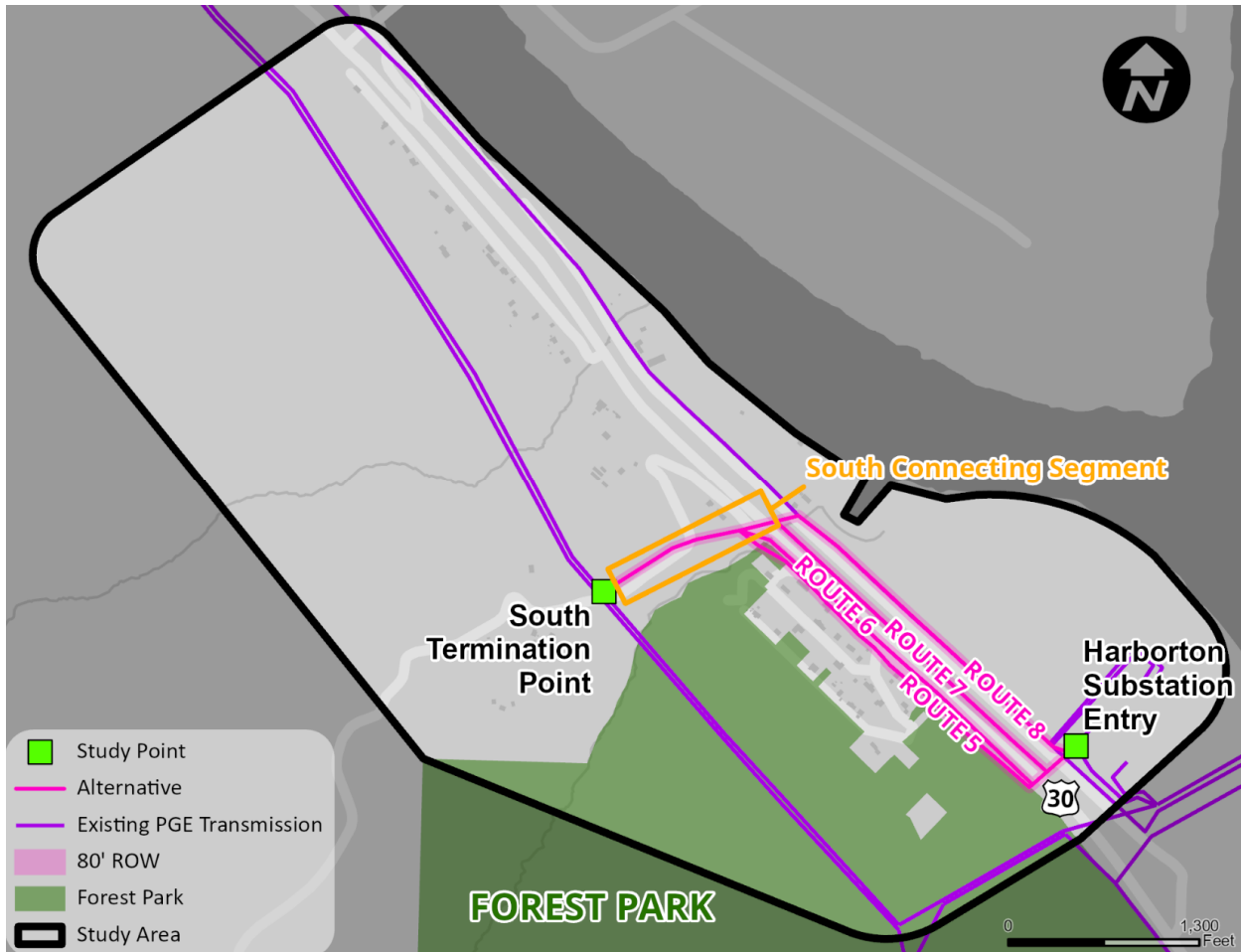


Figure 3: Route Alternatives Originating from South Termination Point

South Connecting Segment

The South Connecting Segment is approximately 1,200 feet long and experiences 250 feet of elevation change. It crosses NW Newberry Rd multiple times to avoid large angles that may require more expense and more easement area for larger foundations or guy wires. The termination point in the Trojan ROW is north of NW Newberry Rd. The following Alternatives 5 through 8 are all dependent on a transmission line segment from the South Termination Point to the Highway 30 area while generally following NW Newberry Rd (See Figure 3). This connecting segment is described separately here so as to not repeat its narrative for each of the four (4) route alternatives that originate at the South Termination Point – its length is included in Alternatives 5 through 8.

Alternative 5

Private ROW, West of Highway 30, South

Alternative 5 connects to the Evergreen-St Marys-Trojan 230 kV transmission line near NW Newberry Rd. The route follows Highway 30 along the west side, but transmission poles would be placed on private property outside of the public ROW. Near Harborton Substation, Alternative 5 crosses Highway 30, the railroad, and NW Marina Way to terminate in Harborton Substation. Alternative 5 is 0.77 miles in length and affects twenty (20) parcels, including the South Connecting Segment.

Alternative 6

Public ROW, West of Highway 30, South

Alternative 6 connects to the Evergreen-St Marys-Trojan 230 kV transmission line near NW Newberry Rd. The route follows the west side of Highway 30 predominantly using public ROW controlled by ODOT. Near Harborton Substation, Alternative 6 crosses Highway 30, the railroad, and NW Marina Way to terminate in Harborton Substation. Alternative 6 is 0.77 miles in length and affects nine (9) parcels, including the South Connecting Segment.

Alternative 7

Public ROW, East of Highway 30, South

Alternative 7 connects to the Evergreen-St Marys-Trojan 230 kV transmission line near NW Newberry Rd and crosses Highway 30 to the east side. The route follows Highway 30 in the public ROW controlled by ODOT. Alternative 7 avoids railroad property, as the owner would likely not grant permission for a transmission line running parallel to the tracks with so little lateral separation. Near Harborton Substation, Alternative 7 crosses the railroad and NW Marina Way to terminate in Harborton Substation. Alternative 7 is 0.77 miles in length and affects five (5) parcels, including the South Termination Point Segment.

Alternative 8

Private ROW, East of Highway 30, South

Alternative 8 connects to the Evergreen-St Marys-Trojan 230 kV transmission line near NW Newberry Rd and crosses Highway 30 and the railroad to the east side of NW Marina Way. Alternative 8 follows NW Marina Way along its east side but transmission poles would be placed on private property outside of the public ROW. This route alternative is co-located PGE's Harborton-St Helens 115 kV transmission line. Use of this route alternative would require finding a separate route for the Harborton-St Helens 115 kV transmission line. Alternative 8 is 0.75 miles in length and affects nine (9) parcels, including the South Connecting Segment.

Description of Impediments

Maps for each of the following Impediment categories can be found in the Appendix.

Building Proximity

Buildings were digitized based on satellite imagery, then further categorized into Residential Buildings and Non-Residential Buildings based on satellite and street view imagery.

Residential Buildings within the route alternatives' approximate centerlines were classified as a Severe Impediment. Residential Buildings within the 80-foot ROW were classified as a Severe Impediment but may be downgraded to a Moderate Impediment if landowner consent can be attained and detailed engineering design may meet any national, state, and local codes.

Residential Buildings within 200 feet of the alternative route were classified as a Moderate Impediment. Non-Residential Buildings within the route alternative's centerline were classified as a Moderate Impediment.

Harborton Conservation Area

PGE recently completed a wetland habitat restoration project on a large parcel of land adjacent to Harborton Substation. This parcel is protected from future development by formal agreements with various agencies and conservation groups. Under the terms of these agreements, a new transmission line with a larger easement area than the 115 kV transmission line may not be permitted crossing the Harborton Conservation Area.

Impacting the Harborton Conservation Area was classified as a Severe Impediment.

Floodplain

FEMA 100-year and 500-year floodplains were mapped relative to the route alternatives. Floodplains are an impediment to transmission line routing due to the risk the high water pose to the soils anchoring the transmission structure foundation. High floodwaters also make maintenance access difficult during storm restoration. When constructing a transmission line, the flood plain may be spanned where possible so that no transmission poles are embedded in the flood plain. In scenarios where that is not possible, additional foundation design, such as piers or vibratory caissons, can mitigate the threat of floodwaters to transmission structures, and matting can be installed to temporarily allow crew access through the floodplain.

Spannable floodplains where the crossing was 700 feet or less were determined to be a Mild Impediment. Floodplain crossings greater than 700 feet were determined to be a Moderate Impediment. Spans greater than 700 feet may be feasible but would require additional engineering and larger ROW.

Landslide Hazard

The Oregon Department of Geology and Mineral Industries (DOGAMI) maintains the Statewide Landslide Information Database for Oregon (SLIDO) which was imported into the Project Area. The Project Area contains Low, Moderate, and High susceptibility to landslides. Route alternatives that run perpendicular to the slope for significant distances are at greater risk of structural foundations weakened by landslides.

Landslide Hazard Very High susceptibility was classified as a Severe Impediment. Landslide Hazard High susceptibility was classified as a Moderate Impediment. Moderate susceptibility was classified as a Mild Impediment.

Railroad Proximity

Portland & Western Railroad owns a railroad that bisects the Project Area. All route alternatives must cross this railroad. Railroad crossings require a permit from the owner. A perpendicular crossing is more likely to be granted if clearance height is sufficient to avoid impacting railroad operations. Railroad operations use the metal rails to transmit a low voltage electric signal for routine railroad operations. Transmission lines that closely parallel railroads may induce a separate electrical signal onto the rails, degrading the railroad's communication signal. If Portland & Western Railroad believes this to be a possibility, they are unlikely to grant a railroad crossing permit. Therefore, route alternatives closely paralleling the railroad should maintain at least 50 feet of separation.

