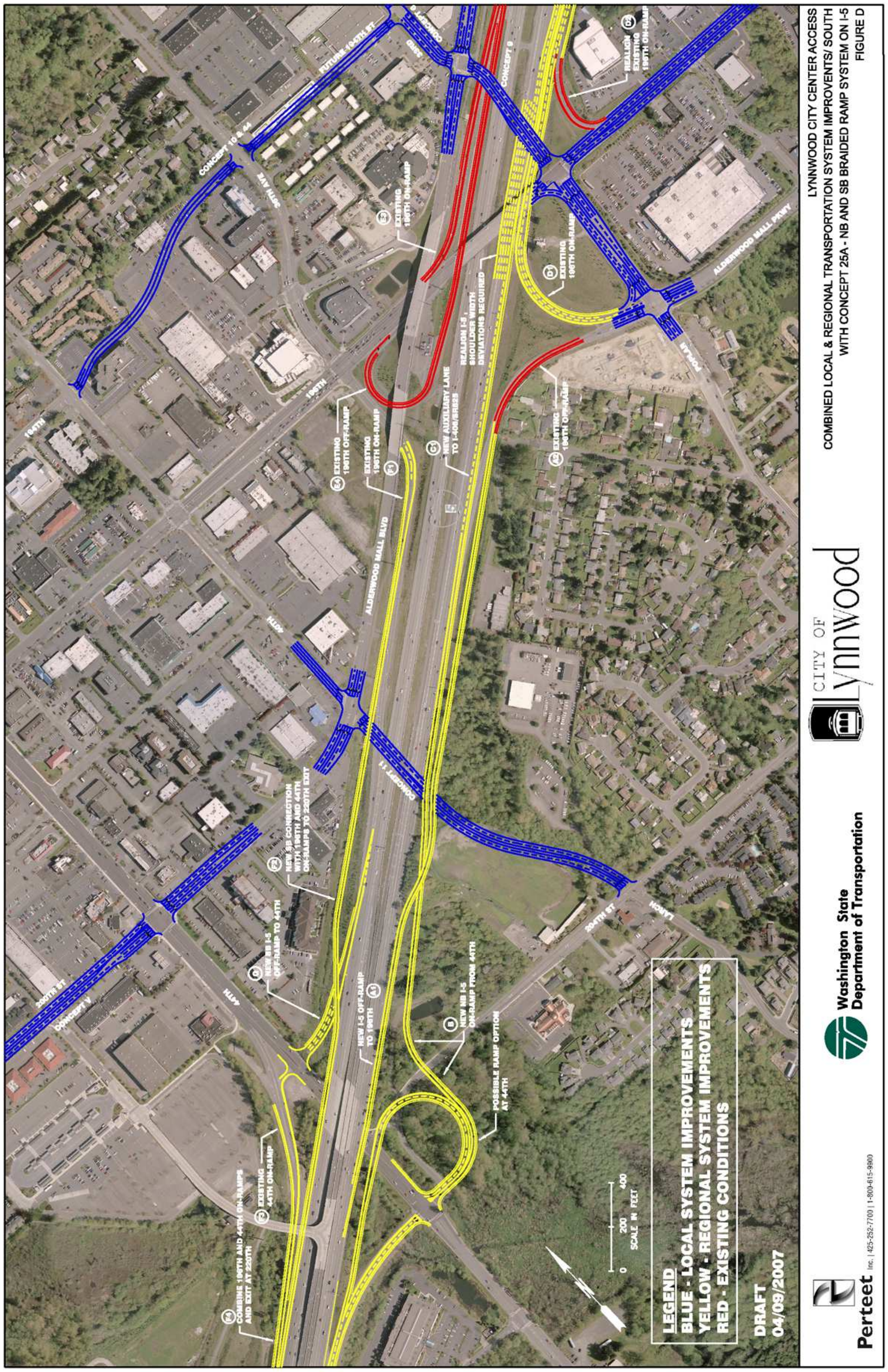
LYNNWOOD CITY CENTER ACCESS
COMBINED LOCAL & REGIONAL TRANSPORTATION SYSTEM IMPROVEMENTS/ SOUTH
WITH CONCEPT 25A - NB AND SB BRAIDED RAMP SYSTEM ON I-5
FIGURE D
LEGEND
BLUE - LOCAL SYSTEM IMPROVEMENTS
YELLOW - REGIONAL SYSTEM IMPROVEMENTS
RED - EXISTING CONDITIONS
DRAFT
04/09/2007
CITY OF Lynnwood
Washington State Department of Transportation
Perteet

LEGEND
BLUE - LOCAL SYSTEM IMPROVEMENTS
YELLOW - REGIONAL SYSTEM IMPROVEMENTS
RED - EXISTING CONDITIONS
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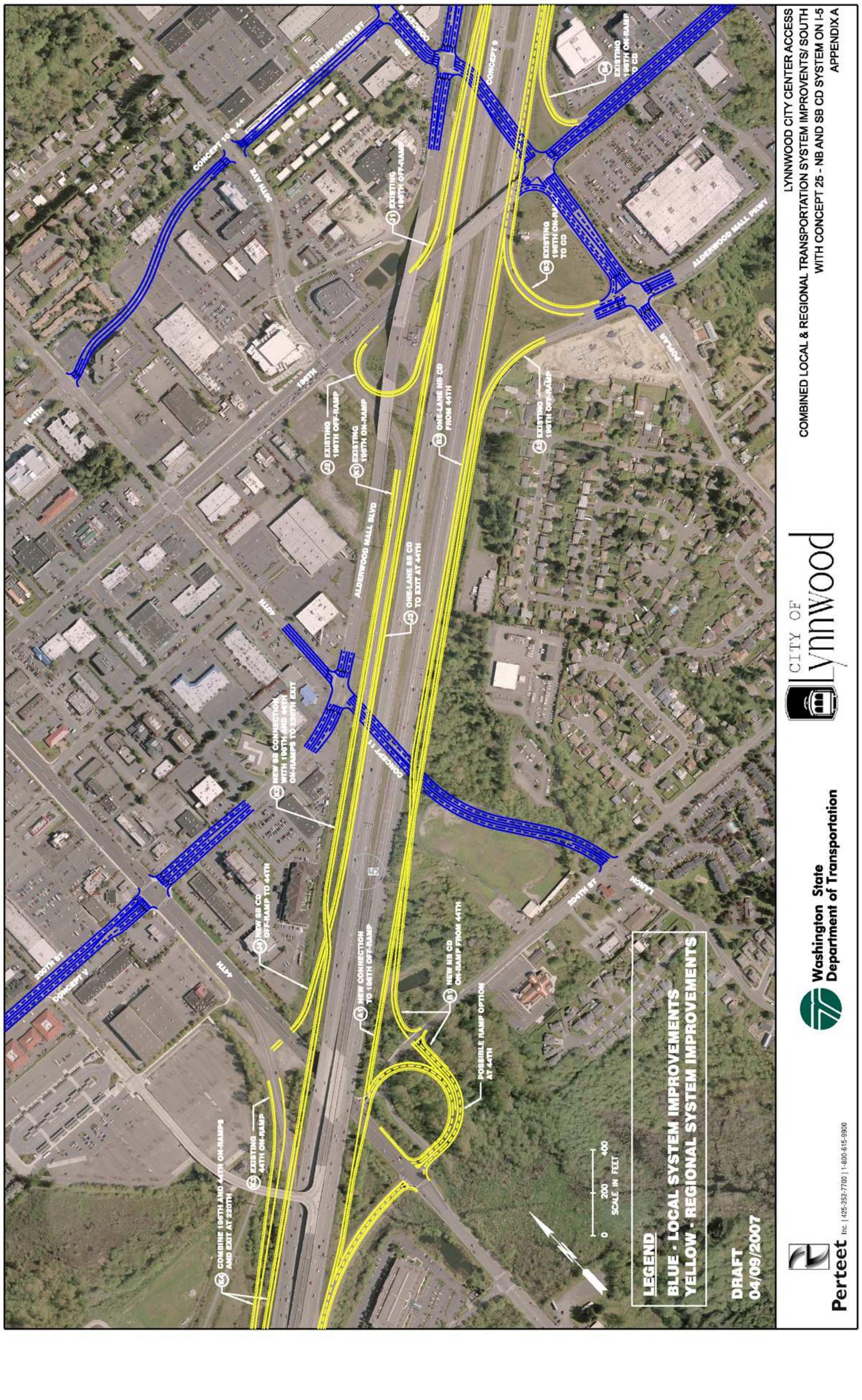
Washington State Department of Transportation
CITY OF Lynnwood
Perteet Inc. | 425-252-7700 | 1-800-615-9860
LYNNWOOD CITY CENTER ACCESS
COMBINED LOCAL & REGIONAL TRANSPORTATION SYSTEM IMPROVENTS/ NORTH
WITH CONCEPT 25A - NB AND SB BRAIDED RAMP SYSTEM ON I-5
FIGURE E

APPENDIX

PRELIMINARY CONCEPTS NOT PURSUED


LYNNWOOD CITY CENTER ACCESS
COMBINED LOCAL & REGIONAL TRANSPORTATION SYSTEM IMPROVENTS/ SOUTH
WITH CONCEPT 25 - NB AND SB CD SYSTEM ON I-5
APPENDIX A
LEGEND
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CITY OF Lynnwood
Washington State Department of Transportation
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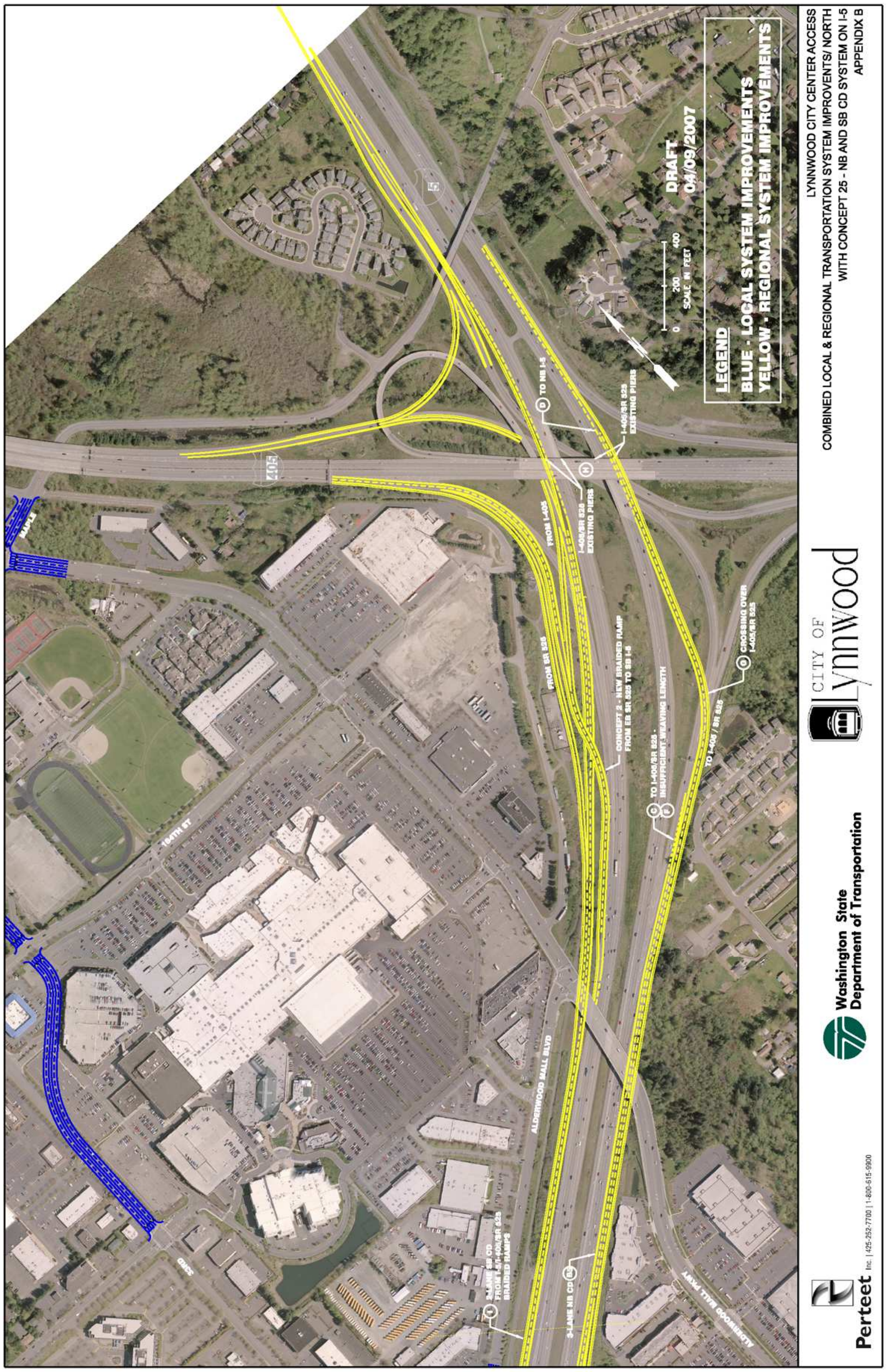
LYNNWOOD CITY CENTER ACCESS
COMBINED LOCAL & REGIONAL TRANSPORTATION SYSTEM IMPROVENTS/ NORTH
WITH CONCEPT 25 - NB AND SB CD SYSTEM ON I-5
APPENDIX B
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BLUE - LOCAL SYSTEM IMPROVEMENTS
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CITY OF Lynnwood
Washington State Department of Transportation
Perteet

Technical Memo #10
Lynnwood City Center Access Study
Draft Environmental Screening

TO: **David Mach, P.E., Project Manager, City of Lynnwood**

FROM: **Peter De Boldt, P.E., Project Manager**
C.K. Eidem, Ecologist

DATE: **July 5, 2007**

RE: **Lynnwood City Center Access Study: Environmental Screening**

1 Summary

This memorandum documents the environmental screening completed for twenty-nine conceptual roadway improvement projects in the City of Lynnwood city center. Twenty-six proposed roadway improvement and safety projects were identified in a previous report: Technical Memo #9 (Concept Refinement, Geometric and Configuration Characteristics: Perteet, April 2007). Three additional closely related alternative alignments were identified by Perteet engineers during subsequent analysis of the city center.

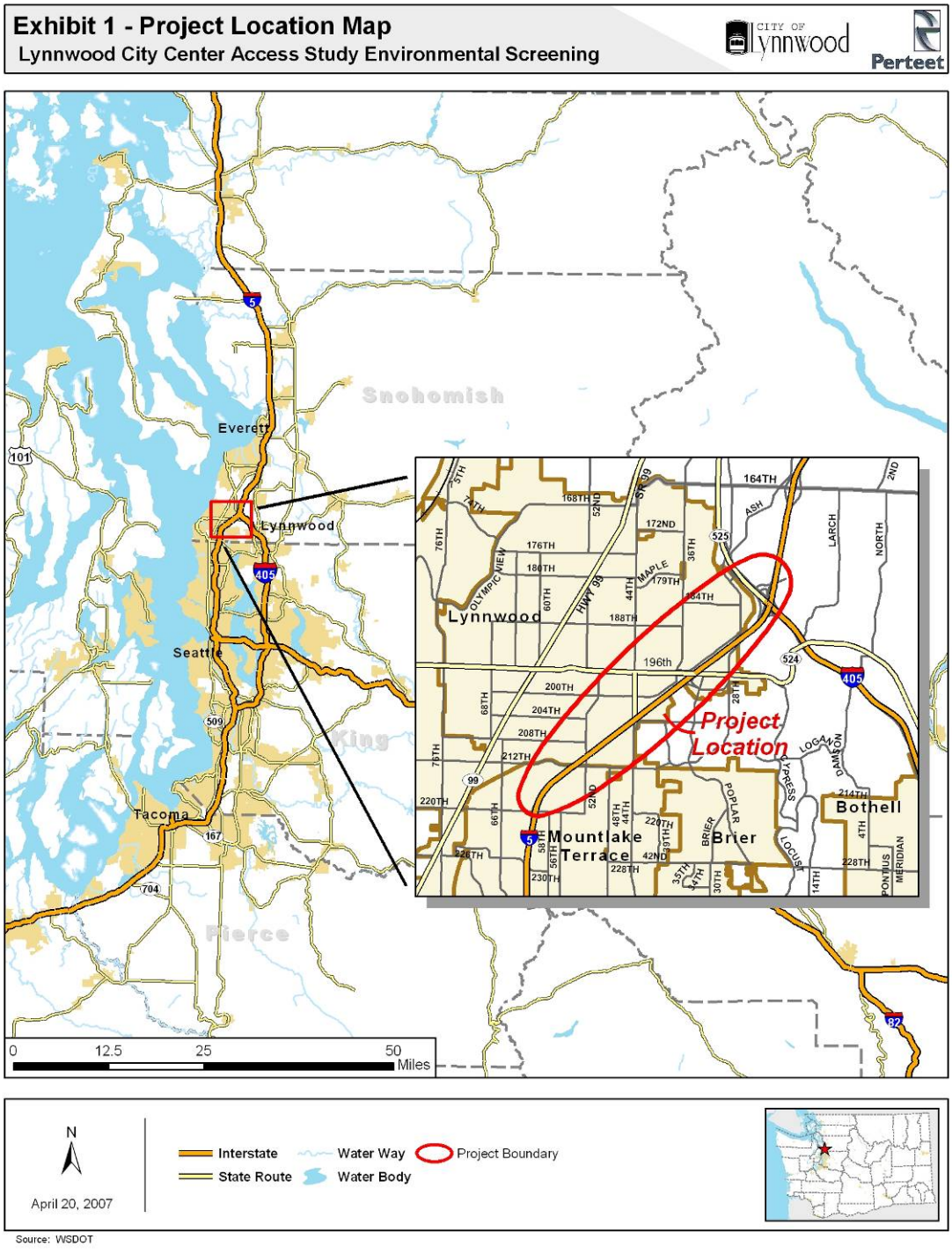
The environmental screening was completed by overlaying available GIS data onto the various project footprints and adjacent areas to calculate potential impacts to environmental elements for each project. This screening will provide detail for analysis of environmental considerations during project planning and help develop strategies for future environmental regulatory approval.

1.1 Study Area

The study area includes the City Center as defined by the Subarea planning process that the City of Lynnwood undertook in 2005 and is bounded by 48th Avenue West to the south, 194th Street SW to the north, and then it follows 36th Street W north to 188th Street SW along the north end, and follows the southern boundary of Alderwood Mall and Alderwood Mall Boulevard to the south. Major landmarks include the current core business districts, the City Civic Center campus, the Lynnwood Park-and-Ride, and the Lynnwood Convention Center. **Exhibit 1** shows the location of the study area and the project locations.

Exhibit 1

Study Area Map



2 Screening Methods

For this report the environmental screening was divided into three categories:

- Natural resources, which include critical areas that are typically regulated by local, state, and federal law;
- Natural hazards, which are areas, resources, and/or critical areas/natural systems and processes that pose a potential hazard to people and property; and
- The human environment, which considers how the project may affect people and their quality of life.

The specific environmental elements evaluated for each category are shown in **Exhibit 2**. The elements evaluated are the typical resources or considerations that would be regulated under the City of Lynnwood and Snohomish County local critical areas ordinance (CAOs), and reviewed for compliance with the State Environmental Policy Act (SEPA) and, when a federal nexus is present, the National Environmental Policy Act (NEPA).

Exhibit 2
Environmental Screening

Category	Element
Natural Resources	Water Quality
	Wetlands
	Streams
	Fish & Aquatic Resources
	Wildlife
Natural Hazards	Floodplains
	Steep Slopes
	Liquefaction
Human Environment	Environmental Justice
	Parks and Recreation Resources
	Cultural and Historic Resources
	Air Quality
	Noise

Each environmental element is discussed separately in its own section, which includes a brief explanation about why the element is relevant, and the specific methods used to analyze the potential project affects on the resource or potential hazard the element presents to the project. In addition, the subsequent sections provide the source of the data and any potential data limitations.

2.1 Projects

The 29 potential roadway improvement projects are listed and described in **Exhibit 3**, and shown in **Exhibit 4**.

Exhibit 3
Proposed Project Concepts and Alternatives

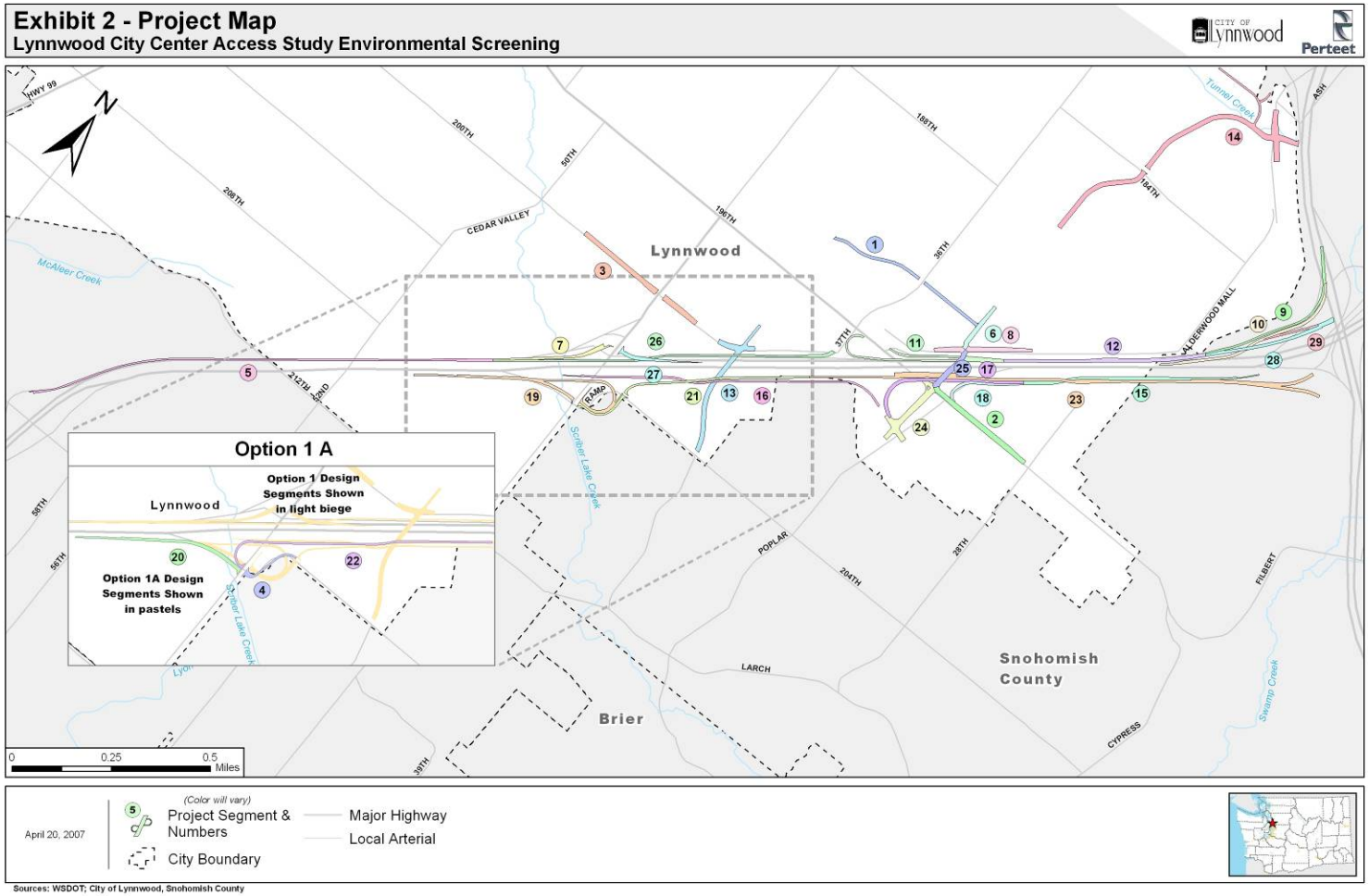
Project No.	Project Name	Project Description
1	Concept 10 – 194th Street Extension	The 194th Street Extension project, also known as Concept 10, will connect 40th Avenue to 33rd Avenue, providing a new access route from the northern portion of the City Center to Alderwood Mall Blvd.
2	Local Concept - 196th Street Widening	The 196th Street Widening project will widen 196th Street from the intersection of Poplar Way to Alderwood Mall Pkwy.
3	Concept V – 200th Street Widening	The 200th Street project – a.k.a. Concept V, will widen 200th Street between 44th Avenue and 48th Avenue into 5 lanes with intersection widening improvements along the east side of 44th Avenue.
4	Concept 25a – 204th Access Rd 1A (part of NB Braided Ramp at 44th)	As part of the northbound I-5 braided ramp system, 204th Street Access Rd 1A is part of an alternative route for the Northbound 44th Avenue interchange to maintain access between 44th Avenue and 204th Street.
5	Concept 25a (SB Braided Ramp) – 220th Street Extension	As part of the southbound I-5 braided ramp system, the 220th Street Extension begins south of the 44th Avenue interchange at the merge point of the braided ramps coming from Southbound 196th Street and 44th Avenue and extends as an auxiliary lane to the 220th Street exit.
6	Concept 6 (part of) - 33rd Avenue Extension	The 33rd Avenue Extension, which is part of Concept 6, will widen 33rd Avenue from just north of the intersection of the future 194th Street extension to Alderwood Mall Blvd.
7	Concept 25a (SB Braided Ramp) – SB 44th On-Ramp	As part of the southbound I-5 braided ramp system, the southbound 44th Avenue on-ramp will connect from 44th Avenue to the 220th Street Extension.
8	Concept 9 (part of) – Intersection of Alderwood Mall Blvd and 33rd Avenue	Part of Concept 9 will widen the intersection at Alderwood Mall Blvd. and 33rd Avenue to accommodate greater capacity for the Poplar Way Overcrossing (Concept 9).
9	Concept 25a (SB Braided Ramp) – EB SR-525 to Merging of SB I-5/I-405/SR 525	A part of the southbound I-5 braided ramp system, this project will run from eastbound SR 525 to where the new southbound off-ramp from I-5 and westbound SR 525 merge prior to exiting at 196th Street.
10	Concept 2 – EB SR-525 to SB I-5	Concept 2 will provide access from eastbound SR 525 to southbound I-5 as a new overcrossing with Concept 25a.

Project No.	Project Name	Project Description
11	Concept 25a (SB Braided Ramp) – Existing 196th Off-Ramps EB/WB	This is the existing southbound 196th Street off-ramps going eastbound and westbound.
12	Concept 25a (SB Braided Ramp) – Merging of SB I-5/I-405/SR 525 to Existing 196th Off-Ramps	As part of the southbound I-5 braided ramp system, this project will begin where the new off-ramps for southbound I-5/SR 525/I-405 merges to the existing 196th Street southbound off-ramps.
13	Concept 11 – 40th /Larch Extension	A.K.A. Concept 11, this project will create a tunnel extension under I-5 from 204th Street and Larch Way to 40th Avenue and Alderwood Mall Blvd.
14	Local Concept – Maple/High School Improvements	Alignment is still being worked out. Will provide access from Maple Road through the site of (NEW OR OLD) Lynnwood High School to 33rd Avenue around the Alderwood Mall.
15	Concept 25a (NB Braided Ramp) – Merging of Poplar/196th On-Ramps to NB I-5	As part of the northbound I-5 braided ramp system, this project is where the two 196th Street on-ramps merge to exit onto northbound I-5.
16	Concept 25a (NB Braided Ramp) - NB 196th Off-Ramp	As part of the northbound I-5 braided ramp system, this is a new off-ramp to 196th Street which will begin further south than the existing 196th Street off-ramp in order to meet vertical clearance requirements going over the proposed on-ramp from 44th Avenue.
17	Concept 25a (NB Braided Ramp) - NB Poplar On-ramp	As part of the northbound I-5 braided ramp system, this project is the I-5 on-ramp from Poplar Way to Project 15 above.
18	Concept 25a (NB Braided Ramp) - NB 196th On-ramp	As part of the northbound I-5 braided ramp system, this project is the I-5 on-ramp from 196th Street to Project 15 above.
19	Concept 25a (NB Braided Ramp) – NB 196th On-ramp Option 2	As part of the northbound I-5 braided ramp system, this project is one northbound off-ramp option from I-5 to 44th Avenue.
20	Concept 25a (NB Braided Ramp) – Concept 25a Option 1A	As part of the northbound I-5 braided ramp system, this project is another NB off-ramp option from I-5 to 44th Avenue.
21	Concept 25a (NB Braided Ramp) – etc, Concept 25a Option 2	As part of the northbound I-5 braided ramp system, this project is a new on-ramp option from 44th Avenue to I-5 to complete the interchange at 44th Avenue.
22	Concept 25a (NB Braided Ramp) – Option 1a	As part of the northbound I-5 braided ramp system, this project is another new on-ramp option from 44th Avenue to I-5 to complete the interchange at 44th Avenue.

Project No.	Project Name	Project Description
23	Concept 25a (NB Braided Ramp) - NB I-405 / SR 525 Off-ramp	As part of the northbound I-5 braided ramp system, this project is the off-ramp from I-5 to SR 525 and I-405.
24	Concept 6 (part of) – Poplar to Alderwood Mall Parkway Extension	As part of Concept 6, this project will widen Poplar Way from the proposed overcrossing in Concept 9 to Alderwood Mall Pkwy.
25	Concept 9 – Poplar I-5 Overcrossing	A.K.A. Concept 9, this project is an extension of Poplar Way between 196th Street and Alderwood Mall Blvd.with a 5 to 6 lane crossing over I-5.
26	Concept 25a (SB Braided Ramp) - SB 196th On-ramp	As part of the southbound I-5 braided ramp system, this project is a new on-ramp from 196th Street to connect with the on-ramp from 44th Avenue.
27	Concept 25a (SB Braided Ramp) - SB 44th Off-ramp	As part of the southbound I-5 braided ramp system, this is a new off-ramp from I-5 to 44th Avenue to complete the interchange at 44th Avenue.
28	Concept 25a (SB Braided Ramp) – SB I-5 Off-ramp into new Braided Ramp System	As part of the southbound I-5 braided ramp system, this is a new off-ramp from I-5 and westbound SR 525 just south of the SR 525/I-405 over crossing that connects with the new ramp from eastbound 525.
29	Concept 2 - WB 525 to SB I-5 On-ramp	This is the new portion of westbound SR 525 that will connect to eastbound SR 525 that will run to southbound I-5.

Exhibit 4

Map of Projects



2.2 Project Footprint and Analysis Area

The project footprint for each project described in Section 2.1 is defined as the physical area of the project, which normally includes the new road surface, curb, gutter, and development of the following associated features:

- fill
- slopes
- retaining walls
- noise walls
- signs
- other utilities or transportation related facilities

A design for stormwater facilities has not been completed at this time, and the environmental effects of the required stormwater systems are potentially outside the currently defined areas of analysis.

Three different sizes of analysis areas have been developed for this environmental screening: the "standard" analysis area; the "extended" analysis area; and the "environmental justice" analysis area.

The **standard analysis** area reflects only the area directly affected by the proposed project – essentially, the area of the environment that may be physically disturbed, which was assumed to include the proposed project footprint, plus 50 feet on either side of the project corridor. For some environmental elements, a different analysis area was chosen. These alternative analysis areas are described below.

The **extended analysis** area reflects areas not directly affected by the proposed project, but that may be indirectly affected by the project. Indirect effects may include increases in noise, air, and water pollution. The extended analysis area is variable in size, based on the regulations and guidelines related to the environmental element being evaluated. These modifications are described for each element that uses an extended analysis area.

The **environmental justice analysis** was based on the use of census geography rather than the standard or extended analysis areas. Census geographical units are variable and based mainly on population density. These units are aggregated at different scales to protect privacy. Specifically, higher sensitivity census information is reported in larger census geographical units to protect the privacy of individual locations. For this analysis, three types of census geographical units were used.

The smallest census geographical unit is the census block, which in a city is normally the size of a city block. The next largest geographical unit is a census block group, which is normally several blocks combined together. The largest census geographical unit used in this analysis is a census tract, which in this case is about square quarter-mile. There are four environmental justice categories screened in this report, including race, poverty, language, and disability. For each category, the geographical unit chosen was the

smallest possible unit that included the necessary data and that was within 500 feet of all of the projects. Specific census data methodology is described in the methods subsection of the environmental justice section.

2.3 GIS Analysis

Perteet completed the Lynnwood City Center Environmental Screening using existing GIS data sources. The GIS analysis used ModelBuilder software, published by ESRI, which is an established method for designing, conducting, and recording complex GIS analyses. The ModelBuilder analysis improves a standard GIS analysis in five important ways:

- It is a published, well-known, recognized, peer-reviewed process.
- It generates a detailed, standardized record (metadata) of the GIS processing.
- It is easily replicated.
- It is easy to modify.
- It creates a framework that facilitates standard analysis across resource types.

In order to create the base map for the ModelBuilder process, Perteet determined the current roadway footprint and estimated the current edge of pavement. Perteet established the approximate location of the project footprint and the edge of pavement by using an aerial photograph and existing road base-maps (Perteet 3/2007). Perteet checked this estimation of the road footprint and the pavement's edge against landmarks on aerial photographs and other GIS layers (i.e., centerline, parcel boundaries, etc.).

The existing GIS data was gathered from numerous sources including local, state, and federal databases. No site-specific field data was obtained for this analysis. Due to the high-level screening and nature of the data used, numerous assumptions were made in order to conduct this environmental screening. Those assumptions are documented in the methodology sections in each individual environmental element subsection.

3 Natural Resources

This environmental screening looks at natural resources typically regulated by local, state, and federal law. Each natural resource element section has a brief introduction to the resource, methods specific to screening for that resource, and results of the screening for the resource.

3.1 Water Quality

Removing existing vegetation and creating impervious/pollution generating surfaces have the potential to affect stormwater quality and quantity. For this report, these stormwater elements are considered "natural resources" because they are integral to the health of wetlands, streams, and many other environmental processes. Perteet used the project footprint area, or "new impervious areas", to estimate the effect of proposed projects on

water quality and quantity (i.e., peak flows). In construction projects these elements are normally protected or maintained using constructed stormwater management structures and through best management practices, such as silt fences. Any proposed project that may affect water quality and/or quality must adhere to federal, state, and local regulations by providing sufficient stormwater detention, stormwater filtration, and adhering to current best management practices.

3.1.1 Methods

New impervious surface areas data was calculated by determining the area of the project footprint. Project footprints and edge of existing pavement was quality checked against landmarks on aerial photographs and other GIS layers.

3.1.2 Results Summary

The result of the project specific impervious surface analysis is summarized in **Exhibit 5**, showing new impervious surface areas by project.

Exhibit 5
Area of New Impervious Surface, in square feet, by project

Project		New Impervious Surface
No.	Name	Project Footprint
1	Concept 10 – 194th Street Extension	78,794
2	Local Concept – 196th Street Widening	107,016
3	Concept V – 200th Street Widening	115,798
4	Concept 25a – 204th Access Rd 1A (part of NB Braided Ramp at 44th)	23,709
5	Concept 25a (SB Braided Ramp) – 220th Street Extension	134,406
6	Concept 6 (part of) – 33rd Avenue Extension	39,329
7	Concept 25a (SB Braided Ramp) – SB 44th On-Ramp	51,277
8	Concept 9 (part of) – Intersection of Alderwood Mall Blvd and 33rd Avenue	71,492
9	Concept 25a (SB Braided Ramp) – EB SR-525 to Merging of SB I-5/I-405/SR 525	65,984
10	Concept 2 – EB SR-525 to SB I-5	87,875
11	Concept 25a (SB Braided Ramp) – Existing 196th Off-Ramps EB/WB	103,397

Project		New Impervious Surface
No.	Name	Project Footprint
12	Concept 25a (SB Braided Ramp) – Merging of SB I-5/I-405/SR 525 to Existing 196th Off-Ramps	115,065
13	Concept 11 – 40th/Larch Extension	136,226
14	Local Concept – Maple/High School Improvements	309,277
15	Concept 25a (NB Braided Ramp) – Merging of Poplar/196th On-Ramps to NB I-5	104,610
16	Concept 25a (NB Braided Ramp) – NB 196th Off-Ramp	94,246
17	Concept 25a (NB Braided Ramp) – NB Poplar On-ramp	88,251
18	Concept 25a (NB Braided Ramp) – NB 196th On-ramp	29,397
19	Concept 25a (NB Braided Ramp) – NB 196th On-ramp Option 2	126,615
20	Concept 25a (NB Braided Ramp) – Concept 25a Option 1A	71,878
21	Concept 25a (NB Braided Ramp) – etc., Concept 25a Option 2	82,698
22	Concept 25a (NB Braided Ramp) – Option 1a	83,477
23	Concept 25a (NB Braided Ramp) – NB I-405 / SR 525 Off-ramp	294,485
24	Concept 6 (part of) – Poplar to Alderwood Mall Parkway Extension	103,229
25	Concept 9 – Poplar I-5 Overcrossing	43,042
26	Concept 25a (SB Braided Ramp) – SB 196th On-ramp	100,467
27	Concept 25a (SB Braided Ramp) – SB 44th Off-ramp	33,106
28	Concept 25a (SB Braided Ramp) – SB I-5 Off-ramp into new Braided Ramp System	71,460
29	Concept 2 – WB 525 to SB I-5 On-ramp	17,849

3.2 Wetlands

Perteet screened the proposed projects for potential impacts to wetlands and "Habitat Areas". Habitat area info from Lynnwood was based on Washington Department of Fish and Wildlife (WDFW) Priority Habitat and Species (PHS) maps. Habitat areas closely matched existing intact vegetation around wetlands and therefore where used as a proxy

for wetland buffer because most wetlands within the City of Lynnwood are surrounded by impervious surfaces and/or similar devlopment. By using the Habitat Areas, only those locations with intact vegetation adjacent to wetlands are screened for potential impacts, not buffers overlaid on existing roads or development. This reduces the potential of artificially inflated buffer impacts and subsequent mitigation cost estimates.