Railroad Proximity was determined to be a Severe Impact for route alternatives that parallel the railroad within 50 feet laterally for a distance greater than 200 feet.

Pipeline Proximity

The Project Area contains two notable underground pipelines: one carrying natural gas and one carrying hazardous liquids. The immediate concern with buried pipelines is the inability to co-locate embedded transmission poles due to physical interference and safe working space. In some areas, the transmission centerline may be shifted to avoid this. Another concern is induced voltage that may require cathodic protection be added to the pipeline.

Co-located transmission poles with buried pipelines were determined to be a Severe Impediment. If room allows for moving the transmission pole at least 15 feet from the buried pipeline to mitigate this, then the impediment is downgraded to a Moderate Impediment. Approval would ultimately be required from the pipeline owner and may require additional studies.



Wetland

Formally-delineated wetlands occur within the Project Area. Impact of delineated wetlands is subject to permitting by the United States Army Corps of Engineers (USACOE), Oregon Department of State Lands (ODSL), and Oregon Department of Environmental Quality (ODEQ). A pre-consultation with all three agencies will determine which category of wetland permit is required and which agency will take the lead.

Transmission poles embedded in wetlands have the potential to impact this habitat and are to be avoided. However, aerial transmission lines may span the wetlands with no permanent impact. The removal-fill process² should be followed when decommissioning existing poles or installing new poles.

No Endangered Species were identified in the Project Area – if they were, a separate impediment criterion for Endangered Species would have been included.

Spannable wetlands where the crossing was 700 feet or less were determined to be a Mild Impediment. Wetland crossings greater than 700 feet were determined to be a Moderate Impediment. Spans greater than 700 feet may be accommodated but would require additional engineering and larger ROW. Impacts to the wetlands may be mitigated by acquiring the required permits and following agency processes.

Land Use Zoning

There are five (5) main zoning designations in the Project Area as determined by unincorporated Multnomah County: Single Family Residential, Rural Residential, Exclusive Farm Use, Parks & Open Spaces, and Heavy Industrial. Exclusive Farm Use and Parks & Open Spaces require a Conditional Use permit for transmission lines. Heavy Industrial, Rural Residential, and Single Family Residential have no such constraint. It is common practice to seek Conditional Use permits for transmission lines.

Exclusive Farm Use and Parks & Open Spaces were determined to be a Moderate Impediment. Securing a Conditional Use permit downgrades these zoning designations to a Mild Impediment. Heavy Industrial, Rural Residential, and Single-Family Residential zones were determined to be a Mild Impediment.

² Removal-Fill Guide - <https://www.oregon.gov/dsl/WW/Pages/Permits.aspx#fd66a24c-16e0-48a2-abc9-67210d97e605>



Forest Park Proximity

Alternative routes to the Preferred Route are being examined due to the Preferred Route's impact on Forest Park. Routing a transmission line through any portion of Forest Park would require clearing of trees within the ROW which is undesirable to the City of Portland.

Forest Park Proximity was determined to be a Severe Impediment where the ROW overlaps with the park boundaries. Forest Park Proximity was determined to be a Moderate Impediment if the route is close enough that "danger trees" are located inside Forest Park. A danger tree is one that, although outside the ROW, is tall enough that if it fell it could impact the transmission wires (see Figure 4 below). PGE manages vegetation and trees in all its transmission ROW³.

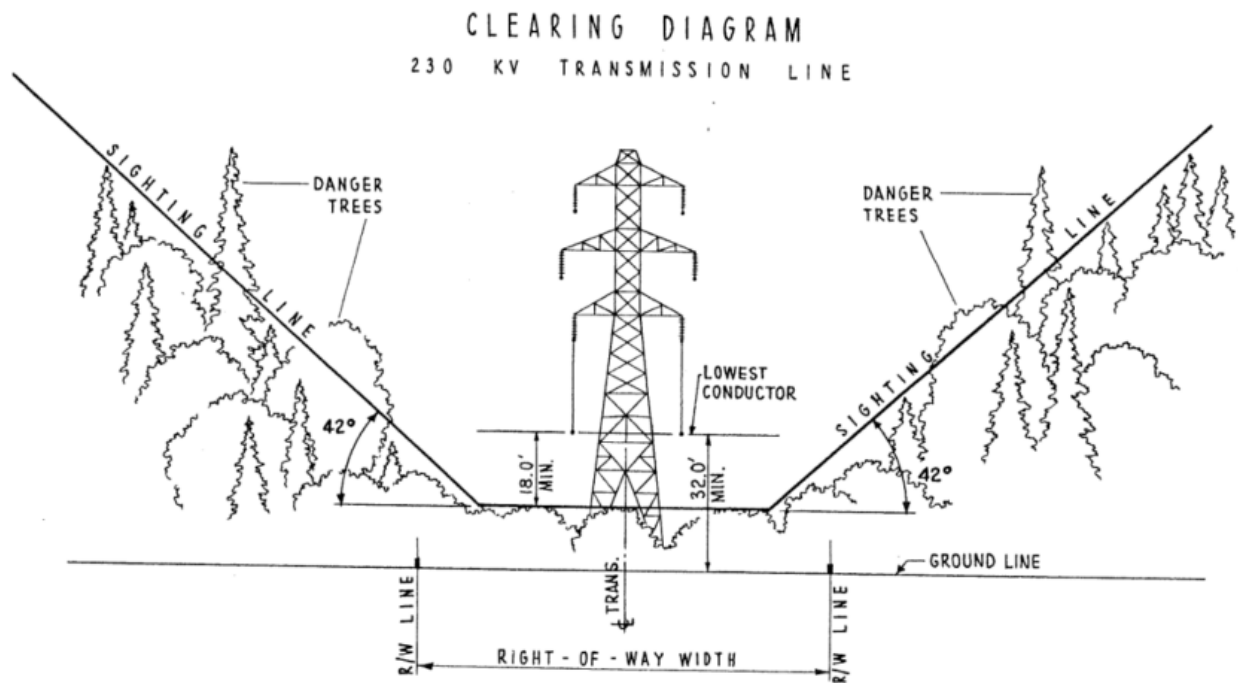


Figure 4: Clearing Diagram – Danger Trees

Existing PGE Facilities

The existing PGE Harborton-St Helens 115 kV transmission line follows NW Marina Way on the northeast side. Route alternatives that utilize the existing PGE Harborton-St Helens 115 kV transmission line ROW will require relocating the Harborton-St Helens 115 kV transmission line to another route corridor. It may be easier to identify a feasible alternative route for a 115 kV transmission line as opposed to a double-

³ See <https://portlandgeneral.com/outages-safety/safety/tree-maintenance>

circuit 230 kV transmission line because of the reduced clearance requirements and options to use wood poles for 115 kV transmission lines.

Existing PGE Facilities were determined to be a Moderate Impediment, provided an alternative route for the Harborton-St Helens 115 kV transmission line can be found. If an alternative route for the Harborton-St Helens 115 kV transmission line cannot be found, then Existing PGE Facilities would be a Severe Impediment.

Constructability

A site visit to the Project Area was conducted by PGE personnel on September 20, 2022, evaluating aspects of the route alternatives that may not be apparent from a desktop review, such as extreme construction methods, terrain issues, and significant impact to existing landowners.

Constructability impacts from the site visit classified as Severe Impediments are:

1. Locating structures immediately southwest of Highway 30 ROW, which likely require extreme construction methods, such as drilling micropiles, in order to stabilize exposed rock face.
2. Extremely steep terrain that may create clearance violations requiring taller structures and create access challenges for routine maintenance or outage restoration.
3. Relatively dense residential development that has significant impact to existing landowners and may require either taller structures with longer span lengths or tighter structure spacing with more angles. These observations supplement the Building Proximity impediment.



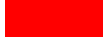


Detailed Account of Impediments to Route Alternatives

Each of the eight (8) route alternatives was considered against each Impediment category, as summarized in Table 1 below. Out of the eight (8) route alternatives, only two (2) route alternatives contain less than two (2) Severe Impediments after mitigation, as shown in Table 2. A narrative description for each route alternative follows. Only Moderate and Severe Impediments are narratively discussed for conciseness.

Table 1: Route Alternative Impediment Summary - Unmitigated

Impediment	Route Alternative - Unmitigated							
	1	2	3	4	5	6	7	8
Building Proximity	Severe	Moderate	Mild	Severe	Severe	Moderate	Mild	Severe
Conservation Area	Mild	Mild	Mild	Severe	Mild	Mild	Mild	Severe
Floodplain	Mild	Mild	Mild	Moderate	Mild	Mild	Mild	Moderate
Landslide Hazard	Moderate	Moderate	Mild	Mild	Moderate	Moderate	Mild	Mild
Railroad Proximity	Moderate	Moderate	Severe	Moderate	Moderate	Moderate	Severe	Moderate
Pipeline Proximity	Mild	Mild	Severe	Severe	Mild	Mild	Severe	Severe
Wetland	Mild	Mild	Mild	Moderate	Mild	Mild	Mild	Moderate
Land Use Zoning	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Forest Park Proximity	Severe	Severe	Mild	Mild	Severe	Severe	Mild	Mild
Existing PGE Facilities	Mild	Mild	Mild	Severe	Mild	Mild	Mild	Severe
Constructability	Severe	Severe	Mild	Moderate	Severe	Severe	Mild	Moderate
SUMMARY	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Severe

Mild Impediment 
 Moderate Impediment 
 Severe Impediment 

North Termination Point Alternatives

North Connecting Segment

Landslide Hazard – This segment lies in part within High susceptibility areas for landslide susceptibility.

Land Use Zoning – Moderate mitigated to Mild

This segment lies within Exclusive Farm Use Zoning and may require a Conditional Use permit. Acquisition of the Conditional Use permit downgrades this impediment to Mild.