Any proposed project that may affect wetlands or their buffers must adhere to federal, state, and local regulations regarding wetland impacts, including water quality, hydrology and habitat effects.

3.2.1 Methods

Perteet used the standard analysis area described in Section 2.2 for the wetland screening (the project footprint, plus 50 feet on each side of the proposed project). Perteet calculated the impacted area for the wetlands and the City of Lynnwood's designated Habitat Areas. The GIS layers for wetlands consisted of wetland data from the City of Lynnwood and Snohomish County, which are largely based on the National Wetland Inventory (NWI), local observation, and in some cases previous delineation.

When a complete environment review is conducted for a selected project, detailed wetland delineations and a buffer analysis will need to be completed. If wetland impacts are identified, the project will have to go through the avoidance/mitigation sequencing process as required by the U.S. Army Corps of Engineers, Department of Ecology and/or local regulations.

3.2.2 Result Summary

The project specific wetland analysis is summarized in **Exhibit 6**. The location of the wetlands and Lynwood's Habitat Areas are described in relation to the proposed projects and depicted on screening maps, which are provided in **Appendix A**.

Exhibit 6
Wetland and Habitat Area Impacts, in square feet by project

Project		Wetland Impact		Habitat Area Impact	
No.	Name	Project Footprint	50 foot Area-of Analysis	Project Footprint	50 foot Area-of Analysis
1	Concept 10 – 194th Street Extension	None		None	
2	Local Concept - 196th Street Widening	0	7,730	0	2,936
3	Concept V – 200th Street Widening	None		None	

Project		Wetland Impact		Habitat Area Impact	
No.	Name	Project Footprint	50 foot Area-of Analysis	Project Footprint	50 foot Area-of Analysis
4	Concept 25a – 204th Access Rd 1A (part of NB Braided Ramp at 44th)	13,021	33,947	17,926	53,680
5	Concept 25a (SB Braided Ramp) – 220th Street Extension	0	13,476	0	17,244
6	Concept 6 (part of) - 33rd Avenue Extension	None		None	
7	Concept 25a (SB Braided Ramp) – SB 44th On-Ramp	4,152	31,509	114	28,783
8	Concept 9 (part of) – Intersection of Alderwood Mall Blvd and 33rd Avenue	None		None	
9	Concept 25a (SB Braided Ramp) – EB SR-525 to Merging of SB I-5/I-405/SR 525	None		None	
10	Concept 2 – EB SR-525 to SB I-5	None		None	
11	Concept 25a (SB Braided Ramp) – Existing 196th Off-Ramps EB/WB	None		None	
12	Concept 25a (SB Braided Ramp) – Merging of SB I-5/I-405/SR 525 to Existing 196th Off-Ramps	None		None	
13	Concept 11 – 40th /Larch Extension	None		None	
14	Local Concept – Maple/High School Improvements	2,142	45,328	None	
15	Concept 25a (NB Braided Ramp) – Merging of Poplar/196th On-Ramps to NB I-5	0	15,929	0	8,234
16	Concept 25a (NB Braided Ramp) - NB 196th Off-Ramp	7,630	10,666	338	12,840

Project		Wetland Impact		Habitat Area Impact	
No.	Name	Project Footprint	50 foot Area-of Analysis	Project Footprint	50 foot Area-of Analysis
17	Concept 25a (NB Braided Ramp) - NB Poplar On-ramp	0	462	None	
18	Concept 25a (NB Braided Ramp) - NB 196th On-ramp	0	882	None	
19	Concept 25a (NB Braided Ramp) – NB 196th On-ramp Option 2	15,287	65,088	22,691	99,017
20	Concept 25a (NB Braided Ramp) – Concept 25a Option 1A	15,632	24,493	13,686	16,014
21	Concept 25a (NB Braided Ramp) – etc, Concept 25a Option 2	0	2,835	14,581	64,596
22	Concept 25a (NB Braided Ramp) – Option 1a	583	11,135	9,423	32,785
23	Concept 25a (NB Braided Ramp) - NB I-405 / SR 525 Off-ramp	4,062	30,813	2,597	23,568
24	Concept 6 (part of) – Poplar to Alderwood Mall Parkway Extension	None		None	
25	Concept 9 – Poplar I-5 Overcrossing	None		None	
26	Concept 25a (SB Braided Ramp) - SB 196th On-ramp	0	12,476	0	7,181
27	Concept 25a (SB Braided Ramp) - SB 44th Off-ramp	None		None	
28	Concept 25a (SB Braided Ramp) – SB I-5 Off-ramp into new Braided Ramp System	None		None	
29	Concept 2 - WB 525 to SB I-5 On-ramp	None		None	

3.3 Streams

Any proposed project that may potentially affect streams or their buffers must adhere to federal, state, and local regulations. Normally those regulations require protecting stream buffers, using mitigation sequencing when in-water work is required, and providing for fish passage when stream crossings of fish-bearing waters are necessary.

3.3.1 Methods

Perteet used the standard analysis area described in Section 2.2 for the stream and stream crossings screening (the project footprint, plus 50 feet on each side of the proposed project). The GIS layers consisted of data from Snohomish County, WDFW, and City of Lynnwood.

3.3.2 Results Summary

Only two of the streams were found to be directly within the project area; Scriber Lake Creek (WRIA 80061) and Tunnel Creek (WRIA 80000). Note that Swamp Creek (WRIA 80059) is located about 250' outside the analysis area and will not be directly affected by project construction. The location of the streams is depicted on screening maps, which are provided in **Appendix A**. The results of the analysis on streams are summarized in **Exhibit 8 (Section 3.4.2)**. Perteet also noted stream culverts and their WDFW designated barrier status on screening maps located in **Appendix A**.

3.4 Fish and Aquatic Resources

Protected fish species determined to inhabit aquatic resources within the area of analysis would have to be considered during the design of the stormwater system and in the permitting and environmental review process. Any proposed project that may potentially affect fish and aquatic resources must adhere to federal, state, and local regulations, especially the federal Endangered Species Act.

Fish species that were screened for presence in the study area included endangered, threatened, and candidate species and state priority species found in Western Washington. **Exhibit 7** lists the fish species potentially located within the project study area and the regulatory status of each of these species.

Exhibit 7
List of Western Washington Fish Species and their Regulatory Status

Common Name	DPU/ESU[1]	ESA Status		Habitat Status	Source[2]
		Federal	State		
Chinook salmon (fall, spring) *Oncorhynchus tshawytscha*	*Puget Sound*	Federal threatened	State priority species or candidate species (food)	Federal - designated; State -any occurrence	WDFW, NOAA
Coho salmon, *O. kisutch*	*Puget Sound*	Federal species of concern	Food fish	Federal - NA; State -any occurrence	WDFW, NOAA
Pink salmon, *O. gorbuscha*	*NA*	Not warranted	Food fish	Federal - NA; State -any occurrence	WDFW, NOAA
Chum salmon (fall), *O. keta*	*NA*	Not warranted	Food fish	Federal - NA; State -any occurrence	WDFW, NOAA
Steelhead/ Rainbow trout (summer, winter), *O mykiss*	*Puget Sound*	Proposed Threatened	Food fish	Federal – TBD; State - any occurrence	WDFW, NOAA
Cutthroat trout, *O. clarki*	*NA*	Not warranted	Game Fish		WDFW, NOAA
Sockeye Salmon, *O. nerka*	*NA*	Not warranted	Food fish	Federal - NA; State -any occurrence	WDFW, NOAA
Dolly Varden/ Bull Trout, *Salvelinus confluentus*	*ID, MT, NV, OR, WA*	Federal threatened	Game Fish	Federal - NA; State - NA	USFW

3.4.1 Methods

Perteet used the standard analysis area described in Section 2.2 for the fish and aquatic resources screening (the project footprint, plus 50 feet on each side of the proposed

[1] DPU – Distinct Population Unit, a term used by Fish and Wildlife to denote the location of the species in the country or region.
ESU - Evolutionarily Significant Unit, a term used by NOAA to denote the location of the species in the country or region.

[2] http://wdfw.wa.gov/wlm/diversty/soc/adv_search.htm
http://wdfw.wa.gov/hab/phsvert.htm#fish
http://www.nmfs.noaa.gov/pr/species/esa.htm#fish
http://www.fws.gov/endangered/wildlife.html
http://www.nwr.noaa.gov/Salmon-Habitat/Critical-Habitat/

project). GIS layers consisted of data from WDFW, Snohomish County, the National Oceanic and Atmospheric Administration (NOAA) Fisheries, and the U.S. Fish and Wildlife Service (USFWS).

3.4.2 Results Summary

Only two of the nine potential fish species were found to be within the project area. Those fish species are Coho salmon and Cutthroat trout. The potential impacts of the projects on fish habitat are summarized in the **Exhibit 8**. The locations of the streams are depicted on screening maps, which are provided in **Appendix A**. The results of the screening of fish and aquatic habitat are summarized in **Exhibit 8**. Perteet also noted stream culverts and their WDFW designated barrier status on screening maps located in **Appendix A**.

Exhibit 8
Potential Project Stream Impacts and Habitat Presence

Project No.	Name	Footprint			50ft Area of Analysis		
		Stream Impact (in linear feet)	Coho habitat	Cutthroat habitat	Stream Impact (in linear feet)	Coho habitat	Cutthroat habitat
7	44th On-ramp	36		✓	127		✓
19	44th Off-ramp	64	✓	✓	211	✓	✓
20	NB 44th Off-ramp1A				159	✓	✓
22	NB 44th On-ramp	24		✓	116		✓
26	SB 196th On-Ramp	36		✓	127		✓

3.5 Wildlife

Protected wildlife species present within the area of analysis must be considered during the permitting and environmental review process. Wildlife evaluated for this screening includes both state and federal endangered, threatened, sensitive, and candidate species; animal aggregations which are considered vulnerable; and those species of recreational, commercial, or tribal importance that are vulnerable and could be affected by project elements. Any proposed project that may affect wildlife must adhere to federal and state regulations, especially the federal Endangered Species Act.

3.5.1 Methods

Perteet requested wildlife data from the Priority Habitats and Species office at WDFW. An extended analysis area of 1,500 feet was used to screen for protected wildlife.

3.5.2 Results Summary

The screening showed two documented protected wildlife observations within 1,500 feet the project sites.

- The first observation is a Blue Heron colony, which is located approximately 780 feet from project #14, the Maple/High School Improvements. Blue Heron [*ARDEA HERODIAS]* is a "State Monitor Species" that requires management, survey, or data emphasis.
- The second observation is a sighting of a Yellow Billed Cuckoo (flying over the freeway) at approximately 345 feet from project # 5, Concept 25a (SB Braided Ramp) – 220th Street Extension. Yellow Billed Cuckoo *[COCCYZUS AMERICANUS]* is a "State Candidate Species" which include fish and wildlife species that the WDFW will review for possible listing as State Endangered, Threatened, or Sensitive.

It is important to note that neither of these species are federally listed species.

4 Natural Hazards

Natural hazards are areas, resources, and/or critical area/natural systems and processes that pose a potential hazard to people and property. This environmental screening looks at natural hazards typically regulated by local, state, and federal laws including: local Critical Area Regulations, State Environmental Policy Act (SEPA) or, Federal laws (i.e., flood management), and/or areas with special engineering considerations (i.e., liquefaction risk).

4.1 Floodplain Screening

Floodplains are regulated by the Flood Emergency Management Agency (FEMA) and local critical areas regulations. Floodplains in Snohomish County are classified as the 100-year floodplain, the 500-year floodplain, the floodway, and the floodway fringe.

The 100-year floodplain is the part of the valley that has a 1 percent chance of flooding in a given year, and the 500-year floodplain has a 0.2 percent chance of flooding in a given year. The floodway means the regular channel of a river, stream, or other watercourse, plus the adjacent land areas that must be reserved in order to discharge the base flood (100-year flood) without cumulatively increasing the water surface elevation more than one foot. Floodway fringe means that portion of a floodplain which is inundated by floodwaters but is not within a defined floodway. Floodway fringes serve as temporary storage areas for floodwaters.

4.1.1 Methods

Perteet used the standard analysis area described in Section 2.2 for the floodplains screening (the project footprint, plus 50 feet on each side of the proposed project). The

GIS layers consisted of data from Flood Insurance Rate Maps (FIRM) made by FEMA's National Flood Insurance Program (NFIP).

4.1.2 Results Summary

The results of the floodplain screening are summarized in the following table, **Exhibit 9**. The location of the floodplains and floodways are depicted on screening maps, which are provided in **Appendix A**.

Exhibit 9
100-year Floodplain Impacts, in square feet by project

Project		Floodplain Impacts	
No.	Name	Footprint	50 foot Area-of-Analysis
1	Concept 10 – 194th Street Extension	None	
2	Local Concept – 196th Street Widening	None	
3	Concept V – 200th Street Widening	None	
4	Concept 25a – 204th Access Rd 1A (part of NB Braided Ramp at 44th)	899	5,394
5	Concept 25a (SB Braided Ramp) – 220th Street Extension	4,674	19,136
6	Concept 6 (part of) – 33rd Avenue Extension	None	
7	Concept 25a (SB Braided Ramp) – SB 44th On-Ramp	136	27,739
8	Concept 9 (part of) – Intersection of Alderwood Mall Blvd and 33rd Avenue	None	
9	Concept 25a (SB Braided Ramp) – EB SR-525 to Merging of SB I-5/I-405/SR 525	None	
10	Concept 2 – EB SR-525 to SB I-5	None	
11	Concept 25a (SB Braided Ramp) – Existing 196th Off-Ramps EB/WB	None	
12	Concept 25a (SB Braided Ramp) – Merging of SB I-5/I-405/SR 525 to Existing 196th Off-Ramps	None	
13	Concept 11 – 40th/Larch Extension	None	

Project		Floodplain Impacts	
No.	Name	Footprint	50 foot Area-of-Analysis
14	Local Concept – Maple/High School Improvements	None	
15	Concept 25a (NB Braided Ramp) – Merging of Poplar/196th On-Ramps to NB I-5	None	
16	Concept 25a (NB Braided Ramp) – NB 196th Off-Ramp	None	
17	Concept 25a (NB Braided Ramp) – NB Poplar On-ramp	None	
18	Concept 25a (NB Braided Ramp) – NB 196th On-ramp	None	
19	Concept 25a (NB Braided Ramp) – NB 196th On-ramp Option 2	0	18,467
20	Concept 25a (NB Braided Ramp) – Concept 25a Option 1A	8,552	18,118
21	Concept 25a (NB Braided Ramp) – etc., Concept 25a Option 2	0	75
22	Concept 25a (NB Braided Ramp) – Option 1a	3,208	10,689
23	Concept 25a (NB Braided Ramp) – NB I-405 / SR 525 Off-ramp	None	
24	Concept 6 (part of) – Poplar to Alderwood Mall Parkway Extension	None	
25	Concept 9 – Poplar I-5 Overcrossing	None	
26	Concept 25a (SB Braided Ramp) – SB 196th On-ramp	0	6,023
27	Concept 25a (SB Braided Ramp) – SB 44th Off-ramp	None	
28	Concept 25a (SB Braided Ramp) – SB I-5 Off-ramp into new Braided Ramp System	None	
29	Concept 2 – WB 525 to SB I-5 On-ramp	None	

4.2 Steep Slopes

Perteet evaluated the occurrence of steep slopes (greater than 40%) within the project area. These areas meet one definition of Lynwood's designated "Geologically Hazardous Areas" (LMC 17.10.030).

4.2.1 Methods

Perteet used the standard analysis area described in Section 2.2 for the steep slopes screening (the project footprint, plus 50 feet on each side of the proposed project). The GIS layers consisted of steep slope data from the City of Lynnwood and Snohomish County.

4.2.2 Results Summary

The results of the corridor projects analysis are summarized in **Exhibit 10**. The location of the steep slopes is depicted on screening maps, which are provided in **Appendix A**. It should be noted that most, if not all of the steep slopes in the project area are not naturally occurring slopes, as they are part of the I-5 road prism and already heavily engineered.

Exhibit 10
Steep Slopes in project area, in square feet, by project

Project		Steep Slopes	
No.	Name	Footprint	50 foot Area-of Analysis
1	Concept 10 – 194th Street Extension	1,357	6,540
2	Local Concept – 196th Street Widening	None	
3	Concept V – 200th Street Widening	None	
4	Concept 25a – 204th Access Rd 1A (part of NB Braided Ramp at 44th)	None	
5	Concept 25a (SB Braided Ramp) – 220th Street Extension	7,137	35,750
6	Concept 6 (part of) – 33rd Avenue Extension	None	
7	Concept 25a (SB Braided Ramp) – SB 44th On-Ramp	9,648	3,936
8	Concept 9 (part of) – Intersection of Alderwood Mall Blvd. and 33rd Avenue	None	

Project		Steep Slopes	
No.	Name	Footprint	50 foot Area-of Analysis
9	Concept 25a (SB Braided Ramp) – EB SR-525 to Merging of SB I-5/I-405/SR 525	3,911	19,959
10	Concept 2 – EB SR-525 to SB I-5	9,042	24,025
11	Concept 25a (SB Braided Ramp) – Existing 196th Off-Ramps EB/WB	0	2,156
12	Concept 25a (SB Braided Ramp) – Merging of SB I-5/I-405/SR 525 to Existing 196th Off-Ramps	None	
13	Concept 11 – 40th/Larch Extension	None	
14	Local Concept – Maple/High School Improvements	None	
15	Concept 25a (NB Braided Ramp) – Merging of Poplar/196th On-Ramps to NB I-5	8,939	8,674
16	Concept 25a (NB Braided Ramp) – NB 196th Off-Ramp	12,882	22,883
17	Concept 25a (NB Braided Ramp) – NB Poplar On-Ramp	6,549	3,873
18	Concept 25a (NB Braided Ramp) – NB 196th On-Ramp	0	9,873
19	Concept 25a (NB Braided Ramp) – NB 196th On-Ramp Option 2	0	32,677
20	Concept 25a (NB Braided Ramp) – Concept 25a Option 1A	6,727	10,941
21	Concept 25a (NB Braided Ramp) – etc, Concept 25a Option 2	0	9,970
22	Concept 25a (NB Braided Ramp) – Option 1a	8,249	20,495
23	Concept 25a (NB Braided Ramp) – NB I-405 / SR 525 Off-Ramp	12,575	13,131
24	Concept 6 (part of) – Poplar to Alderwood Mall Parkway Extension	None	
25	Concept 9 – Poplar I-5 Overcrossing	None	
26	Concept 25a (SB Braided Ramp) – SB 196th On-Ramp	1,669	11,624

Project		Steep Slopes	
No.	Name	Footprint	50 foot Area-of Analysis
27	Concept 25a (SB Braided Ramp) – SB 44th Off-Ramp	None	
28	Concept 25a (SB Braided Ramp) – SB I-5 Off-Ramp into new Braided Ramp System	4,506	10,932
29	Concept 2 - WB 525 to SB I-5 On-Ramp	3,405	8,498

4.3 Liquefaction Screening

Perteet evaluated the risk of soil liquefaction within the project area. Liquefaction occurs when soil takes on the characteristics of a liquid as a result of an increase in soil pore pressure and a reduction in stress. Liquefiable soil is normally solid ground that turns to a jellylike material when disturbed by an earthquake, or other large disturbances and can cause landslides and massive structural damage.

4.3.1 Methods

Perteet used the standard analysis area described in Section 2.2 for soil liquefaction risk screening (the project footprint, plus 50 feet on each side of the proposed project). Perteet calculated the estimated project area found within identified soil extents. These soils were categorized based on their potential liquefaction risk, as classified by Washington State Department of Natural Resources, which can be rated as:

- High
- Moderate to High
- Low
- Very Low to Low
- Very Low

The GIS layers consisted of liquefaction data from the Washington State Department of Natural Resources.

4.3.2 Results Summary

The results of the screening are summarized in the following table, **Exhibit 11**. Soils in the study fell into only two risk categories; very low, and moderate to high. The location of the soil liquefaction risk is depicted on screening maps, which are provided in **Appendix A**.

Exhibit 11
Soil Liquefaction Risk, in square feet, by project

Project	Project	Very Low	Moderate to high
1	Concept 10 – 194th Street Extension	78,794	0
2	Local Concept – 196th Street Widening	107,016	0
3	Concept V – 200th Street Widening	115,798	0
4	Concept 25a – 204th Access Rd 1A (part of NB Braided Ramp at 44th)	4,649	19,079
5	Concept 25a (SB Braided Ramp) – 220th Street Extension	11,4921	19,485
6	Concept 6 (part of) – 33rd Avenue Extension	39,329	0
7	Concept 25a (SB Braided Ramp) – SB 44th On-Ramp	29,393	21,884
8	Concept 9 (part of) – Intersection of Alderwood Mall Blvd and 33rd Avenue	71,492	0
9	Concept 25a (SB Braided Ramp) – EB SR-525 to Merging of SB I-5/I-405/SR 525	65,984	0
10	Concept 2 – EB SR-525 to SB I-5	87,875	0
11	Concept 25a (SB Braided Ramp) – Existing 196th Off-Ramps EB/WB	103,397	0
12	Concept 25a (SB Braided Ramp) – Merging of SB I-5/I-405/SR 525 to Existing 196th Off-Ramps	1,155,065	0
13	Concept 11 – 40th/Larch Extension	136,226	0
14	Local Concept – Maple/High School Improvements	241,941	67,337
15	Concept 25a (NB Braided Ramp) – Merging of Poplar/196th On-Ramps to NB I-5	104,610	0
16	Concept 25a (NB Braided Ramp) – NB 196th Off-Ramp	86,555	7,691
17	Concept 25a (NB Braided Ramp) – NB Poplar On-Ramp	88,251	0
18	Concept 25a (NB Braided Ramp) – NB 196th On-Ramp	29,397	0
19	Concept 25a (NB Braided Ramp) – NB 196th On-Ramp Option 2	61,715	64,900
20	Concept 25a (NB Braided Ramp) – Concept 25a Option 1A	48,927	22,890

Project	Project	Very Low	Moderate to high
21	Concept 25a (NB Braided Ramp) – etc., Concept 25a Option 2	68,897	13,801
22	Concept 25a (NB Braided Ramp) – Option 1a	62,183	21,246
23	Concept 25a (NB Braided Ramp) – NB I-405 / SR 525 Off-Ramp	294,485	0
24	Concept 6 (part of) – Poplar to Alderwood Mall Parkway Extension	103,229	0
25	Concept 9 – Poplar I-5 Overcrossing	43,042	0
26	Concept 25a (SB Braided Ramp) – SB 196th On-ramp	84,330	16,137
27	Concept 25a (SB Braided Ramp) – SB 44th Off-ramp	33,106	0
28	Concept 25a (SB Braided Ramp) – SB I-5 Off-ramp into new Braided Ramp System	71,460	0
29	Concept 2 – WB 525 to SB I-5 On-ramp	17,849	0

5 Human Environment

The human environment refers to project effects that impact quality of life, social justice, historic places, and cultural resources. This environmental screening looks at the human environment typically regulated by local, state, and federal law and policies.

5.1 Environmental Justice

The City will comply with WSDOT Environmental Justice policies and procedures as required. This environmental justice screening is not intended to fully satisfy WSDOT requirements or to be a comprehensive environmental justice analysis but instead is a preliminary screening of available environmental justice data. This screening is intended to determine if minority and/or low-income populations are found in the vicinity of the proposed projects and to facilitate development of project-specific environmental justice analysis. For further information on the environmental justice analysis process please visit the WSDOT website, http://www.wsdot.wa.gov/Environment/EJ/EnviroJustice.htm.

This environmental screening will also help project planners establish a strategy for Environmental Justice public involvement. When significant populations in a project area speak languages other than English, WSDOT policy is that outreach and noticing be available in those languages as well as English. This screening will identify those areas where populations will need this additional public outreach.

5.1.1 Methods

Perteet reviewed 2000 U.S. Census Bureau data for low-income and minority populations for the City of Lynnwood. The census geography selected were those that are within 500-feet of any project. Census data used included:

- Race Table P4
- Poverty by Age table P87
- Language Spoken at Home Table PCT 10
- Disability Table QT P21

The results of the environmental justice screening are reported differently than other analysis. The results for race, language, and poverty are reported for all of the projects together instead of by individual project. This was done due to the close proximity of projects, the extended analysis area, and the type of data available.

5.1.2 Race Results

This part of the analysis used 2000 Census data, Table P4 Race. Each race is shown as a percent of the total population for first the City and then for the project area in **Exhibit 12**. Race data is presented by Census Block on maps located in **Appendix A**. A map for each race compares the percent of that race in each census block to the City average. Race is used to determine public outreach and noticing requirements.

Exhibit 12
Race as a Percentage of total population, 2000 Census Data

Geographic Area	Caucasian	Hispanic	African American	American Indian	Asian	Native Hawaiian or Pacific Islander	Other	Two or more races
City of Lynnwood	74.3%	7%	3.3%	1%	13.9%	0.4%	2.8%	0.04%
Project Area	78.3%	4.9%	2.0%	0.8%	0.9%	0.4%	0.2%	3.4%enc

If the rate of minority race in the project area is substantially higher than the surrounding area, a detailed environmental justice analysis of the project is recommended. The screening is intended to identify areas for further study using WSDOT or FHWA methodologies. However these preliminary screening results show that the projects will likely not have a disproportionate impact on minorities.

Another use for race data is noticing and public outreach. WSDOT policy recommends noticing and public outreach programs should be developed when Hispanic and Asian populations greater than 5%, are located in a project area. For this project, language spoken at home was also used to determine noticing and public outreach requirements. See Section 5.1.3 Language Results, for further discussion.

5.1.3 Language Results

When greater than 5% of a population in a project area speaks a language other than English at home, WSDOT environmental justice guidance recommends that notice of the project be published in the appropriate language(s) and a public outreach program be established. In the greater project area two non-English languages are spoken which make up greater 5% of a census tract, Korean and Spanish.

This analysis used 2000 Census data, Table PCT 10, and only considered the population over 18. The project area is defined as census data that intersected 500 feet from the edge of any proposed project footprint. Two maps in **Appendix A** identify tracts which have at least 5% non-English language groups. One map shows census tracts with greater than 5% Korean speakers, the other shows census tracts with 5% or greater Spanish speakers.

5.1.4 Poverty Results

This analysis used 2000 Census data, Table P87. The percentage of the population with incomes below the poverty level in 1999 in the City of Lynnwood was 9.5%, while the project area percentage is 6.4%. These preliminary results show that the projects will likely not be have a disproportionate impact on low-income populations.

Results are displayed on three maps in **Appendix A** by census block group. The first map compares the poverty rate of all people to the City average, the second map compares the poverty rate of minors (under 19) to the City average for minors, and the third map shows the poverty rate of seniors (over 65) to the City average for seniors. These preliminary results show that the projects will likely not have a disproportionate impact on disabled populations.

5.1.5 Disability Results

This analysis used 2000 Census data Table QT P21, disabled population over 5-years old. The percentage of the population over 5-years old who were disabled in 1999 in the City of Lynnwood was 20.7%, while the project area percentage is 17%. The results are shown on a map in **Appendix A**. This map compares the percent of disabled people in each census tract to the City average. These preliminary results show that the projects will likely not have a disproportionate impact on disabled populations.

5.2 Parks and Recreation

Perteet evaluated the effects of the proposed projects on parks and recreation. The proposed projects are located near a number parks and historical sites. These areas are protected by Section 4(f) of the Department of Transportation Act of 1966 (49 United States Code Section 303), which prohibits the Federal Highway Administration (FHWA) from approving projects that would affect these resources unless there is no feasible and prudent alternative to using the land or the project includes all possible planning to minimize harm to the property.

5.2.1 Methods

Perteet used the standard analysis area described in Section 2.2 for parks and recreation screening (the project footprint, plus 50 feet on each side of the proposed project). The GIS layers consisted of data from parks and recreation GIS data layers from Snohomish County, and City of Lynnwood.

5.2.2 Result Summary

The results of the corridor projects analysis are summarized in the following table, **Exhibit 13**. The location of the parks and recreation areas are depicted on screening maps, which are provided in **Appendix A**. The majority of potential project impacts to park lands are on the Interurban Trail. Project planning should take into account re-alignment and/or repair of the trail as a part of the project design.

Exhibit 13
Parks in project area, in square feet, by project

No.	Project	Interurban Trail Footprint	50-foot Area of Analysis
1	Local Concept – 196th Street Widening	None	
2	Concept V – 200th Street Widening	None	
3	Concept 25a – 204th Access Rd 1A (part of NB Braided Ramp at 44th)	243	474
4	Concept 25a (SB Braided Ramp) – 220th Street Extension	None	
5	Concept 6 (part of) – 33rd Avenue Extension	None	
6	Concept 25a (SB Braided Ramp) – SB 44th On-Ramp	None	
7	Concept 9 (part of) – Intersection of Alderwood Mall Blvd and 33rd Avenue	None	

No.	Project	Interurban Trail Footprint	50-foot Area of Analysis
8	Concept 25a (SB Braided Ramp) – EB SR-525 to Merging of SB I-5/I-405/SR 525	0	1396
9	Concept 2 – EB SR-525 to SB I-5	183	1,328
10	Concept 25a (SB Braided Ramp) – Existing 196th Off-Ramps EB/WB	0	78
11	Concept 25a (SB Braided Ramp) – Merging of SB I-5/I-405/SR 525 to Existing 196th Off-Ramps	73	1,487
12	Concept 11 – 40th /Larch Extension	182	1,296
13	Local Concept – Maple/High School Improvements	354	259
14	Concept 25a (NB Braided Ramp) – Merging of Poplar/196th On-Ramps to NB I-5	0	88
15	Concept 25a (NB Braided Ramp) – NB 196th Off-Ramp	None	
16	Concept 25a (NB Braided Ramp) – NB Poplar On-Ramp	None	
17	Concept 25a (NB Braided Ramp) – NB 196th On-Ramp	None	
18	Concept 25a (NB Braided Ramp) – NB 196th On-Ramp Option 2	None	
19	Concept 25a (NB Braided Ramp) – Concept 25a Option 1A	None	
20	Concept 25a (NB Braided Ramp) – etc., Concept 25a Option 2	None	
21	Concept 25a (NB Braided Ramp) – Option 1a	None	
22	Concept 25a (NB Braided Ramp) – NB I-405 / SR 525 Off-ramp	None	
23	Concept 6 (part of) – Poplar to Alderwood Mall Parkway Extension	None	
24	Concept 9 – Poplar I-5 Overcrossing	None	
25	Concept 25a (SB Braided Ramp) – SB 196th On-Ramp	67	115

No.	Project	Interurban Trail Footprint	50-foot Area of Analysis
26	Concept 25a (SB Braided Ramp) – SB 44th Off-Ramp	5	845
27	Concept 25a (SB Braided Ramp) – SB I-5 Off-Ramp into new Braided Ramp System	None	
28	Concept 2 – WB 525 to SB I-5 On-Ramp	0	332
29	Concept 10 – 194th Street Extension	None	

5.3 Cultural and Historic Resources

Cultural resources are archaeological sites, historic structures (such as buildings and bridges) and areas of traditional cultural importance to tribes or other communities. Section 106 of the National Historic Preservation Act protects important historical, archeological, and cultural places, either as a property that is registered with or is eligible for registering with the National Registry of Historic Places (NRHP).

5.3.1 Methods

Perteet used the standard analysis area described in Section 2.2 for cultural and historic resource screening (the project footprint, plus 50 feet on each side of the proposed project). The analysis area was compared to state cultural and historic places data to determine potential effect.

5.3.2 Results Summary

Official state records have shown two sites that have historical or cultural significance in the study area. There is a prehistoric lithic flake (swamp creek isolate SN377) and the Wickers Building. These sites are outside project analysis areas will not be affected by any of the proposed projects. These sites are not shown in any exhibits.

5.4 Air Quality

Road projects may affect air quality either indirectly by changing the amount of vehicle emissions in an area, or directly by maintenance, construction, or demolition of facilities that release particulates and other emissions into the air. Federal, state, and local regulations require that projects which change traffic flow, increase capacity and/or traffic lanes, or add traffic signals within carbon monoxide non-attainment or maintenance areas conduct quantitative analysis for potential impacts to carbon monoxide at the project level.

5.4.1 Methods

Perteet determined whether the project areas are within either an ozone maintenance area and/or carbon monoxide maintenance area as determined by the Washington Department of Ecology.

5.4.2 Results Summary

All projects are within Washington Department of Ecology's defined ozone maintenance areas and carbon monoxide maintenance areas. Project specific analysis of air quality may be required.

5.5 Noise

State policy requires the review and consideration of noise abatement for sensitive noise receptions (described in the methods) on projects that substantially alter the topography surrounding a state highway.

5.5.1 Methods

Perteet used an extended analysis area for studying noise quality. This area included the proposed project footprint plus a ½ mile area around the project. The analysis area was overlaid on zoning maps. Residential zones were used as a surrogate for all sensitive receptor which include residential dwellings, nursing homes, medical and health services, churches, libraries, cultural activities centers, and schools.

The GIS zoning data layers consisted of data from City of Lynnwood and Snohomish County. Data from Mountlake Terrace was not included due to its unavailability.

5.5.2 Results Summary

The residential zones within 500 feet the projects are depicted on screening maps, which are provided in **Appendix A**. Large portions of the study area are sensitive noise receptors. It should be noted that these areas already experience freeway noise. However, construction noise and increases in existing noise will need to be examined on a project-by-project basis and specific noise analysis will need to be conducted for the each future project.

APPENDIX A
MAPS

Lynnwood City Center Access Study
Technical Memo #10
Environmental Screening

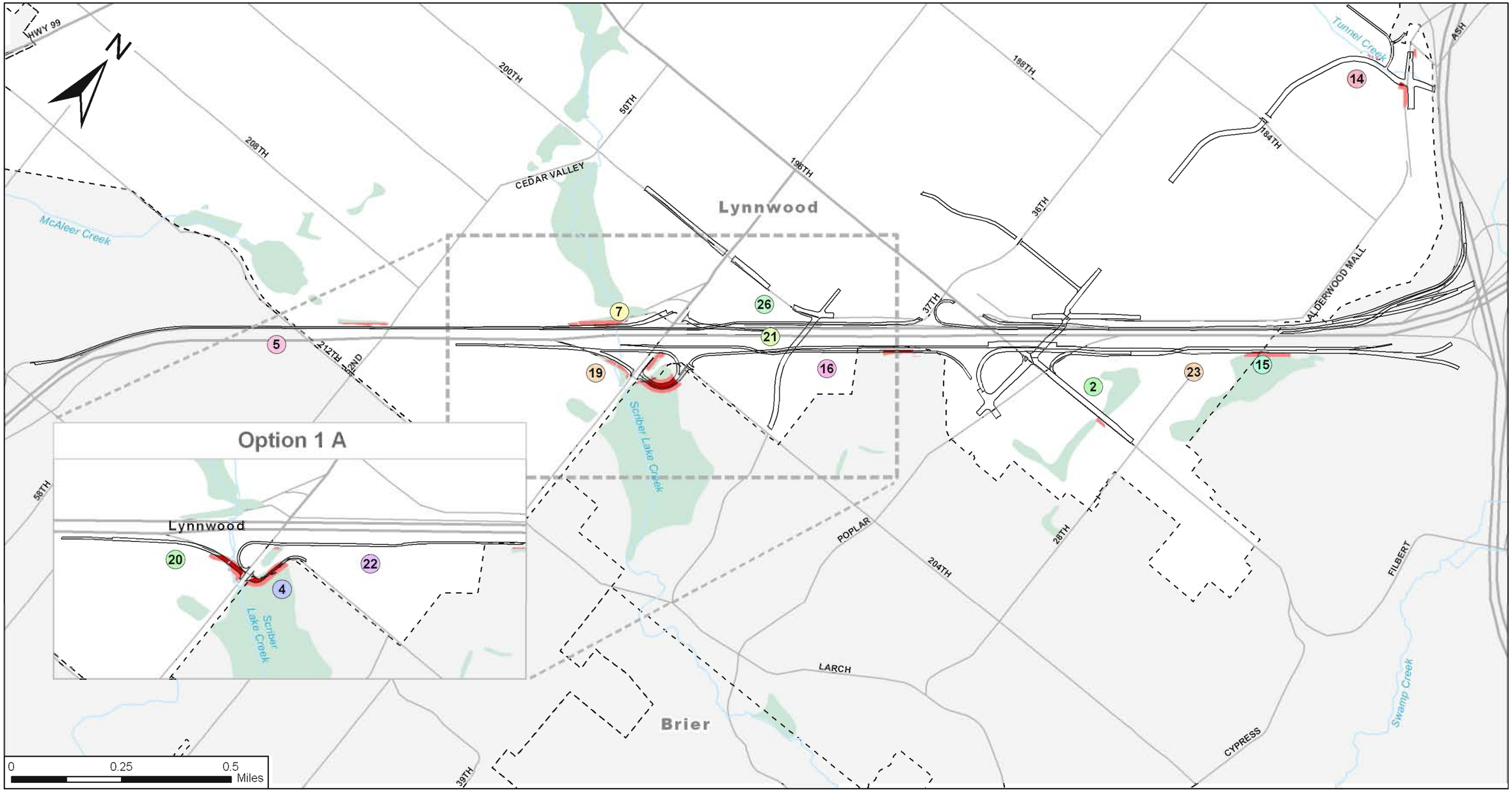
Appendix A

Figure 1 -- Wetlands

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

5 *(Color will vary)* Project Segments & Numbers

City Boundary

Major Highway

Local Arterial

Wetlands Impacted by Design Footprint

Wetlands Impacted by 50ft Area of Analysis

Non-Impacted Wetlands

! *Segment numbers are only shown for segments that intersect the wetlands data layers.*