Constructability – Moderate

This segment has extremely steep terrain that may create clearance violations requiring taller structures and create access challenges for routine maintenance or outage restoration.

In summary, there are no Severe Impediments to this transmission segment, and it is viable for route alternatives 1 through 4.

Alternative 1

Building Proximity – Severe

Alternative 1 passes over seventeen (17) Residential Buildings and six (6) Non-Residential Buildings along NW Riverview Dr and NW Harborton Dr. There are no feasible mitigations. Shifting the transmission line to back lots for the community along NW Riverview Dr is not practical as there is no access for maintenance and PGE would be better off considering Alternative 5 instead. Shifting the transmission line to back lots for the community along NW Harborton Dr is not practical as there are additional homes in that vicinity. Physically shifting the transmission line closer to the road causes it to align with Alternative 2.

Landslide Hazard – Moderate

Alternative 1 lies in part within High Landslide Susceptibility. Additional embedded pole depth or more robust foundation footings may mitigate this for small landslides.

Railroad Proximity – Moderate

Alternative 1 crosses the railroad, as does every route alternative. Alternative 1 does not parallel the railroad closely.

Land Use Zoning – Moderate mitigated to Mild

Alternative 1 will require a Conditional Use permit for Exclusive Farm Use and Parks & Open Spaces. Acquisition of the Conditional Use permit downgrades this impediment to Mild. Alternative 1 would require 5.58 acres of ROW in Exclusive Farm Use and 2.21 acres of ROW in Parks & Open Spaces.

Forest Park Proximity – Severe

Alternative 1 goes through the outskirts of Forest Park in its effort to avoid Public ROW. In those limited areas north and south of the community on NW Harborton Dr, Alternative 1 would need to seek Public ROW to avoid impeding on Forest Park. In addition to the resource impacts of Alternative 1, PGE would need to acquire new land rights to occupy the parkland.

Constructability – Severe

Alternative 1 requires locating structures immediately southwest of Highway 30 ROW that may require extreme construction. Alternative 1 also traverses relatively dense residential development that has significant impact to existing landowners and may require either taller structures with longer span lengths or tighter structure spacing with more angles.

In summary, Alternative 1 is not a viable alternative due to Severe impediments from Residential Buildings, Forest Park Proximity, and Constructability.

Alternative 2

Building Proximity – Moderate

Alternative 2 is within 60 feet of four (4) Residential Buildings along NW Harborton Dr, although they are not directly within the required ROW.

Landslide Hazard – Moderate

Alternative 2 lies in part within High Landslide Susceptibility. Additional embedded pole depth or more robust foundation footings may mitigate this for small landslides.

Railroad Proximity – Moderate

Alternative 2 crosses the railroad, as does every route alternative, but does not parallel the railroad closely.

Land Use Zoning – Moderate mitigated to Mild

Alternative 2 will require a Conditional Use permit for Exclusive Farm Use and Parks & Open Spaces. Acquisition of the Conditional Use permit downgrades this impediment to Mild. Alternative 2 requires 5.64 acres of new ROW in Exclusive Farm Use and 1.78 acres in Parks & Open Spaces.

Forest Park Proximity – Severe

Alternative 2 ROW includes lands within Forest Park and would require a new easement. Trees within its ROW would need to be cleared. Trees outside of its ROW that are within Forest Park would constitute danger trees to a new line along this route alternative. The trees are located up a steep slope from the alignment, which renders the number of danger trees much higher than in a flat ROW.

Constructability – Severe

Alternative 2 requires locating structures immediately southwest of Highway 30 ROW that may require extreme construction methods. Alternative 2 also traverses relatively dense residential development that has significant impact to existing landowners and may require either taller structures with longer span lengths or tighter structure spacing with more angles.

In summary, Alternative 2 is not a viable alternative due to its Severe impediments from Forest Park Proximity and Constructability.

Alternative 3

Railroad Proximity – Severe

Alternative 3 parallels the Portland & Western railroad for nearly its entire length. There is 3,000 feet of rail within 50 feet of the transmission centerline. Portland & Western Railroad is unlikely to approve the required railroad crossing permit or any easement for aerial lines that overhang its private property.

Pipeline Proximity – Severe

Alternative 3 parallels a buried pipeline for nearly its entire length. There is 5,130 feet of pipeline within 15 feet of the transmission centerline. There is insufficient room to shift the transmission centerline to avoid the embedded poles being within 15 feet of the buried pipeline.

Land Use Zoning – Moderate mitigated to Mild

Alternative 3 will require a Conditional Use permit for Exclusive Farm Use. Acquisition of the Conditional Use permit downgrades this impediment to Mild. Alternative 3 requires 9.07 acres of ROW in Exclusive Farm Use.

In summary, Alternative 3 is not a viable route alternative due to Severe impediments from Railroad Proximity and Pipeline Proximity.

Alternative 4

Building Proximity – Severe mitigated to Moderate

Alternative 4 passes over a one (1) Residential Building and three (3) Non-Residential Buildings along NW Marina Way. It may be possible for the route alternative to deviate around the single Residential Building or for PGE to purchase this property and remove the structure, downgrading this to a Moderate Impediment.

Harborton Conservation Area – Severe mitigated to Moderate

Alternative 4 passes adjacent to the designated Harborton Conservation Area. However, due to Pipeline Proximity, it is not possible to locate the existing PGE 115 kV transmission line, the pipeline, and Alternative 4 without impacting the Harborton Conservation Area. It would be necessary to utilize the existing 115 kV transmission pole line for Alternative 4 and find a new route for the 115 kV transmission line.

Floodplain – Moderate mitigated to Mild

Alternative 4 lies within 100-year and 500-year floodplains. The 100-year floodplain and the 500-year floodplain cannot be spanned in every location but can be mitigated with the addition of piers or vibratory caissons and matting can be installed to allow for crew access.

Railroad Proximity – Moderate

Alternative 4 crosses the railroad, as does every route alternative, but does not parallel the railroad closely.

Pipeline Proximity – Severe mitigated to Moderate

Alternative 4 parallels a buried pipeline on the northside of NW Marina Way. There is 630 feet of pipeline within 15 feet of the transmission centerline. There is sufficient room to shift the transmission centerline to the northwest to avoid the embedding poles within 15 feet of the buried pipeline, but this mitigation would increase the impact to the Harborton Conservation Area. Therefore, Alternative 4 requires using the existing 115 kV ROW and an alternative route for the 115 kV transmission line would need to be identified.

Wetland – Moderate mitigated to Mild

Alternative 4 lies within areas designated as Wetlands. Care should be taken during construction to minimize the temporary impacts to his habitat and federal and/or state permits may be needed.

Land Use Zoning – Moderate mitigated to Mild

Alternative 4 will require a Conditional Use permit for Exclusive Farm Use and Parks & Open Spaces. Acquisition of the Conditional Use permit downgrades this impediment to Mild. Alternative 4 requires 9.35 acres of ROW in Exclusive Farm Use and 1.96 acres in Parks & Open Spaces.

Existing PGE Facilities – Severe

Alternative 4 would need to occupy the ROW used by the Harborton-St Helens 115 kV transmission line. In order to downgrade this impediment, an alternate corridor for the 115 kV line, as well as underbuilt 13 kV distribution and telecommunication lines, must be found. As detailed in the rest of this study, severe impediments exist for other route alternatives that would apply to a 115 kV single-circuit corridor as well.

Examining the engineering and operational feasibility of co-locating three overhead transmission lines in one corridor is beyond the scope of this study.

Constructability – Moderate

Alternative 4 may require a transmission design with a narrower ROW requirement to mitigate impacts to the Harborton Conservation Area. Any electric distribution or fiber lines along Alternative 4 would be buried to reduce the complexity of the pole attachments.

In summary, Alternative 4 is a viable route alternative provided the noted impediments from Residential Buildings, Harborton Conservation Area, Pipeline Proximity, and Existing PGE Facilities can be downgraded. Alternative 4 requires purchasing the Residential Building or a minor deviation to avoid the Residential Building. The existing 115 kV transmission line would need to be relocated elsewhere. Alternative 4 may need to occupy a reduce ROW width in the Harborton Conservation Area.

South Termination Point Alternatives

South Connecting Segment

Building Proximity – Moderate

There is a single Residential Building that may be avoided but would require clearing of trees. This may be objectionable to the landowner and inhibit obtaining land rights to construct the line.

Landslide Hazard – Moderate

This segment lies within High susceptibility areas for landslide.

Land Use Zoning – Moderate mitigated to Mild

This segment lies within Exclusive Farm Use Zoning and may require a Conditional Use permit. Acquisition of the Conditional Use permit downgrades this impediment to Mild.

Constructability – Moderate

This segment has extremely steep terrain that may create clearance violations requiring taller structures and create access challenges for routine maintenance or outage restoration.

In summary, there are no Severe Impediments to this transmission segment, and it is viable for route Alternatives 5 through 8.

Alternative 5

Building Proximity – Severe

Alternative 5 passes over four (4) Residential Buildings and three (3) Non-Residential Buildings along NW Harborton Dr. There are no feasible mitigations. Physically shifting the transmission line to back lots is not practical as there are additional homes. Physically shifting the transmission line closer to the road would make this alternative no different than Alternative 6.

Landslide Hazard – Moderate

Alternative 5 lies in part within High Landslide Susceptibility. Additional embedded pole depth or more robust foundation footings may mitigate this for small landslides.

Railroad Proximity – Moderate

Alternative 5 crosses the railroad, as does every route alternative, but does not parallel the railroad closely.

Land Use Zoning – Moderate mitigated to Mild

Alternative 5 will require a Conditional Use permit for Exclusive Farm Use and Parks & Open Spaces. Acquisition of the Conditional Use permit downgrades this impediment to Mild. Alternative 5 requires 2.31 acres of ROW in Exclusive Farm Use and 2.21 acres in Parks & Open Spaces.