Source: Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

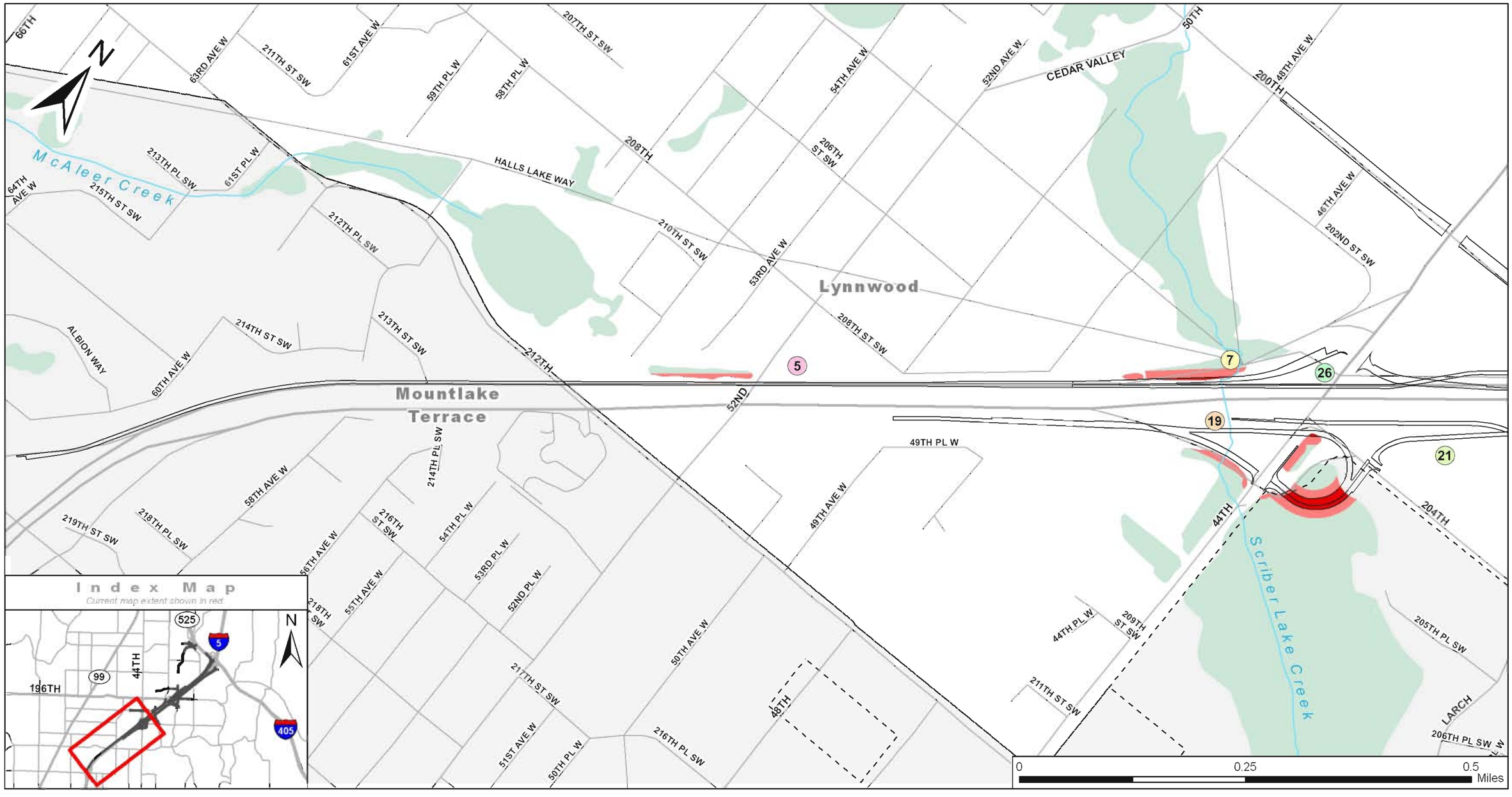
Appendix A

Figure 1.1 -- Wetlands South

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

5 (Color will vary) Project Segments & Numbers

City Boundary

Major Highway

Local Arterial

Wetlands Impacted by Design Footprint

Wetlands Impacted by 50ft Area of Analysis

Non-Impacted Wetlands

! *Segment numbers are only shown for segments that intersect wetland data layers.*

Source: Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

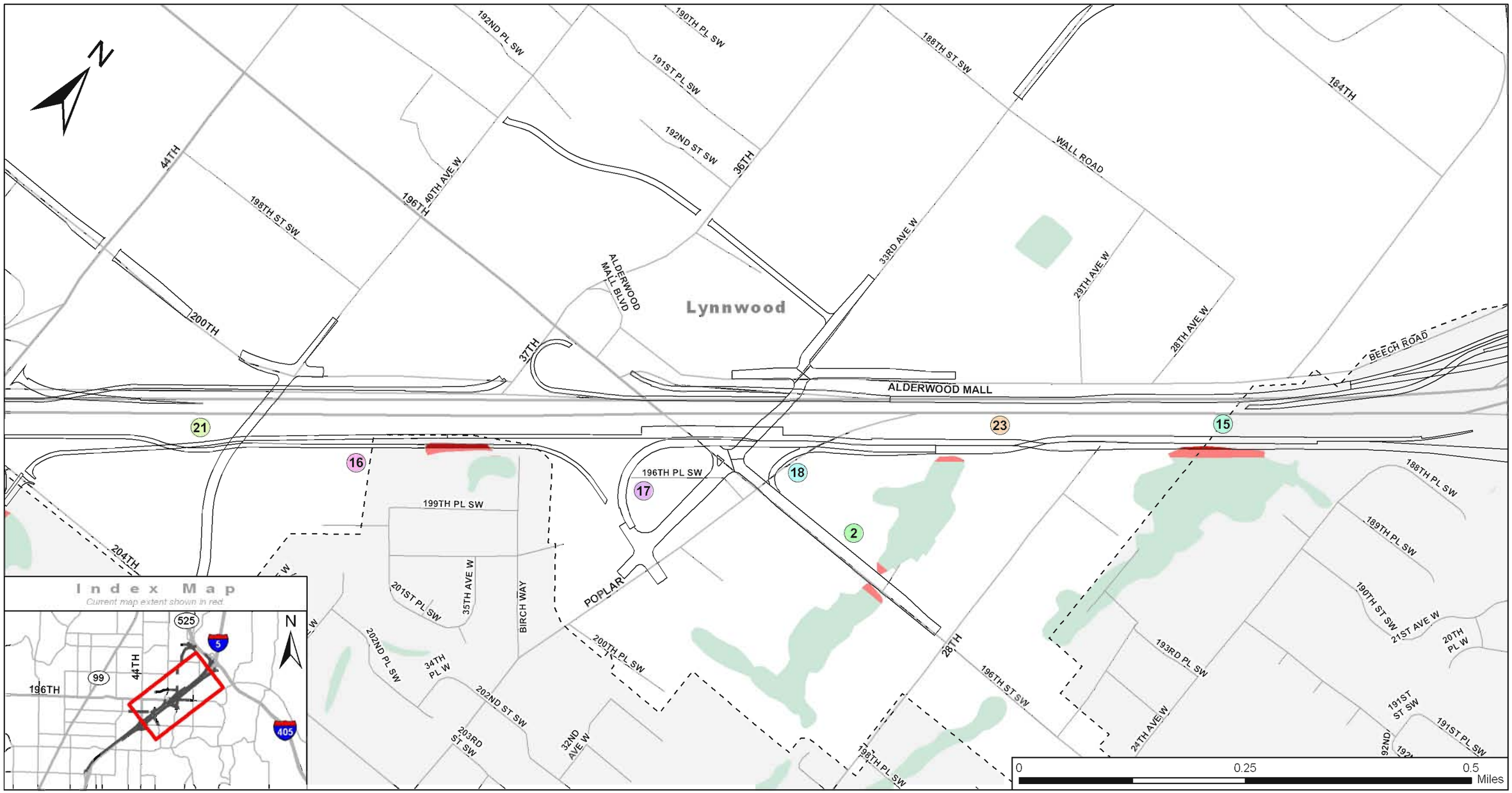
Appendix A

Figure 1.2 -- Wetlands Center

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

5 (Color will vary) Project Segments & Numbers

City Boundary

Major Highway

Local Arterial

Wetlands Impacted by Design Footprint

Wetlands Impacted by 50ft Area of Analysis

Non-Impacted Wetlands

! *Segment numbers are only shown for segments that intersect wetland data layers.*

Source: Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

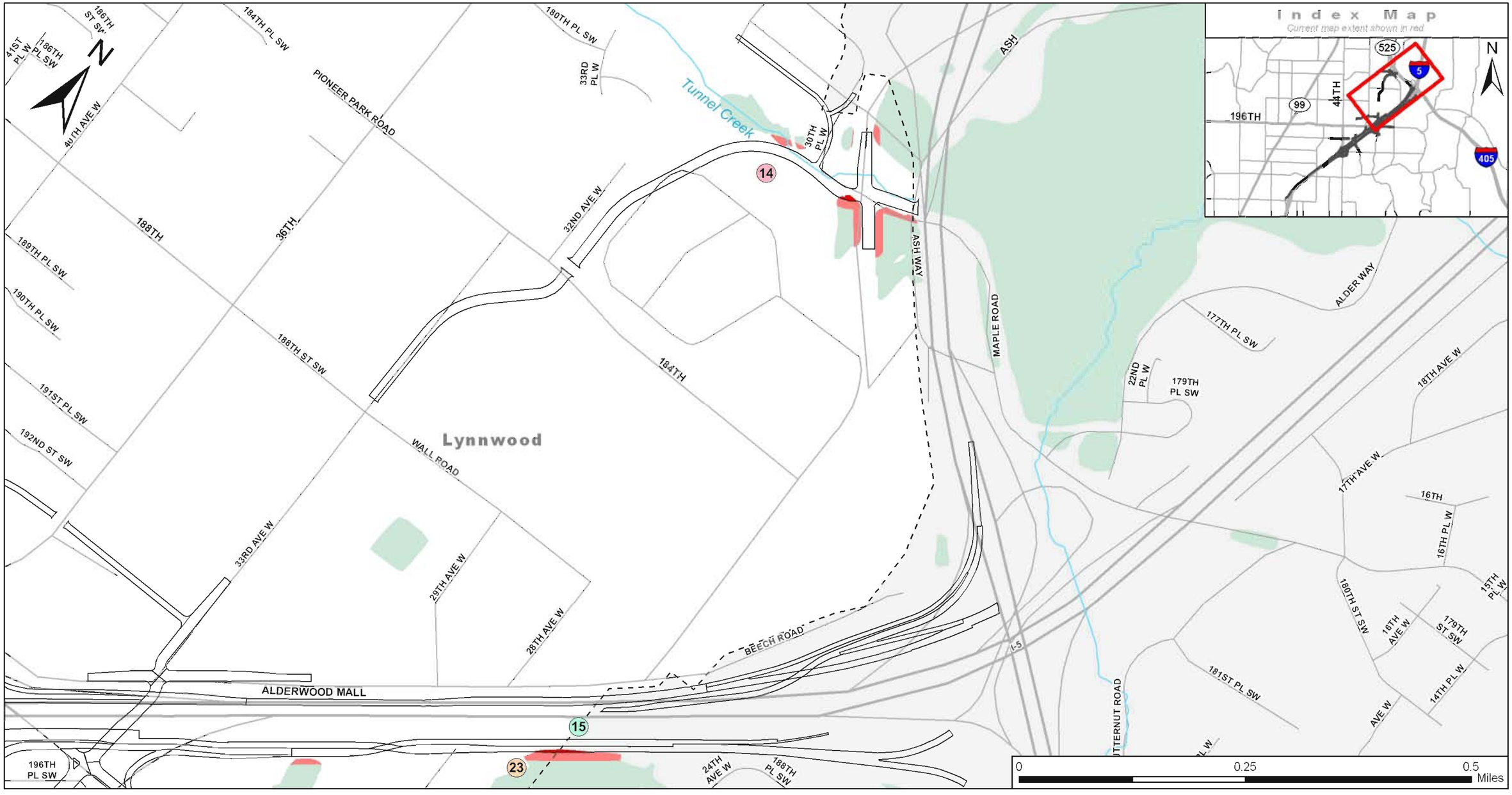
Appendix A

Figure 1.3 -- Wetlands North

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

5 (Color will vary) Project Segments & Numbers

City Boundary

Major Highway

Local Arterial

Wetlands Impacted by Design Footprint

Wetlands Impacted by 50ft Area of Analysis

Non-Impacted Wetlands

! *Segment numbers are only shown for segments that intersect wetland data layers.*

Source: Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

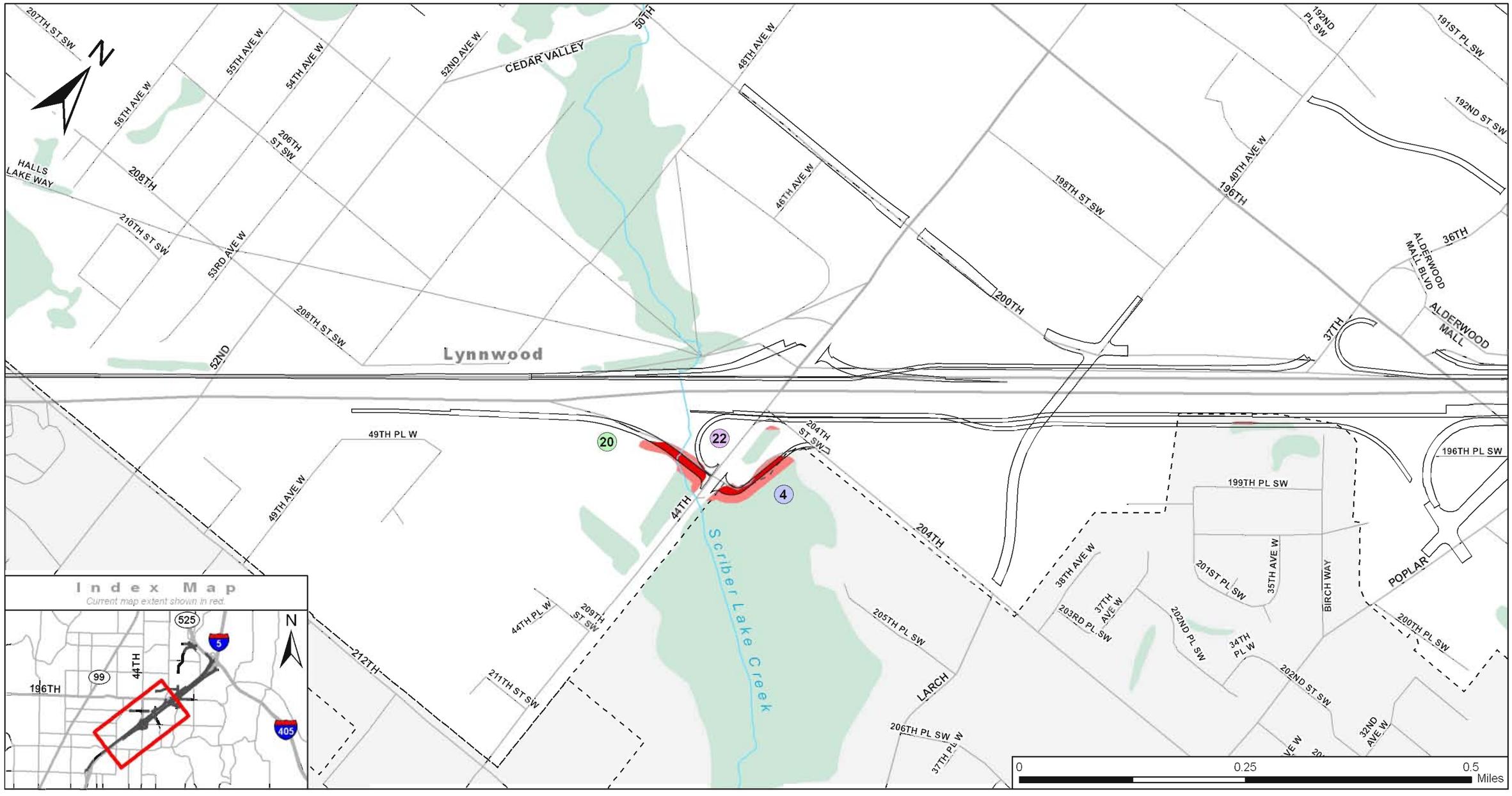
Appendix A

Figure 1.4 -- Wetlands, Option 1A

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

(Color will vary)

- Project Segments & Numbers
- City Boundary
- Major Highway
- Local Arterial
- Wetlands Impacted by Design Footprint
- Wetlands Impacted by 50ft Area of Analysis
- Non-Impacted Wetlands

! *Segment numbers are only shown for segments that intersect wetland data layers.*

Source: Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

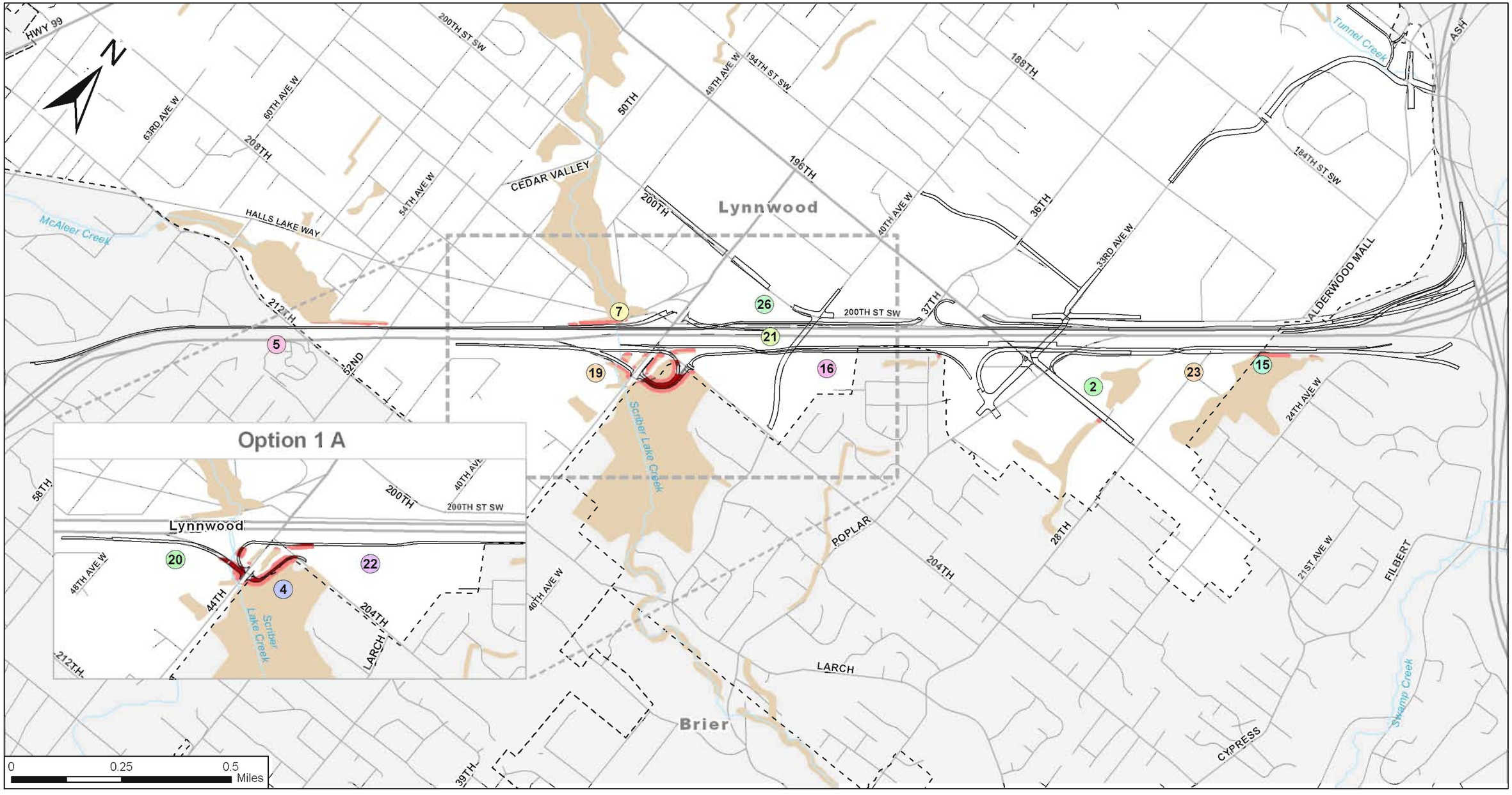
Appendix A

Figure 2 -- City of Lynnwood Designated Habitat

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

5 *(Color will vary)* Project Segments & Numbers

City Boundary

Major Highway

Local Arterial

Critical Habitat Impacted by Design Footprint

Critical Habitat Impacted by 50ft Area of Analysis

Non-Impacted Critical Habitat

! *Segment numbers are only shown for segments that intersect the habitat data layers.*

Source: Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

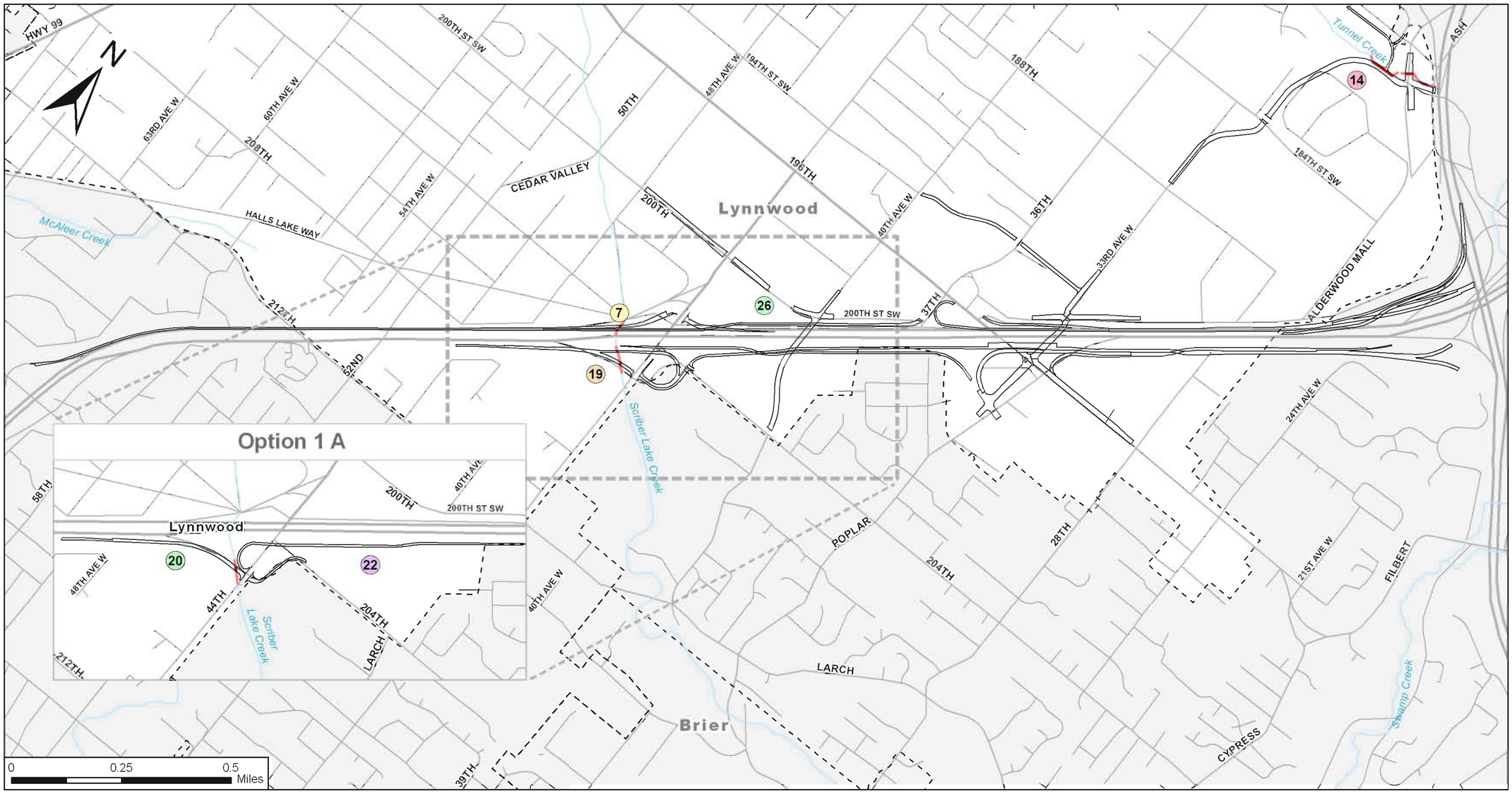
Appendix A

Figure 3 -- Streams

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

(Color will vary)

Project Segments & Numbers

City Boundary

Major Highway

Local Arterial

Streams Impacted by Design Footprint

Streams Impacted by 50ft Area Of Analysis

Non-Impacted Streams

Segment numbers are only shown for segments that intersect the stream data layers.

Stream locations provided by WDFW and Snohomish County do not match. This map uses the WDFW 2006 stream locations, whereas all other screening maps use Snohomish County stream locations.

Source: Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

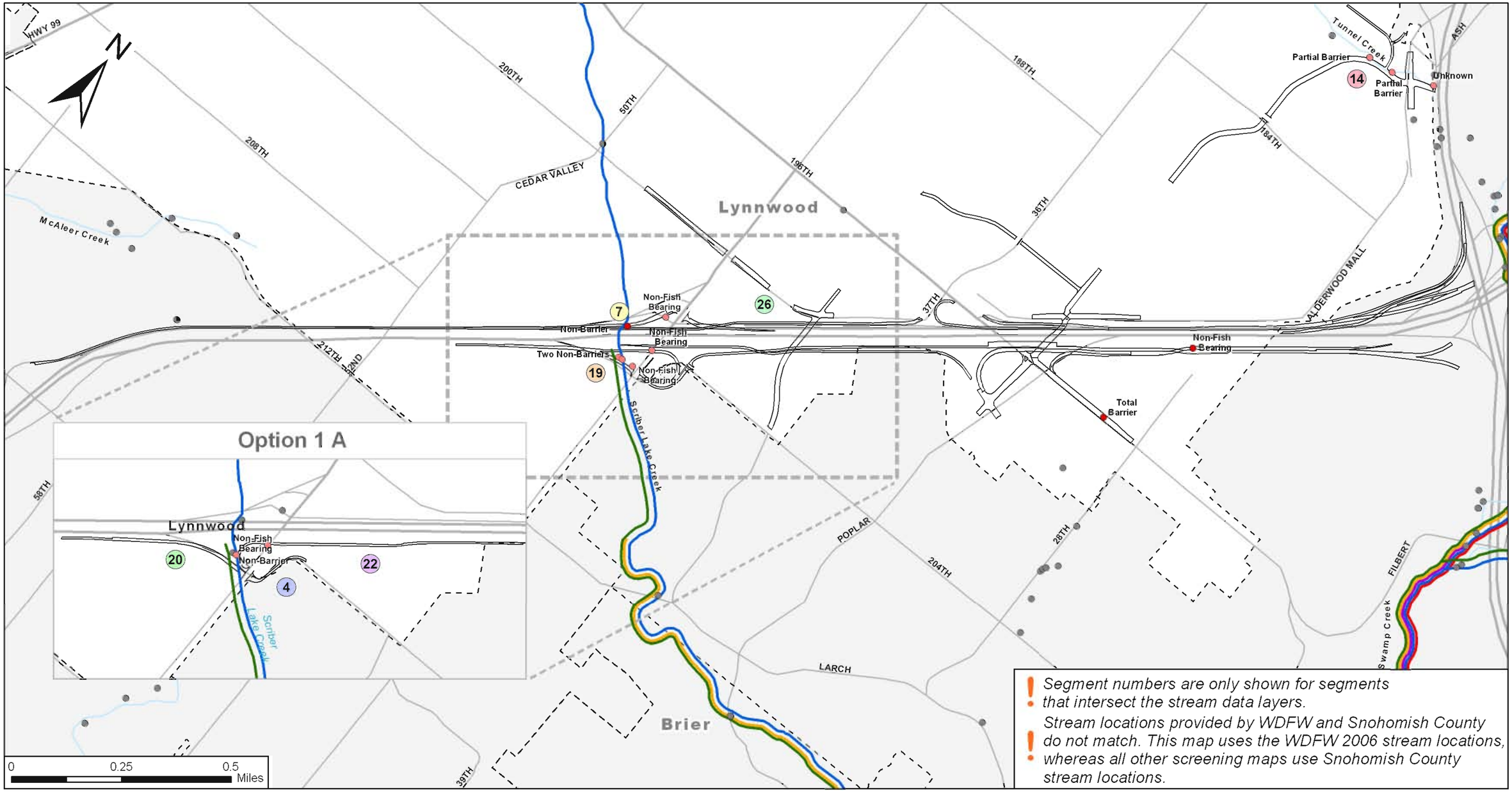
Appendix A

Figure 4 -- Fish Distribution and WDFW Barrier Culverts

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

(Color will vary)

- Project Segments & Numbers
- City Boundary
- Major Highway
- Local Arterial
- Culverts Within Design Footprint
- Culverts Within 50ft Area of Analysis
- Culverts Outside Project Area
- Chinook
- Coho
- Cutthroat
- Sockeye
- Steelhead

Source: Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

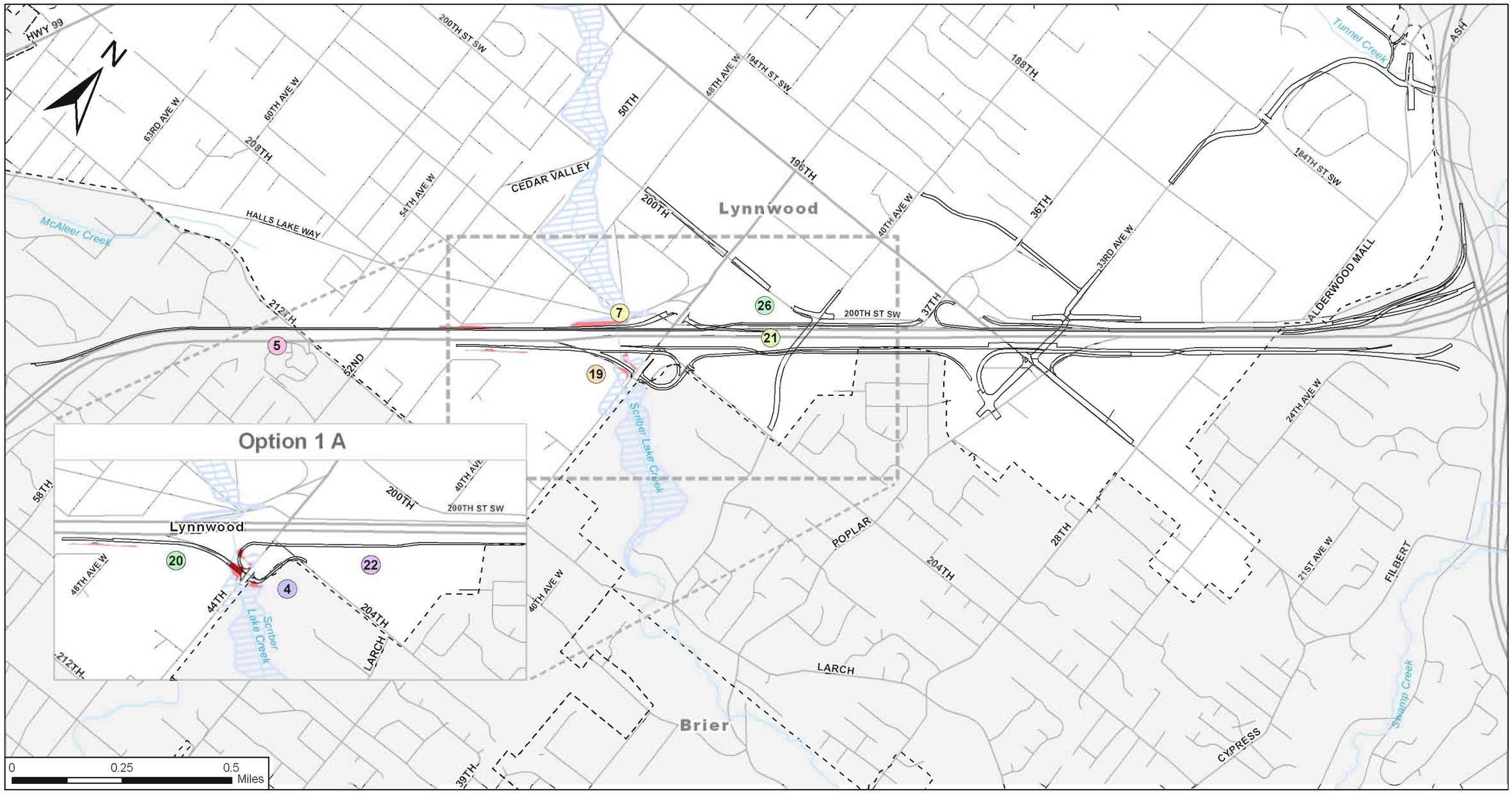
Appendix A

Figure 5 -- Floodplain

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

5 (Color will vary) Project Segments & Numbers

City Boundary

Major Highway

Local Arterial

Floodplain Within Design Footprint

Floodplain Within 50ft Area of Analysis

Floodplain Outside Project Area

! *Segment numbers are only shown for segments that intersect the flood plain data layers.*

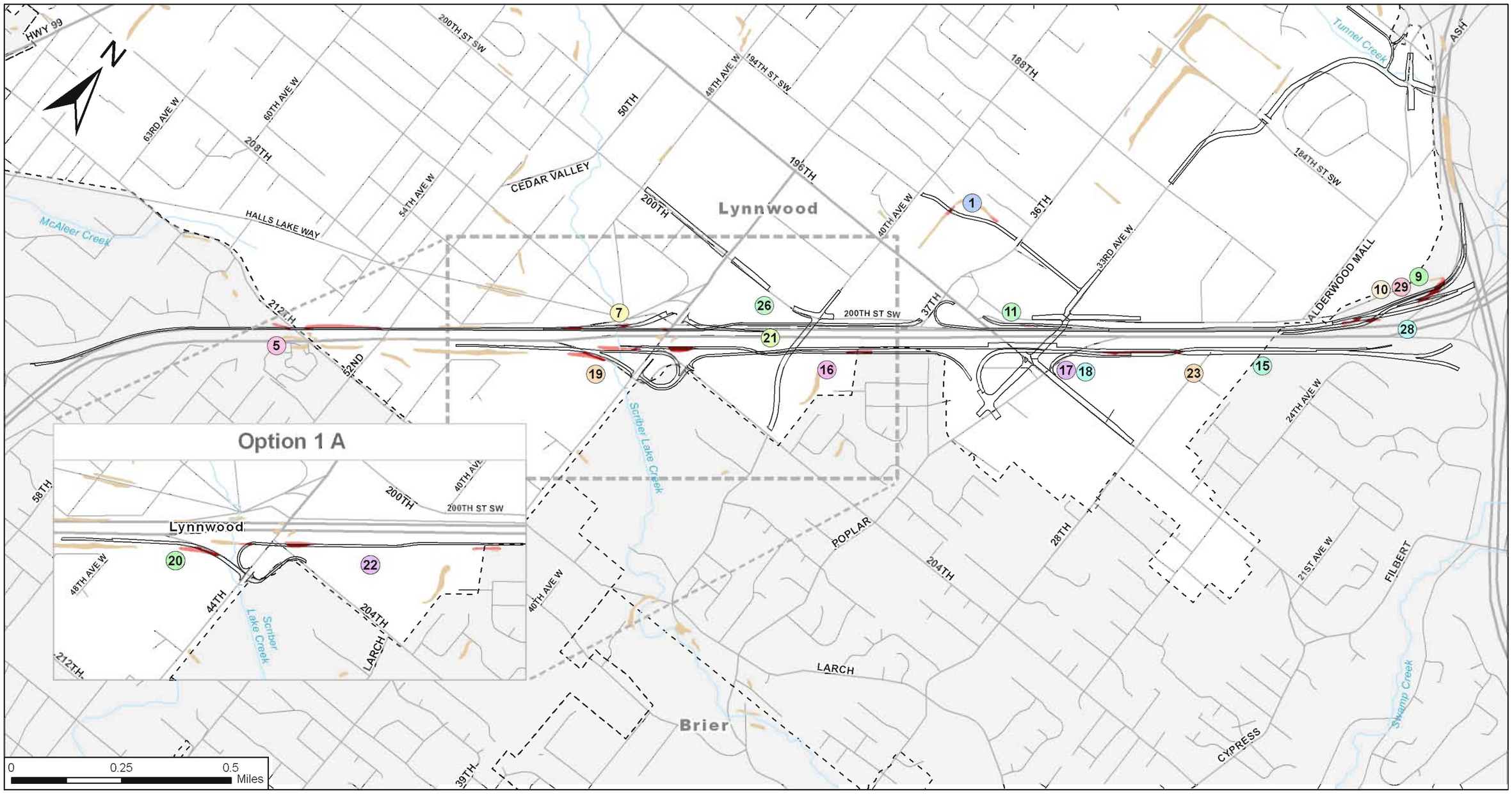
Source: Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Appendix A

Figure 6 -- Steep Slopes
Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

(Color will vary)

Project Segments & Numbers

City Boundary

Major Highway

Local Arterial

Steep Slopes Within Design Footprints

Steep Slopes Within 50ft Area of Analysis

Steep Slopes Outside Project Area

Segment numbers are only shown for segments that intersect steep slopes data layers.