Forest Park Proximity – Severe

Alternative 5 goes through the outskirts of Forest Park in its effort to stay off Public ROW. In those limited areas, Alternative 5 would need to seek Public ROW to mitigate impacts to Forest Park. However, the required ROW would still impede on Forest Park, and constructability impediments prevent this mitigation option, leaving no effective mitigation options.

Constructability – Severe

Alternative 5 requires locating structures immediately southwest of Highway 30 ROW that may require extreme construction methods to stabilize the rock face. Alternative 5 also traverses relatively dense residential development that has significant impact to existing landowners and may require either taller structures with longer span lengths or tighter structure spacing with more angles.

In summary, Alternative 5 is not a viable alternative due to its Severe impediments on Residential Buildings, Forest Park Proximity, and Constructability.

Alternative 6

Building Proximity – Moderate

Alternative 6 is within 60 feet of four (4) Residential Buildings along NW Harborton Dr, although they are not directly within the required ROW.

Landslide Hazard – Moderate

Alternative 6 lies in part within High Landslide Susceptibility. Additional embedded pole depth or more robust foundation footings may mitigate this for small landslides.

Railroad Proximity – Moderate

Alternative 6 crosses the railroad, as does every route alternative, but does not parallel the railroad closely.

Land Use Zoning – Moderate mitigated to Mild

Alternative 6 will require a Conditional Use permit for Exclusive Farm Use and Parks & Open Spaces. Acquisition of the Conditional Use permit downgrades this impediment to Mild. Alternative 6 requires 2.36 acres of ROW in Exclusive Farm Use and 1.78 acres in Parks & Open Spaces.

Forest Park Proximity – Severe

Alternative 6 ROW includes lands within Forest Park and would require a new easement. Trees within its ROW would need to be cleared. Trees outside of its ROW that are within Forest Park would constitute danger trees to a new line along this route alternative. The trees are located up a steep slope from the alignment, which renders the number of danger trees much higher than in a flat ROW.

Constructability - Severe

Alternative 6 requires locating structures immediately southwest of Highway 30 ROW that may require extreme construction methods such as drilling micropiles or similar to stabilize the rock face. Alternative 6 also traverses relatively dense residential development that has significant impact to existing landowners and may require either taller structures with longer span lengths or tighter structure spacing with more angles.

In summary, Alternative 6 is not a viable route alternative due to its severe impediments from Forest Park and Constructability.

Alternative 7

Railroad Proximity – Severe

Alternative 7 parallels the Portland & Western railroad for nearly its entire length. There is 250 feet of railroad within 50 feet of the transmission centerline. Portland & Western Railroad is unlikely to approve the required railroad crossing permit or any easement for aerial lines that overhang its private property.

Pipeline Proximity – Severe

Alternative 7 parallels a buried pipeline for nearly its entire length. There is 2,575 feet of pipeline within 15 feet of the transmission centerline. There is insufficient room to shift the transmission centerline to avoid the embedded poles being within 15 feet of the buried pipeline.

Land Use Zoning – Moderate mitigated to Mild

Alternative 7 will require a Conditional Use permit for Exclusive Farm Use. Acquisition of the Conditional Use permit downgrades this impediment to Mild. Alternative 7 requires 2.58 acres of ROW in Exclusive Farm Use.

In summary, Alternative 7 is not a viable route alternative due to its Severe impediments from Railroad Proximity and Pipeline Proximity.

Alternative 8

Building Proximity – Severe mitigated to Moderate

Alternative 8 passes near a one (1) Residential Building on NW Marina Way. It may be possible to deviate from the study alignment to avoid the structure or to purchase this property, downgrading this to a Moderate Impediment.

Harborton Conservation Area – Severe mitigated to Moderate

Alternative 8 passes adjacent to the designated Harborton Conservation Area utilizing the existing narrow transmission corridor retained by PGE. Due to Pipeline Proximity, it is not possible to locate a separate pole line for the PGE 115 kV transmission line, a separate pole line for Alternative 8, and the pipeline without impacting the Harborton Conservation Area. It would be necessary to utilize the existing 115 kV transmission pole line for Alternative 8 and find an alternative route for the 115 kV transmission line.

Floodplain – Moderate mitigated to Mild

Alternative 8 lies within 100-year and 500-year floodplains. The 500-year floodplain may be spanned with a 600-foot span if needed. The 100-year floodplain cannot be spanned in every location but can be mitigated with the additions of piers or vibratory caissons and matting can be installed to allow for crew access.

Railroad Proximity – Moderate

Alternative 8 crosses the railroad, as does every route alternative, but does not parallel the railroad closely.

Pipeline Proximity – Severe mitigated to Moderate

Alternative 8 parallels a buried pipeline on the northside of NW Marina Way. There is 630 feet of pipeline within 15 feet of the transmission centerline. There is sufficient room to shift the transmission centerline to the northwest to avoid the embedding poles within 15 feet of the buried pipeline, but this mitigation would increase the impact to the Harborton Conservation Area. Therefore, Alternative 8 requires using the existing 115 kV ROW and an alternative route for the 115 kV transmission line would need to be identified.

Wetland – Moderate mitigated to Mild

Alternative 8 lies within areas designated as Wetlands. Care should be taken during construction to minimize the temporary impacts to his habitat and federal and/or state permits may be needed.

Land Use Zoning – Moderate mitigated to Mild

Alternative 8 will require a Conditional Use permit for Exclusive Farm Use and Parks & Open Spaces. Acquisition of the Conditional Use permit downgrades this impediment to Mild. Alternative 8 requires 2.80 acres of ROW in Exclusive Farm Use.

Existing PGE Facilities – Severe

Alternative 8 would need to occupy the ROW used by the Harborton-St Helens 115 kV transmission line. In order to downgrade this impediment, an alternate corridor for the 115 kV line, as well as underbuilt 13 kV distribution and telecommunication lines, must be found. As detailed in the rest of this study, severe impediments exist for other route alternatives that would apply to a 115 kV single-circuit corridor as well.

Examining the engineering and operational feasibility of co-locating three overhead transmission lines in one corridor is beyond the scope of this study.

Constructability – Moderate

Alternative 8 may require a transmission design with a narrower ROW requirement to mitigate impacts to the Harborton Conservation Area. Any electric distribution or fiber lines along Alternative 8 would be buried to reduce the complexity of the pole attachments.

In summary, Alternative 8 is a viable route alternative only if it occupies the existing 115 kV pole line to mitigate impacts to the Harborton Conservation Area and Pipeline. An alternative route for the 115 kV transmission line would need to be identified.

Summary of Results

Of the initial eight (8) route alternatives considered, two (2) route alternatives only encounter a single Severe impediment and remain feasible for further discussion, as seen in Table 2 below. The remaining Severe impediment for Alternative 4 and Alternative 8, Existing PGE Facilities, lies wholly within PGE's purview and may be surmountable with further study.

Table 2: Route Alternative Impediment Summary - Mitigated

Impediment	Route Alternative - Mitigated							
	1	2	3	4	5	6	7	8
Building Proximity	Severe	Moderate	Mild	Moderate	Severe	Moderate	Mild	Moderate
Conservation Area	Mild	Mild	Mild	Moderate	Mild	Mild	Mild	Moderate
Floodplain	Mild	Mild	Mild	Mild	Mild	Mild	Mild	Mild
Landslide Hazard	Moderate	Moderate	Mild	Mild	Moderate	Moderate	Mild	Mild
Railroad Proximity	Moderate	Moderate	Severe	Moderate	Moderate	Moderate	Severe	Moderate
Pipeline Proximity	Mild	Mild	Severe	Moderate	Mild	Mild	Severe	Moderate
Wetland	Mild	Mild	Mild	Mild	Mild	Mild	Mild	Mild
Land Use Zoning	Mild	Mild	Mild	Mild	Mild	Mild	Mild	Mild
Forest Park Proximity	Severe	Severe	Mild	Mild	Severe	Severe	Mild	Mild
Existing PGE Facilities	Mild	Mild	Mild	Severe	Mild	Mild	Mild	Severe
Constructability	Severe	Severe	Mild	Moderate	Severe	Severe	Mild	Moderate
SUMMARY	Severe	Severe	Severe	Severe	Severe	Severe	Severe	Severe

Mild Impediment



Moderate Impediment



Severe Impediment



Alternative 4 utilizes private ROW but avoids most Severe Impediments after mitigation. Its proximity to a single Residential Building along NW Marina Way may be skirted or the parcel purchased outright; the Non-Residential Buildings will either require taller poles or a minor route deviation. The Conservation Area should not be impacted if the existing Harborton-St Helens 115 kV pole line is followed; however, a separate route would then need to be found for the Harborton-St Helens 115 kV transmission line. A railroad crossing permit is still required, but the chances of permit approval are improved by avoiding paralleling the railroad. The buried pipeline should not be impacted if the existing Harborton-St Helens 115 kV pole line is followed; however, as with the Conservation Area impediment, a separate route would need to be found for the Harborton-St Helens 115 kV transmission line.