Source: Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

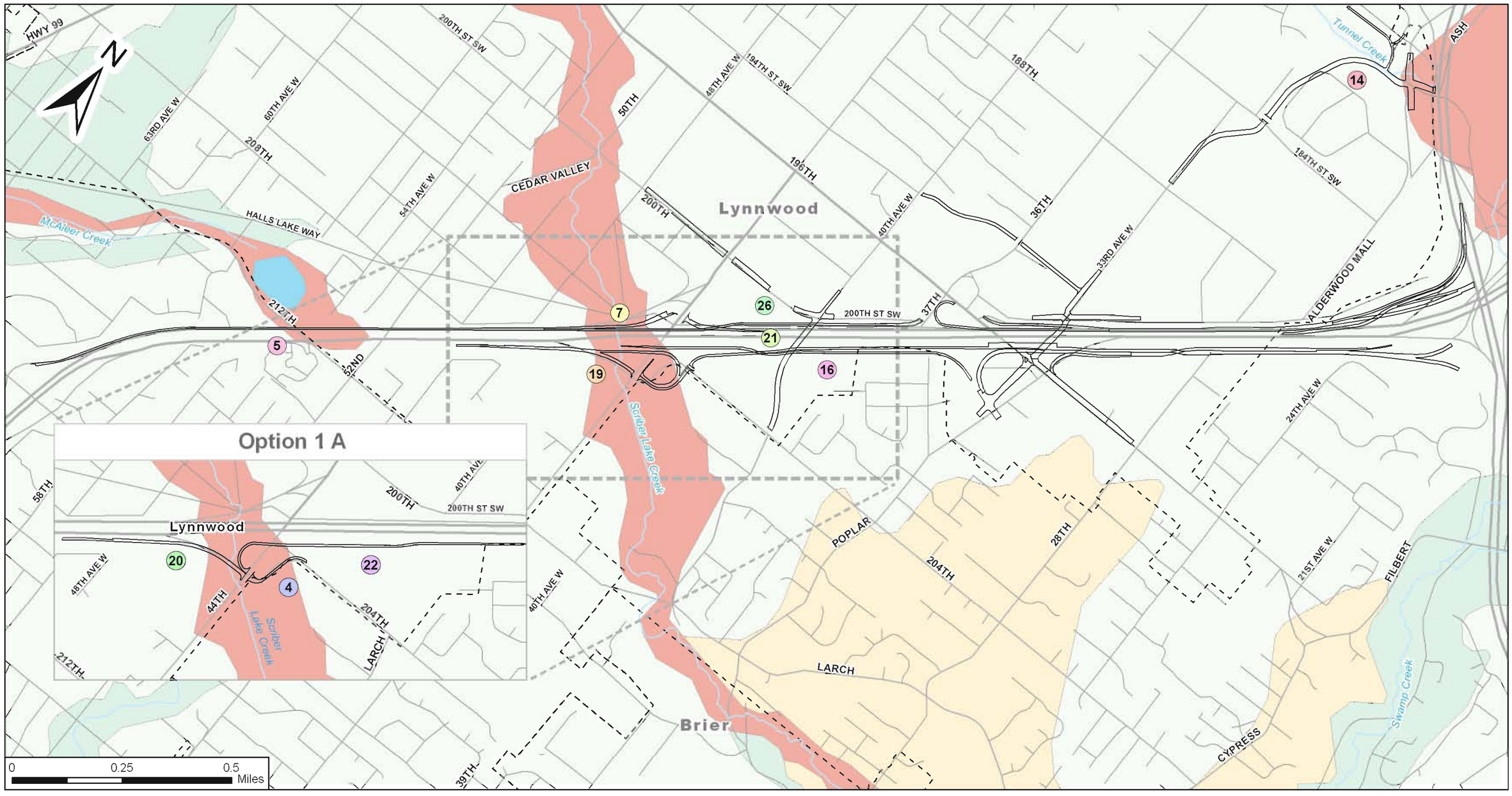
Appendix A

Figure 7 -- Liquafaction

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

5 Project Segments & Numbers *(Color will vary)*

City Boundary

Major Highway

Local Arterial

very low

very low to low

low

low to moderate

moderate to high

water

! *Segment numbers are only shown for segments that intersect zones of moderate to high liquafaction risk.*

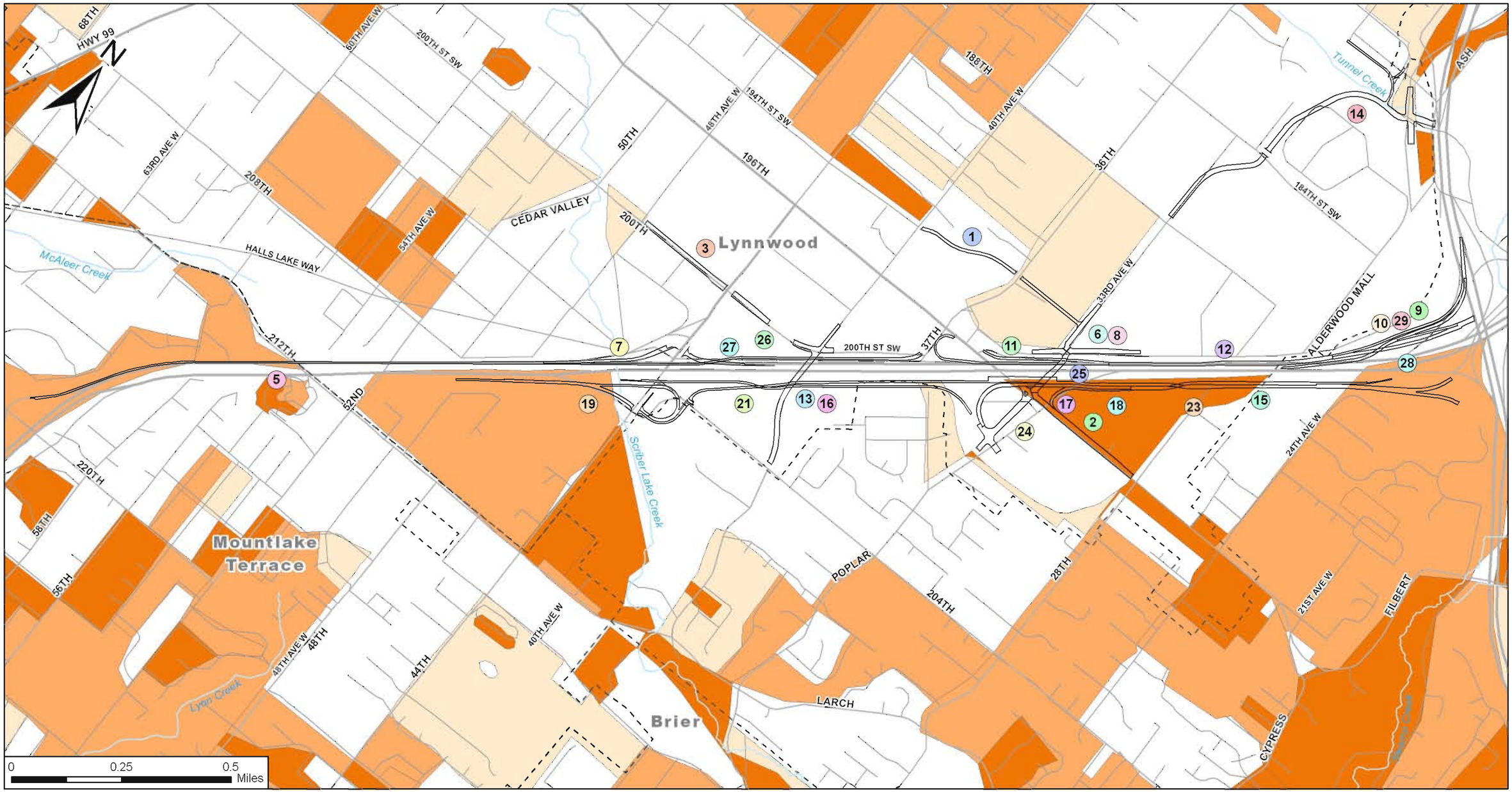
Source: Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood, Washington Department of Natural Resources.

Figure 8 -- Percent of Caucasian Population Above City Average (By Census Block)

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

Project Segment

Segment Number
(Color will vary)

Major Highway

Local Arterial

City Boundary

Percent Above City Average

- 0.1% - 3.0%
- 3.1% - 10.0%
- Over 10%

City of Lynwood, Caucasian Population Average: 74.3%

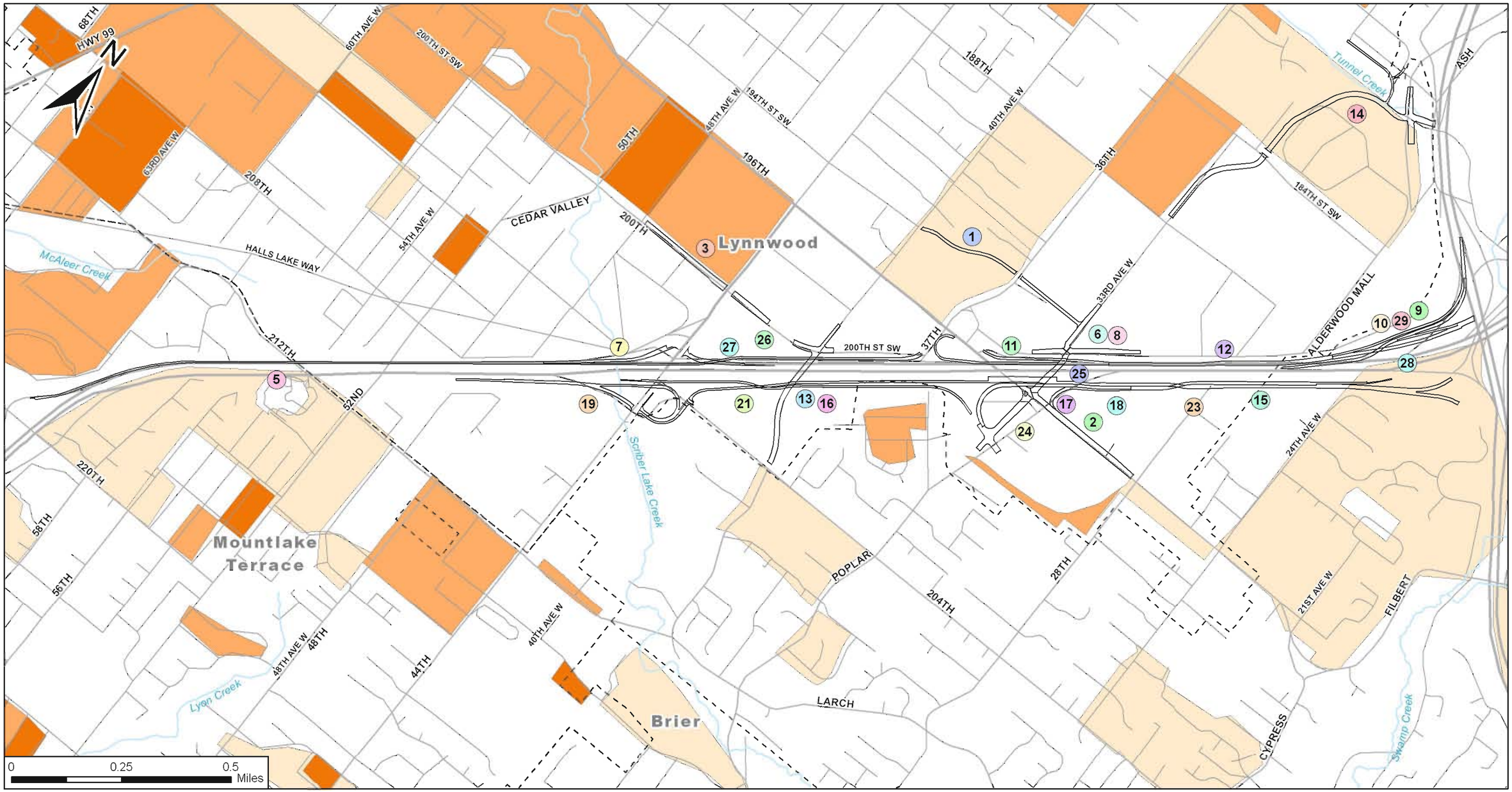
Source: U.S. Census Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Figure 9 -- Percent of Hispanic Population Above City Average (By Census Block)

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

Project Segment

Segment Number
(Color will vary)

Major Highway

Local Arterial

City Boundary

Percent Above City Average

0.0% - 3.0%

3.1% - 10.0%

Over 10%

City of Lynwood, Hispanic Population Average: 7%

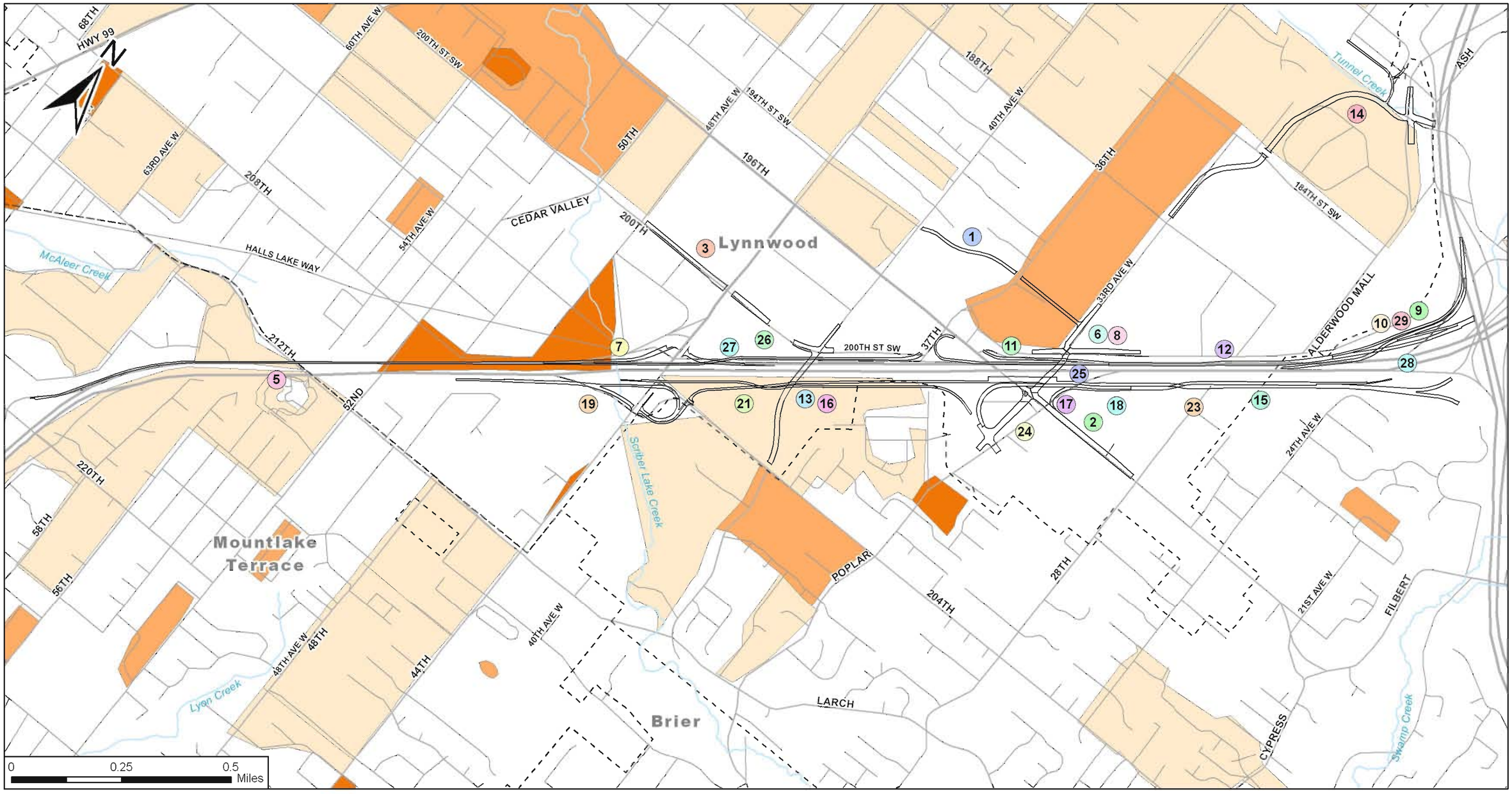
Source: U.S. Census Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Figure 10 -- Percent of African American Population Above City Average (By Census Block)

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

Project Segment

Segment Number
(Color will vary)