Alternative 8 utilizes private ROW but avoids most Severe Impediments after mitigation. Its proximity to a single Residential Building along NW Marina Way may be skirted or the parcel purchased outright. The Conservation Area should not be impacted if the existing Harborton-St Helens 115 kV pole line is followed;

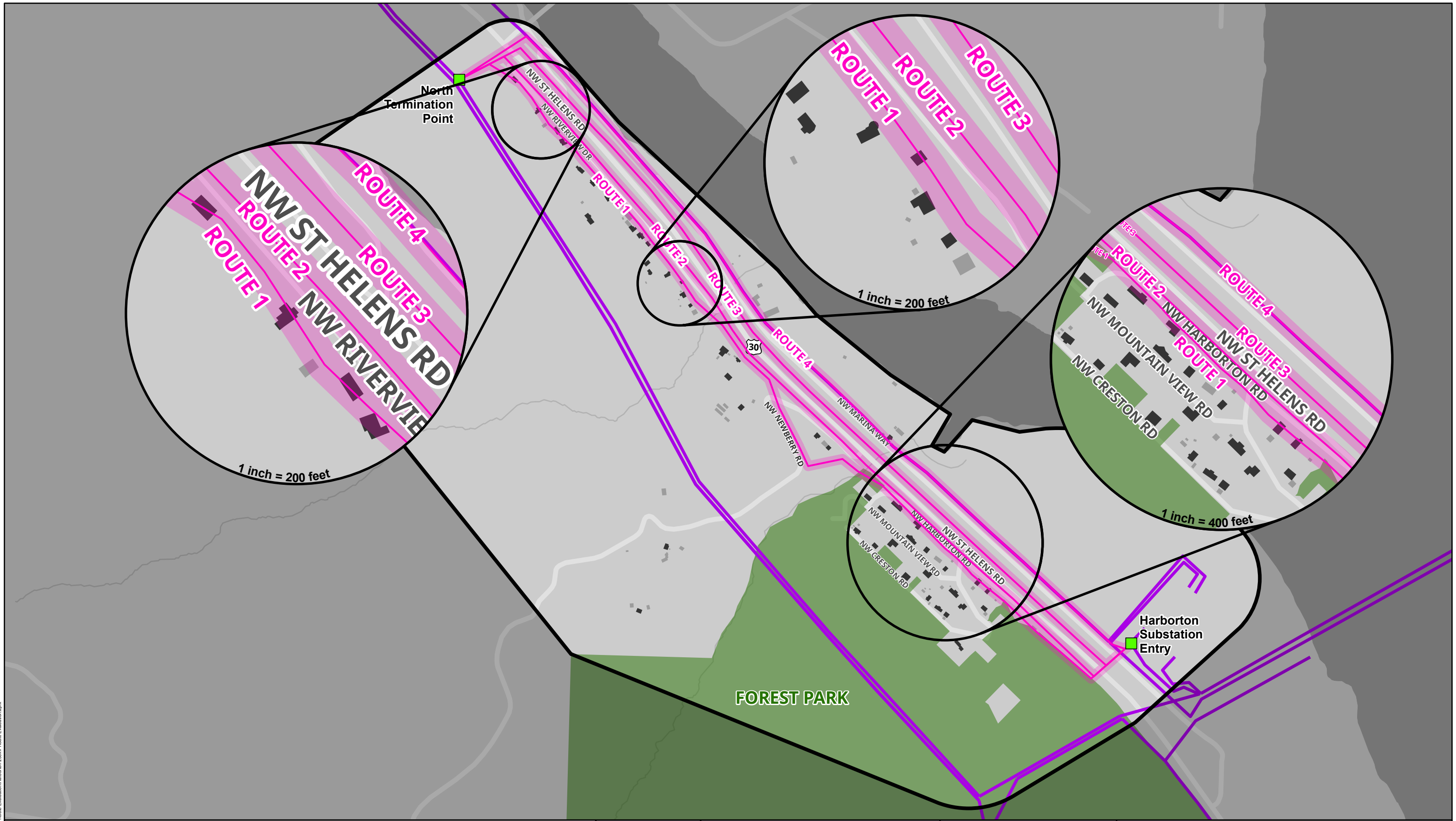
however, a separate route would then need to be found for the Harborton-St Helens 115 kV transmission line. A railroad crossing permit is still required, but the chances of permit approval are improved by avoiding paralleling the railroad. The buried pipeline should not be impacted if the existing Harborton-St Helens 115 kV pole line is followed; however, as with the Conservation Area impediment, a separate route would then need to be found for the Harborton-St Helens 115 kV transmission line.









Alternative 8 is shorter in distance than Alternative 4 and traverses fewer parcels which creates less potential to impact the community. Alternative 8 follows NW Newberry Rd which is more favorable terrain to descend from the Trojan ROW to Highway 30 compared to the extremely steep hillside of the North Connecting Segment. However, Alternative 8 requires clearing trees that may be objectionable to landowners. With either Alternative 4 or Alternative 8, additional analysis to determine a feasible 115 kV route corridor or alternative construction method may be needed.

Harborton 230kV Alternatives Analysis

Appendix

Maps




	Study Point		Forest Park
	Alternative		Residential Building
	Existing PGE Transmission		Non-Residential Building
	80' ROW		Study Area

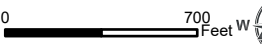



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MAP BY: mbrown	DATE: 9/27/2022
APPD. BY: ALB	DATE: 09/27/2022

Harborton 230 kV Alternative Routes	
Map Title: Building Proximity - North	Map Number: MB-258 : 1
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	
 	

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	Study Point		Forest Park
	Alternative		Residential Building
	Existing PGE Transmission		Non-Residential Building
	80' ROW		Study Area

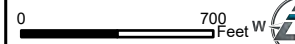



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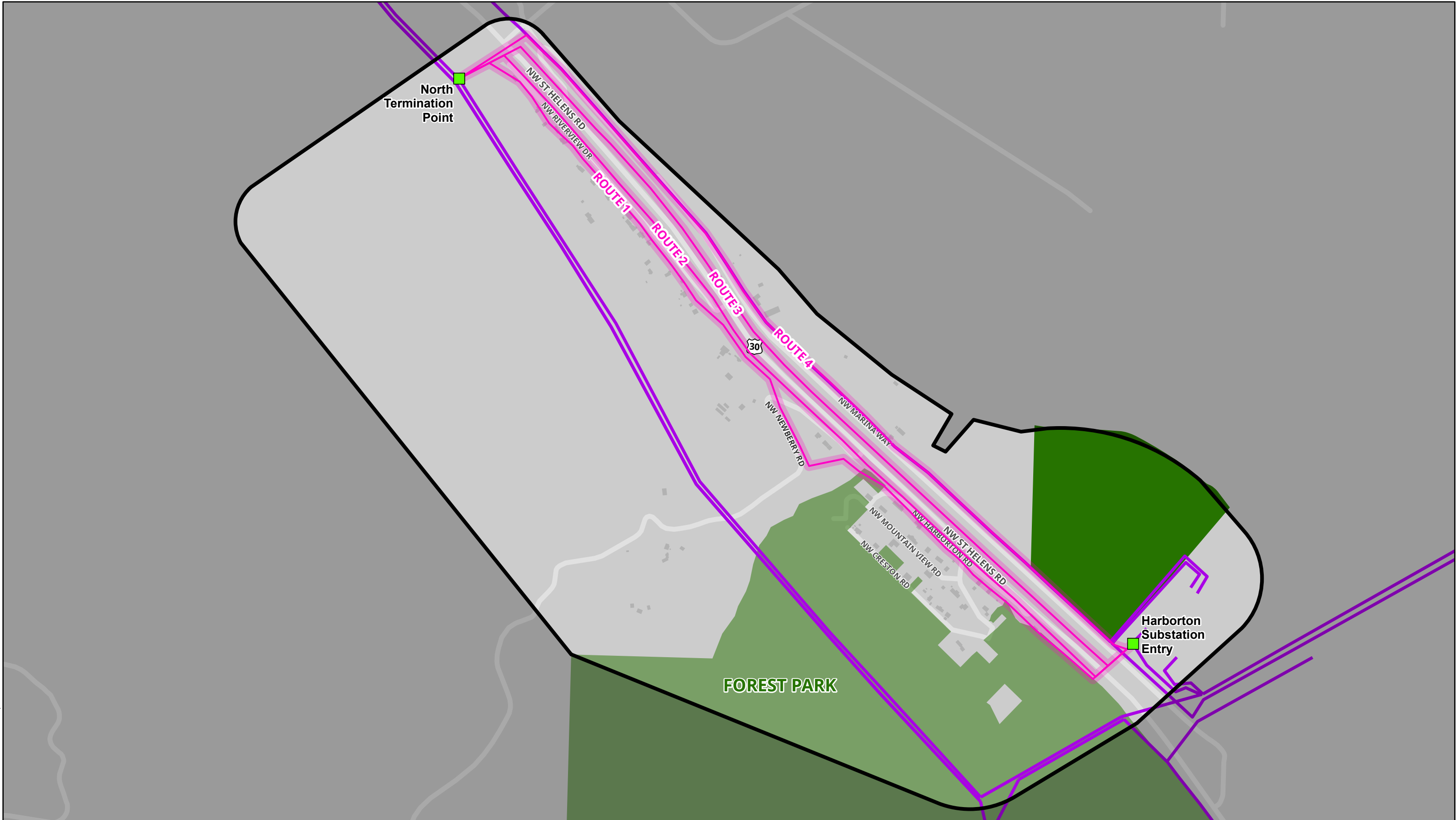
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




MAP BY: mbrown	DATE: 9/27/2022
APPD. BY: ALB	DATE: 09/27/2022

Harborton 230 kV Alternative Routes	
Map Title: Building Proximity - South	Map Number: MB-258 : 2
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	
 	

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 Study Point	 Harborton Conservation Area
 Alternative	 Forest Park
 Existing PGE Transmission	 Study Area
 80' ROW	





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MAP BY: mbrown	DATE: 9/27/2022
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Harborton 230 kV Alternative Routes	
Map Title: Conservation Area - North	Map Number: MB-270 : 1
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	
 	




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 Study Point	 Harborton Conservation Area
 Alternative	 Forest Park
 Existing PGE Transmission	 Study Area
 80' ROW	





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







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Harborton 230 kV Alternative Routes	
Map Title: Conservation Area - South	Map Number: MB-270 : 2
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	
 	




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 Study Point	 FEMA 100 Year Floodplain
 Alternative	 FEMA 500 Year Floodplain
 Existing PGE Transmission	 Forest Park
 80' ROW	 Study Area





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








MAP BY: mbrown	DATE: 9/27/2022
APPD. BY: ALB	DATE: 09/27/2022

Harborton 230 kV Alternative Routes	
Map Title: Floodplain - North	Map Number: MB-254 : 1
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	
 	




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 Study Point	 FEMA 100 Year Floodplain
 Alternative	 FEMA 500 Year Floodplain
 Existing PGE Transmission	 Forest Park
 80' ROW	 Study Area





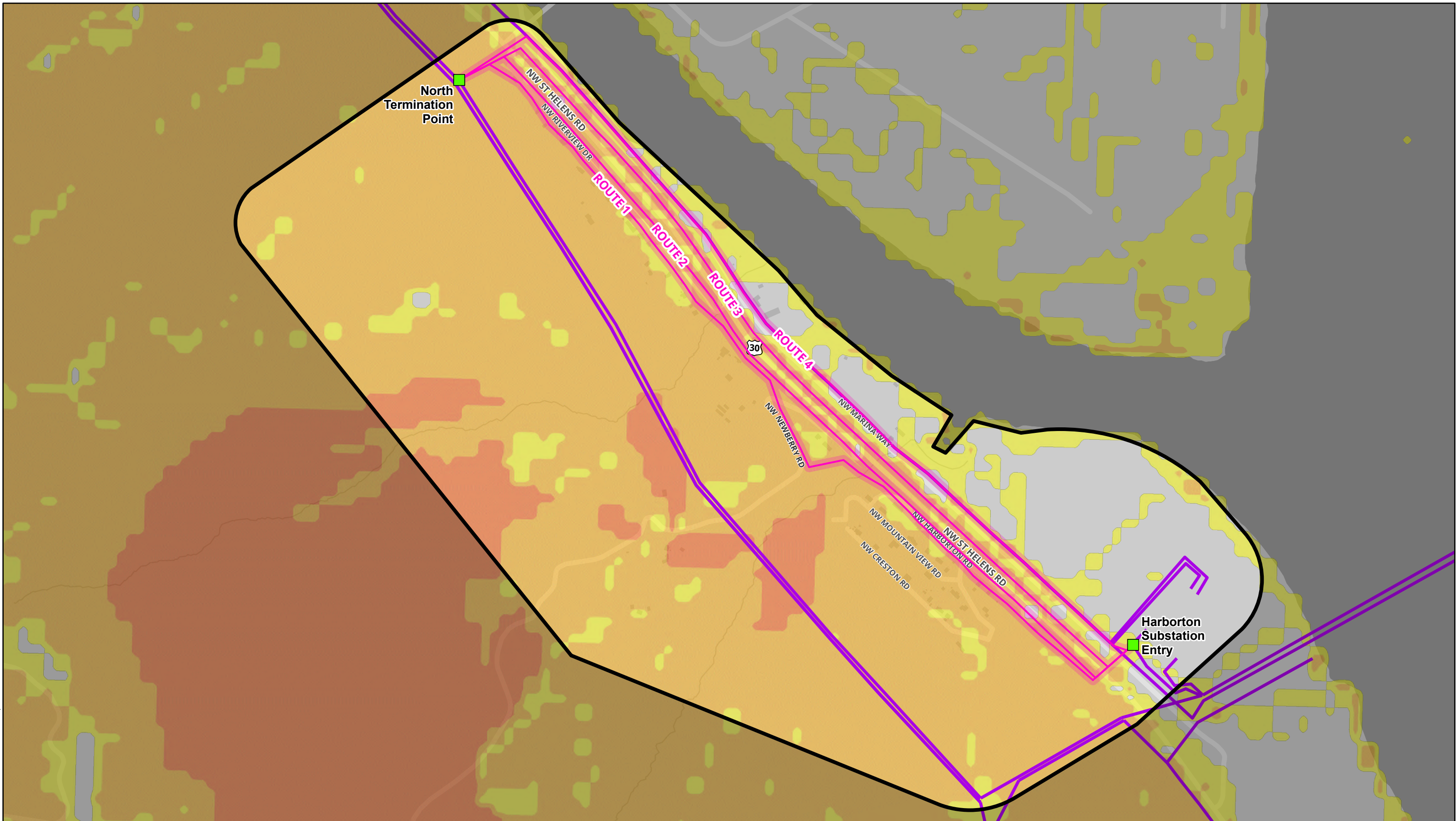
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







MAP BY: mbrown	DATE: 9/27/2022
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Harborton 230 kV Alternative Routes	
Map Title: Floodplain - South	Map Number: MB-254 : 2
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	
 	




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 Study Point	SLIDO Landslide Susceptibility
 Alternative	 Moderate - Landslide Possible
 Existing PGE Transmission	 High - Landslide Likely
 80' ROW	 Very High - Existing Landslide
 Study Area	





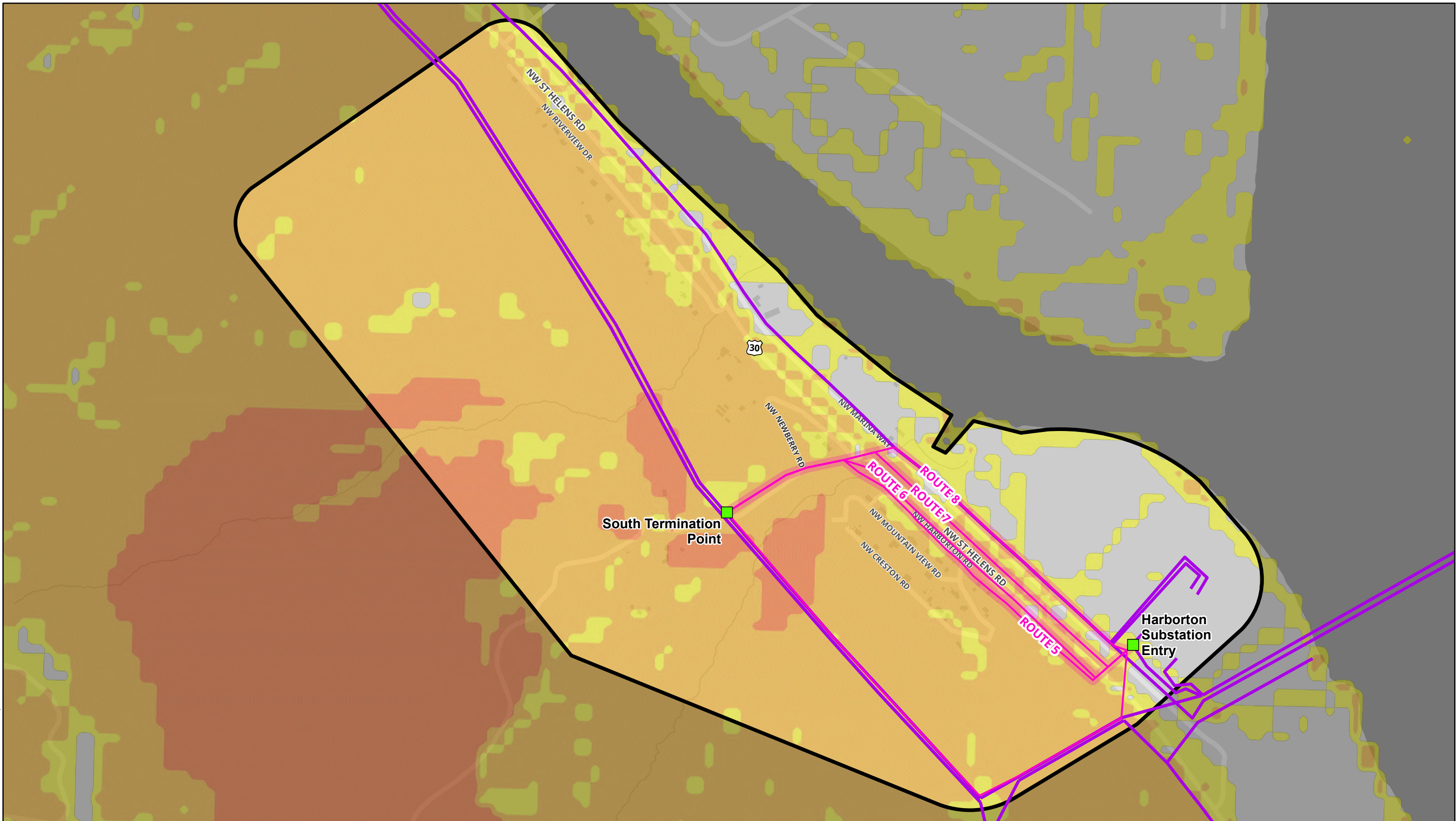
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Harborton 230 kV Alternative Routes	
Map Title: Landslide Susceptibility - North	Map Number: MB-255 : 1
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<ul style="list-style-type: none"> ■ Study Point — Alternative — Existing PGE Transmission 80' ROW Study Area 	<p>SLIDO Landslide Susceptibility</p> <ul style="list-style-type: none"> Moderate - Landslide Possible High - Landslide Likely Very High - Existing Landslide
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







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APPD. BY: ALB	DATE: 09/27/2022

Harborton 230 kV Alternative Routes	
Map Title: Landslide Susceptibility - South	Map Number: MB-255 : 2
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	
 	




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 Study Point	 80' ROW
 Alternative	 Railroad-owned Parcel
 Existing PGE Transmission	 Forest Park
 Railroad	 Study Area





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







MAP BY: mbrown	DATE: 9/27/2022
APPD. BY: ALB	DATE: 09/27/2022

Harborion 230 kV Alternative Routes	
Map Title: Railroad Proximity - North	Map Number: MB-261 : 1
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	
 	




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 Study Point	 80' ROW
 Alternative	 Railroad-owned Parcel
 Existing PGE Transmission	 Forest Park
 Railroad	 Study Area

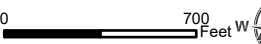



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Harborton 230 kV Alternative Routes	
Map Title: Railroad Proximity - South	Map Number: MB-261 : 2
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	
 	



	Study Point		Hazardous Liquid Pipeline
	Alternative		80' ROW
	Existing PGE Transmission		Forest Park
	Gas Pipeline		Study Area

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PGE

MAP BY: mbrown DATE: 9/27/2022
 APPD. BY: ALB DATE: 09/27/2022









Harborton 230 kV Alternative Routes

Map Title: Pipeline Proximity - North	Map Number: MB-259 : 1
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	

0 700 Feet

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 Study Point	 Hazardous Liquid Pipeline
 Alternative	 80' ROW
 Existing PGE Transmission	 Forest Park
 Gas Pipeline	 Study Area

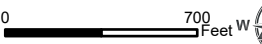



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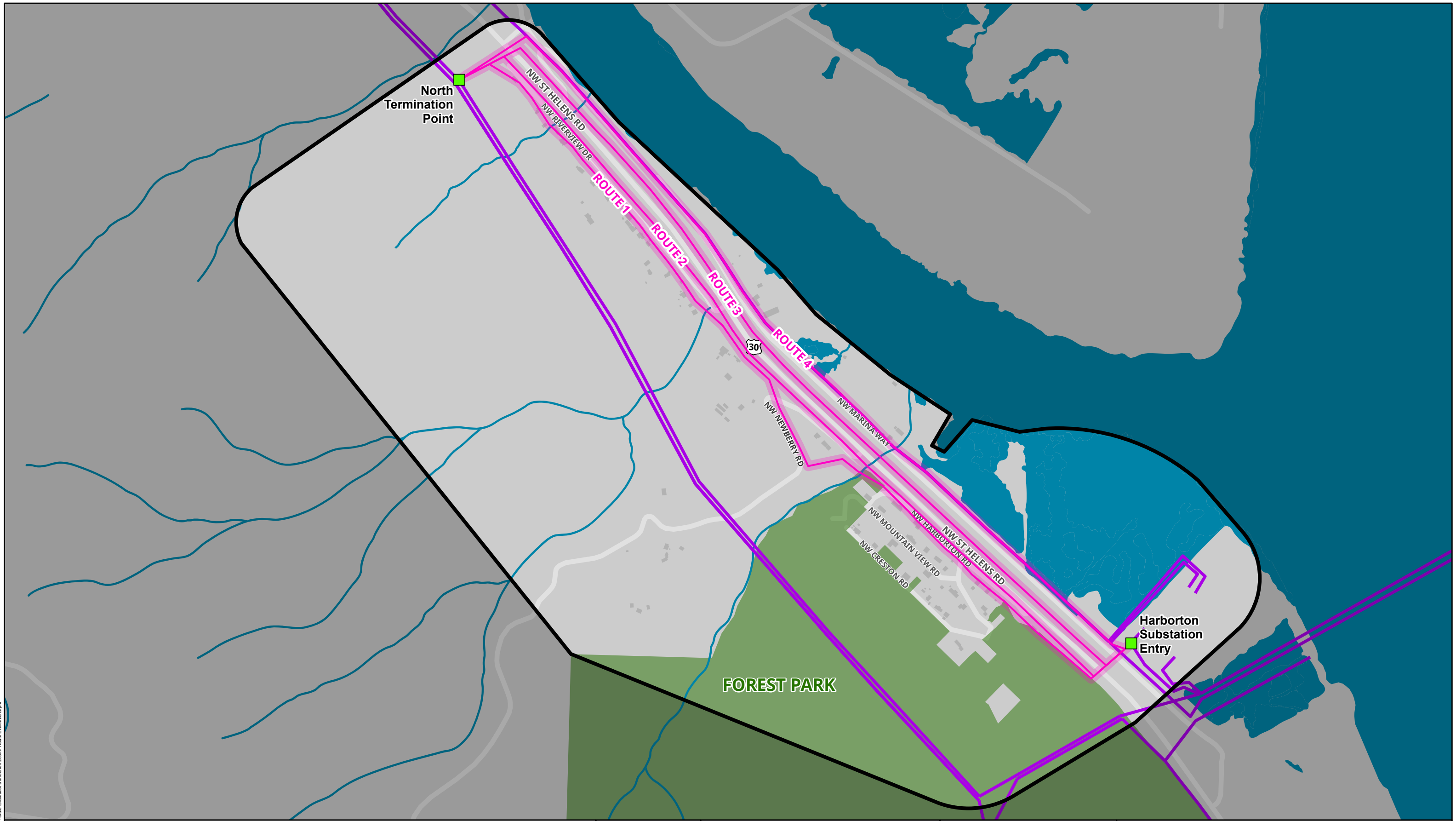
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






MAP BY: mbrown	DATE: 9/27/2022
APPD. BY: ALB	DATE: 09/27/2022

Harborton 230 kV Alternative Routes	
Map Title: Pipeline Proximity - South	Map Number: MB-259 : 2
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	
 	

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 Study Point	 USFWS Wetland
 Alternative	 Forest Park
 Existing PGE Transmission	 Study Area
 80' ROW	

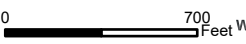



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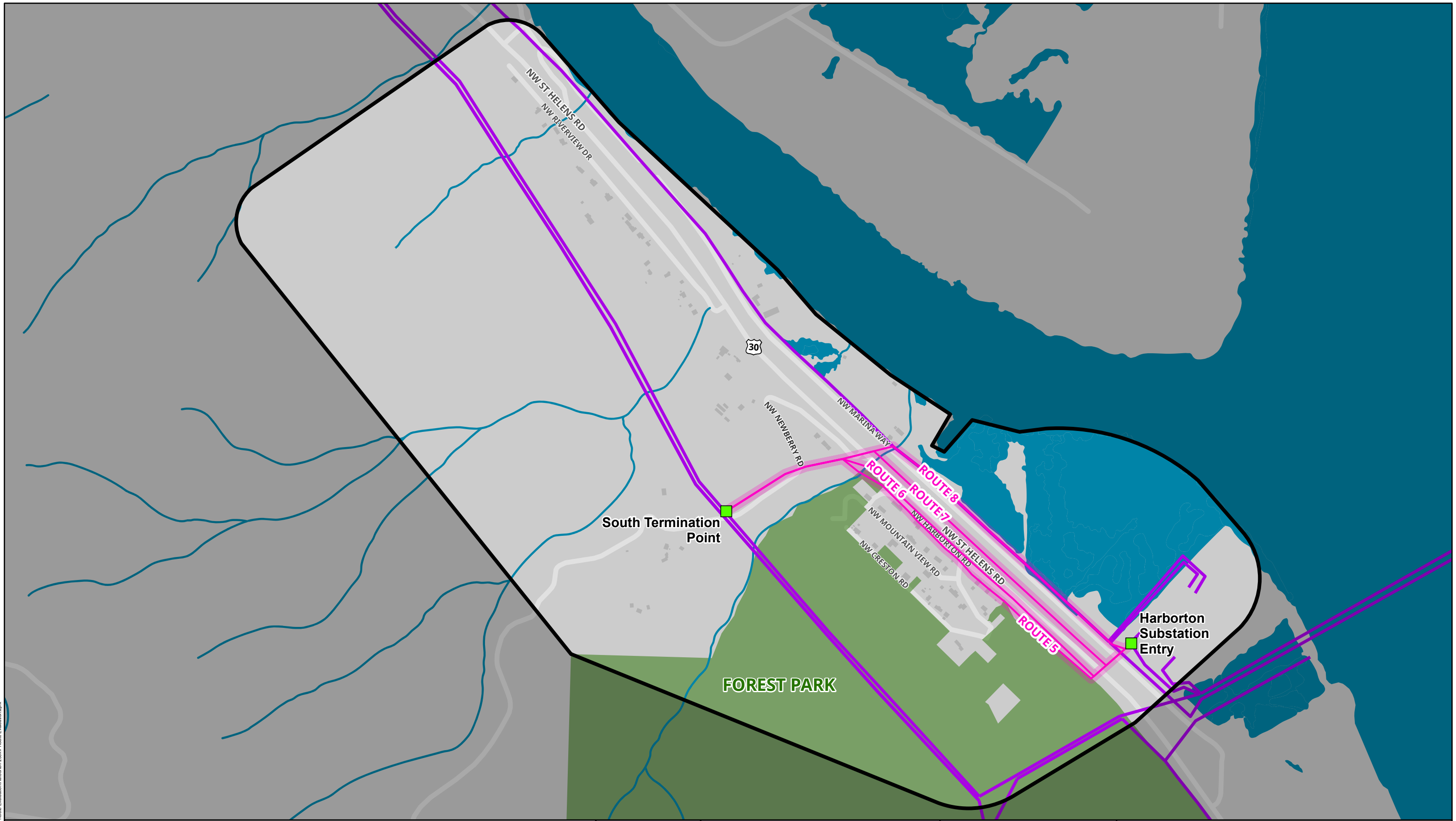
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




MAP BY: mbrown	DATE: 9/27/2022
APPD. BY: ALB	DATE: 09/27/2022

Harborton 230 kV Alternative Routes	
Map Title: Wetland - North	Map Number: MB-257 : 1
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	
 	

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	Study Point		USFWS Wetland
	Alternative		Forest Park
	Existing PGE Transmission		Study Area
	80' ROW		

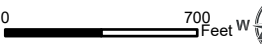



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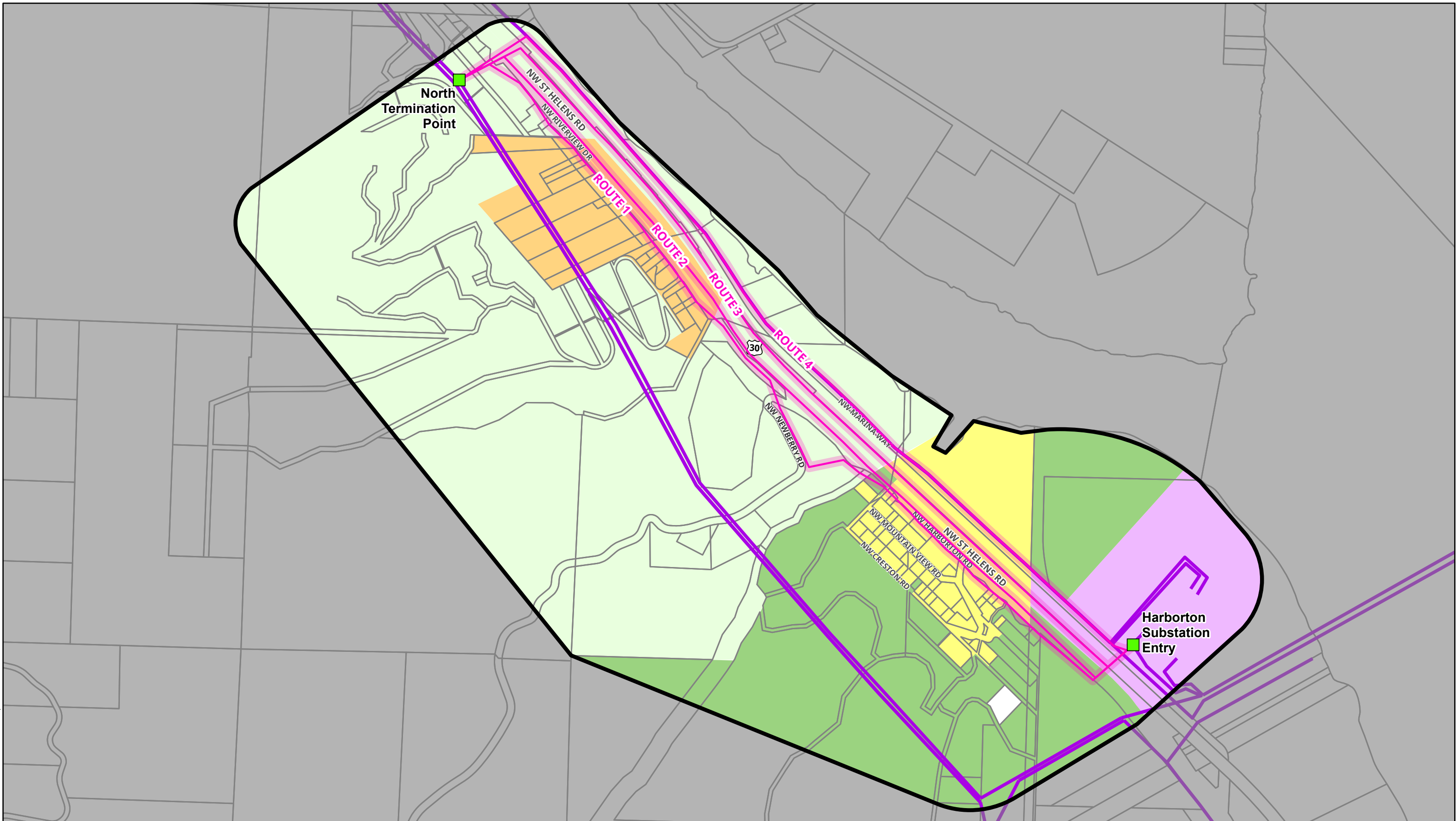
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MAP BY: mbrown	DATE: 9/27/2022
APPD. BY: ALB	DATE: 09/27/2022

Harborton 230 kV Alternative Routes	
Map Title: Wetland - South	Map Number: MB-257 : 2
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	
 	

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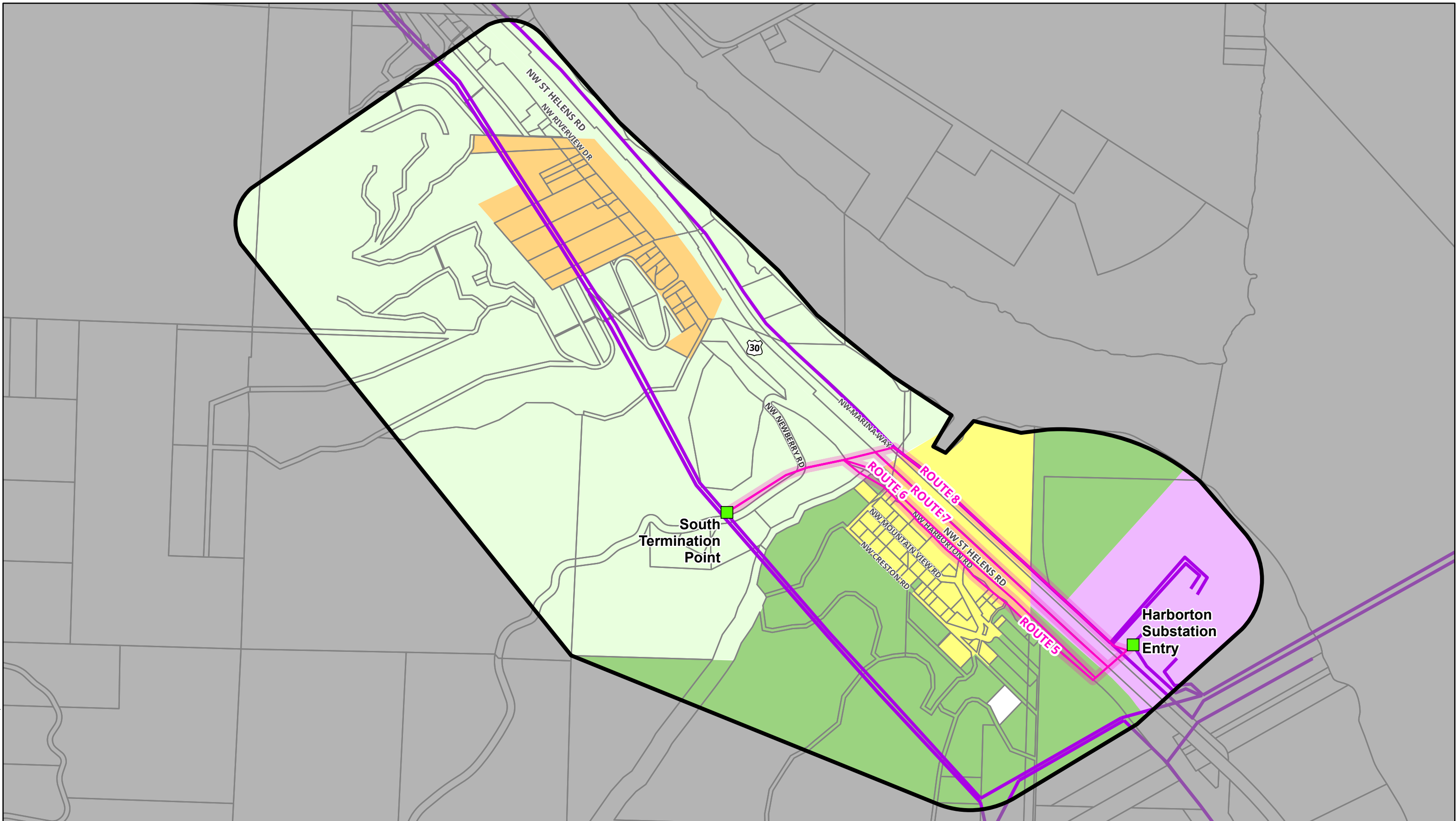
Study Point	Study Area	Parks & Open Spaces
Alternative	Metro Land Use Zoning (6/29/2022)	Heavy Industrial
Existing PGE Transmission	Single Family Residential	
80' ROW	Rural Residential or Future Urban	
Metro Taxlots (7/1/2022)	Exclusive Farm Use	

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MAP BY: mbrown	DATE: 9/27/2022
APPD. BY: ALB	DATE: 09/27/2022

Harborton 230 kV Alternative Routes	
Map Title: Land Use Zoning - North	Map Number: MB-256 : 1
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	



Study Point	Study Area	Parks & Open Spaces
Alternative	Metro Land Use Zoning (6/29/2022)	Heavy Industrial
Existing PGE Transmission	Single Family Residential	
80' ROW	Rural Residential or Future Urban	
Metro Taxlots (7/1/2022)	Exclusive Farm Use	

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MAP BY: mbrown DATE: 9/27/2022
 APPD. BY: ALB DATE: 09/27/2022

Harborton 230 kV Alternative Routes

Map Title: Land Use Zoning - South	Map Number: MB-256 : 2
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	

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- Study Point
- Alternative
- Existing PGE Transmission
- 80' ROW
- Forest Park
- Study Area

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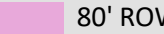




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MAP BY: mbrown DATE: 9/27/2022
 APPD. BY: ALB DATE: 09/27/2022

Harborton 230 kV Alternative Routes	
Map Title: Forest Park Proximity - North	Map Number: MB-262 : 1
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	




 Study Point	 80' ROW
 Alternative	 Forest Park
 Existing PGE Transmission	 Study Area

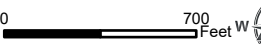



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MAP BY: mbrown	DATE: 9/27/2022
APPD. BY: ALB	DATE: 09/27/2022

Harborton 230 kV Alternative Routes	
Map Title: Forest Park Proximity - South	Map Number: MB-262 : 2
Client: PORTLAND GENERAL ELECTRIC PORTLAND, OREGON	
 	

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