Major Highway

Local Arterial

City Boundary

Percent Above City Average

- 0.0% - 3.0%
- 3.1% - 10.0%
- Over 10%

City of Lynwood, African American Population Average: 3.3%

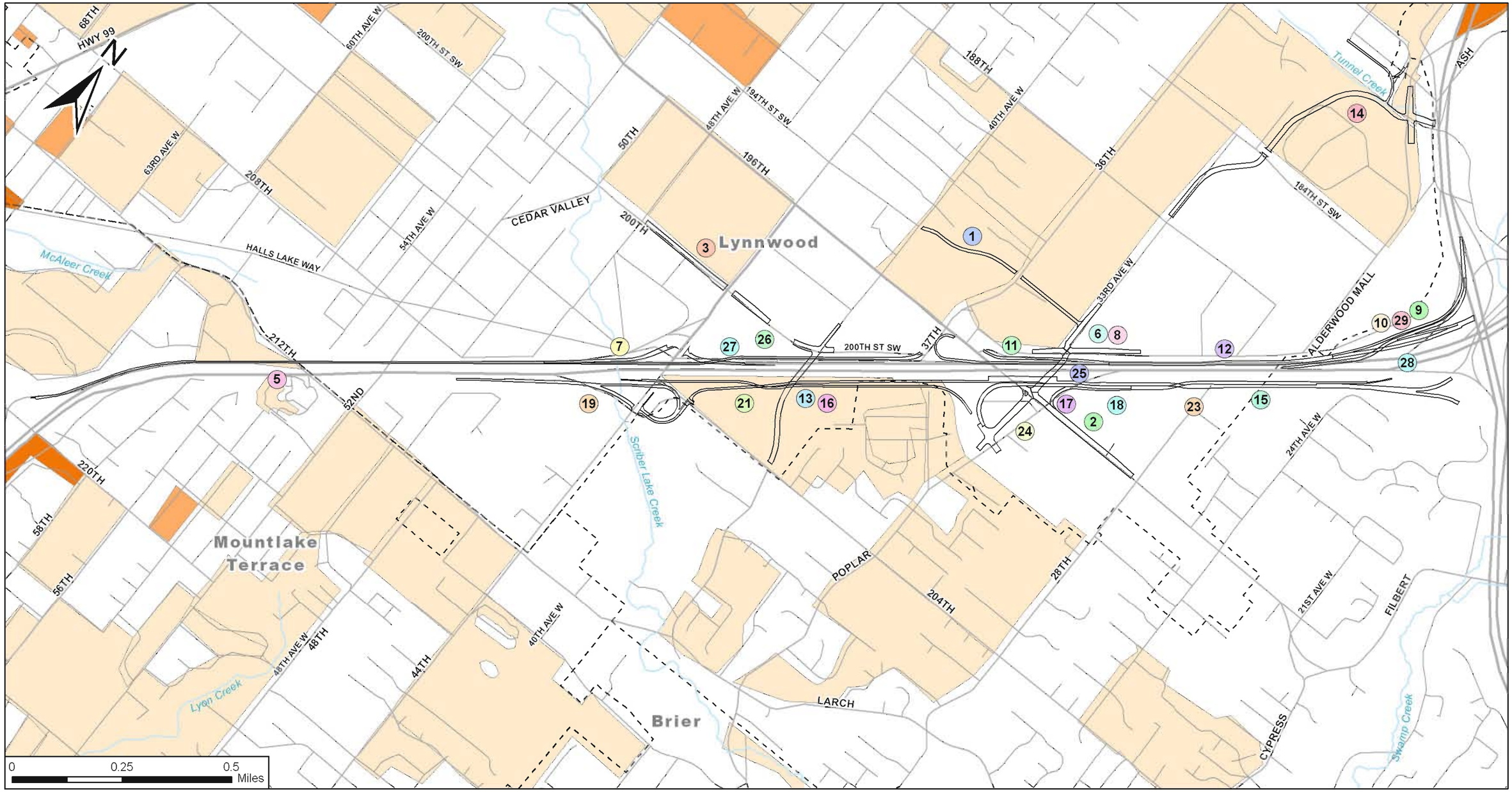
Source: U.S. Census Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Figure 11 -- Percent of American Indian Population Above City Average (By Census Block)

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

Project Segment

Segment Number
(Color will vary)

Major Highway

Local Arterial

City Boundary

Percent Above City Average

- 0.0% - 3.0%
- 3.1% - 10.0%
- Over 10%

City of Lynwood, American Indian Population Average: 1%

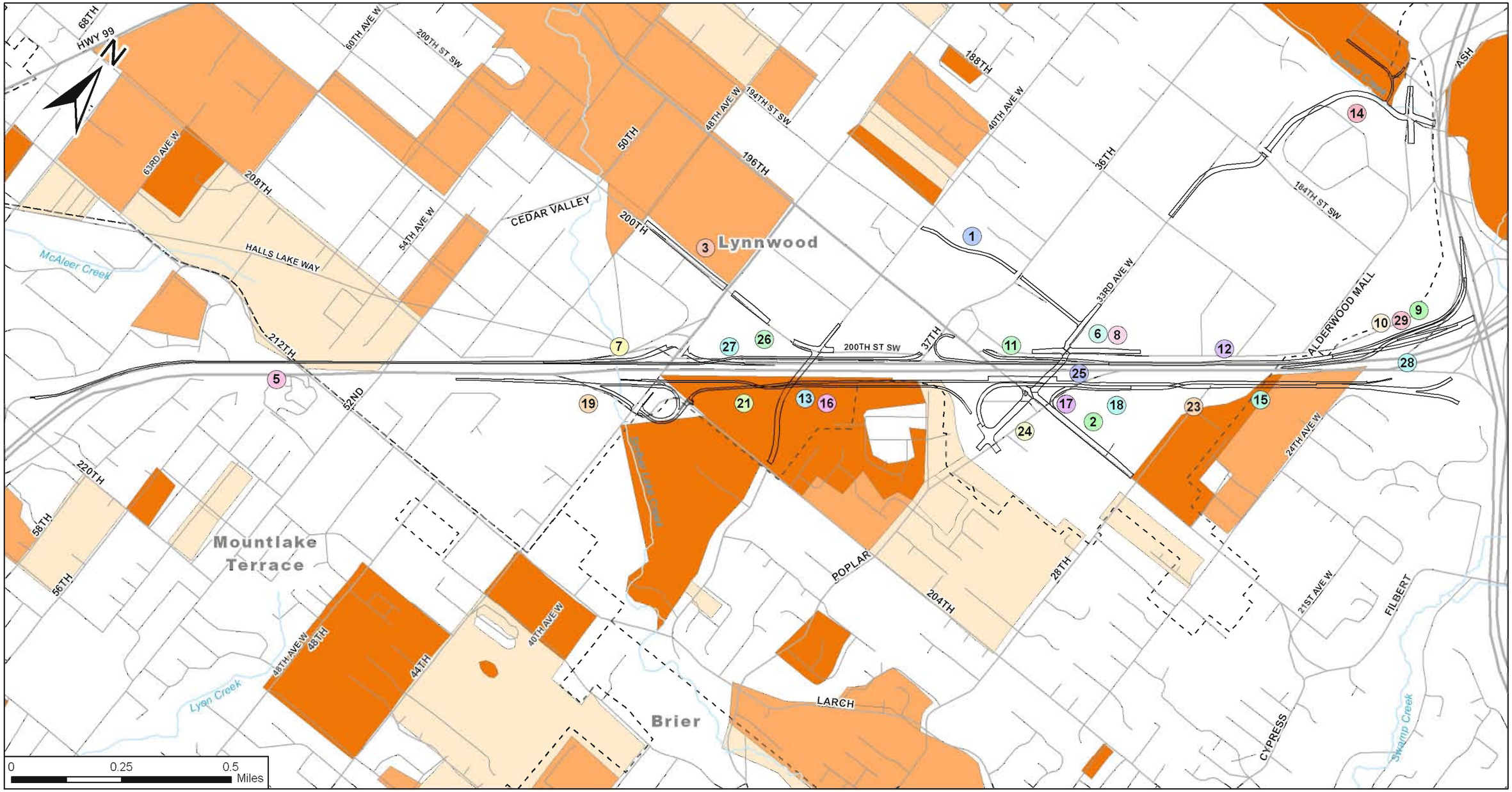
Source: U.S. Census Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Figure 12 -- Percent of Asian Population Above City Average (By Census Block)

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

Project Segment

Segment Number
(Color will vary)

Major Highway

Local Arterial

City Boundary

Percent Above City Average

- 0.0% - 3.0%
- 3.1% - 10.0%
- Over 10%

City of Lynwood, Asian Population Average: 13.9%

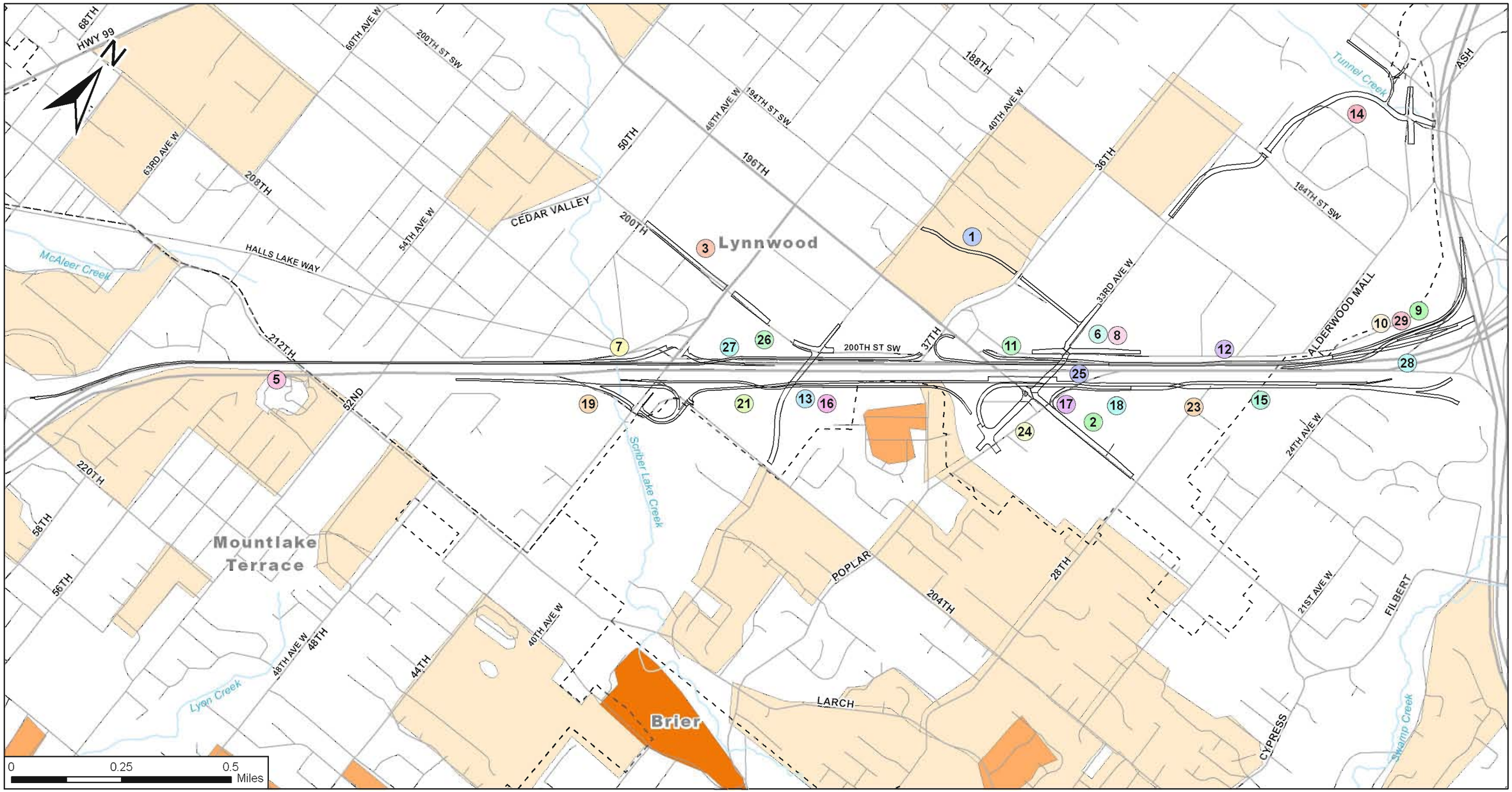
Source: U.S. Census Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Figure 13 -- Percent of Hawaiian or Pacific Islander Population Above City Average (By Census Block)

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

Project Segment

Segment Number (Color will vary)

Major Highway

Local Arterial

City Boundary

Percent Above City Average

- 0.0% - 3.0%
- 3.1% - 10.0%
- Over 10%

City of Lynwood, Hawaiian or Pacific Islander Population Average: 0.04%

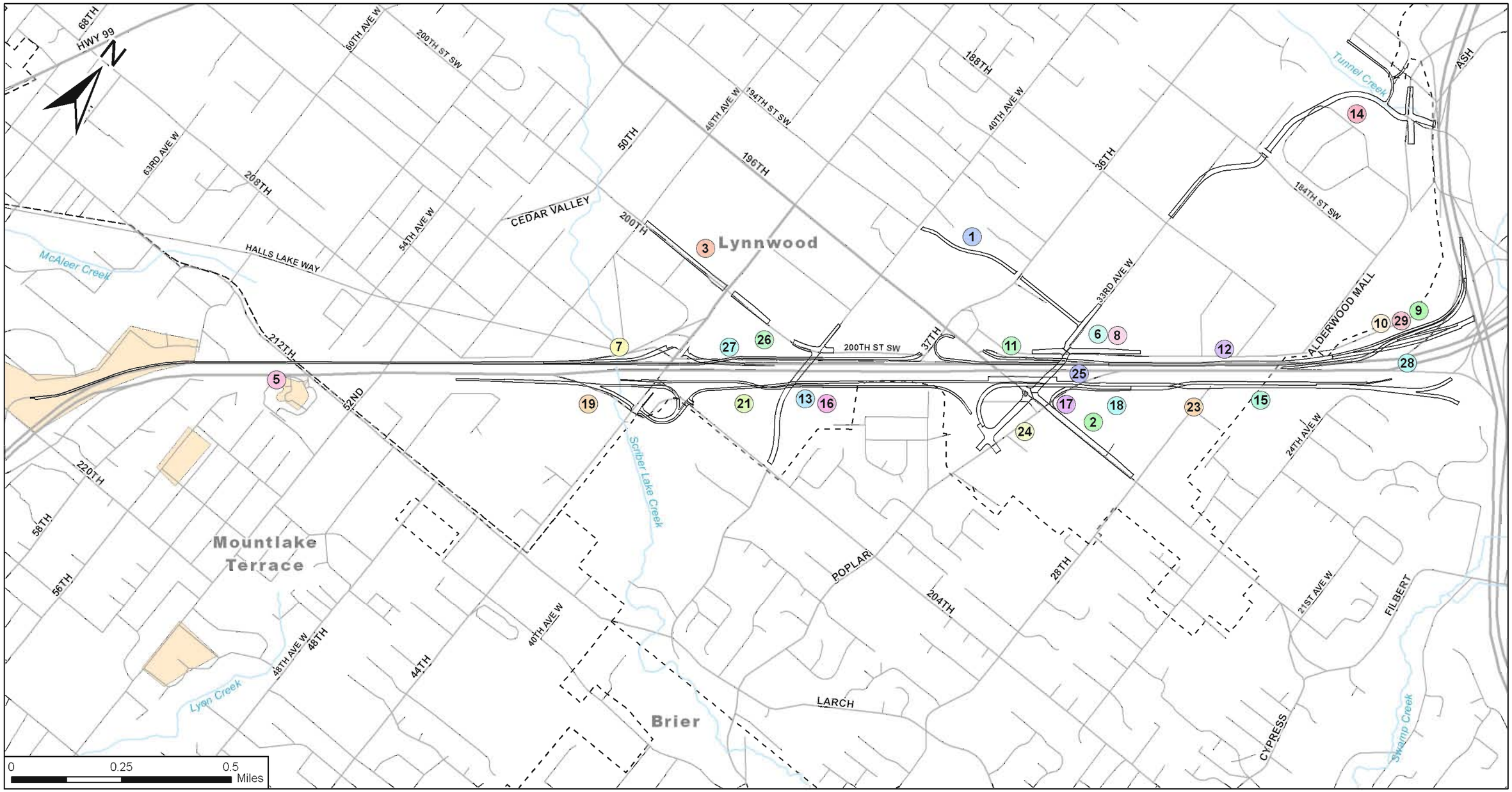
Source: U.S. Census Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Figure 14 -- Percent of "Other" Population Above City Average (By Census Block)

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

Project Segment

5 Segment Number
(Color will vary)

Major Highway

Local Arterial

City Boundary

Percent Above City Average

-0.4% - 3.0%

3.1% - 10.0%

Over 10%

City of Lynwood, "Other"
Population Average: 2.8%

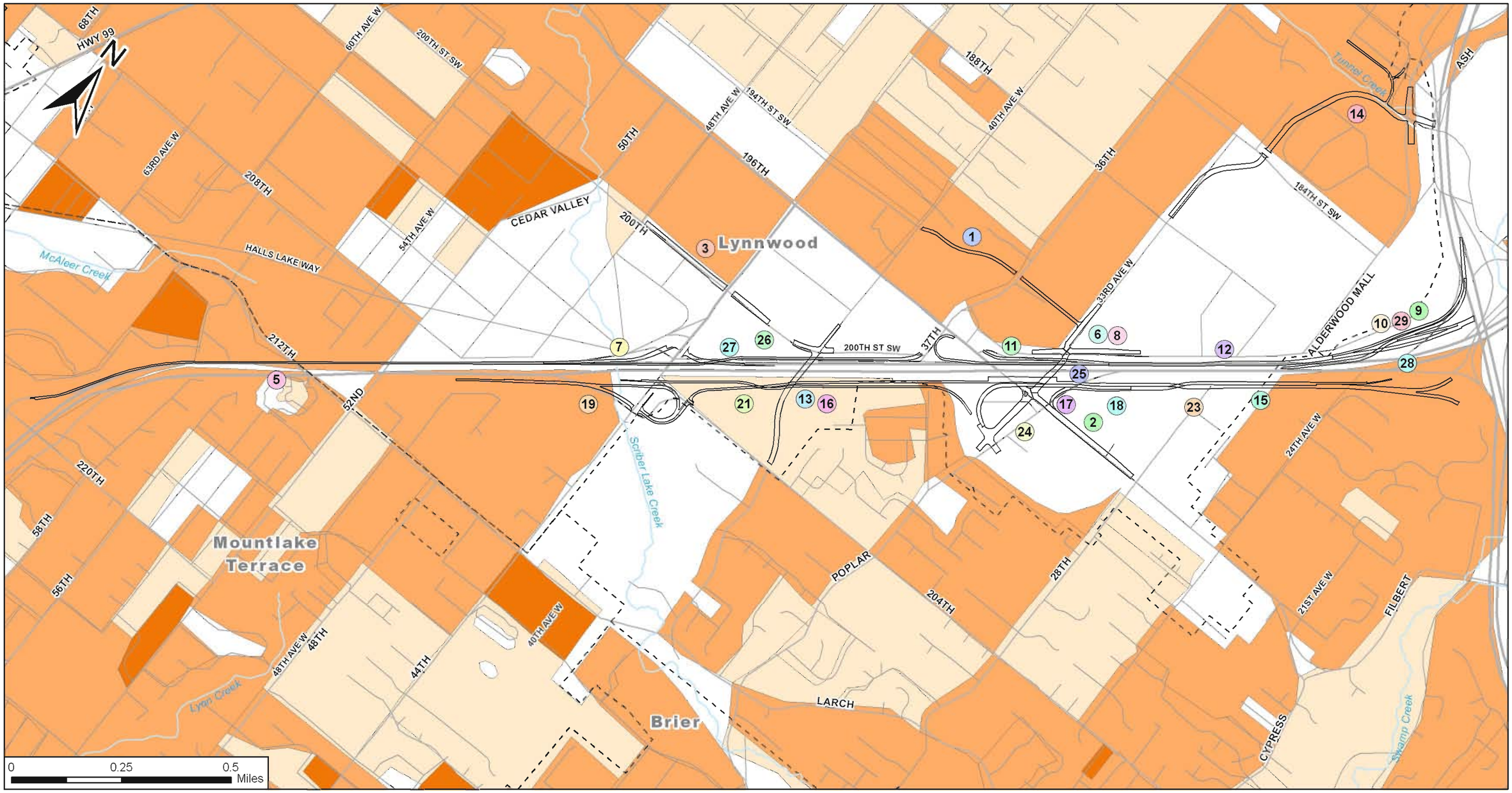
Source: U.S. Census Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Figure 15 -- Percent of "Two or More" Population Above City Average (By Census Block)

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

Project Segment

Segment Number
(Color will vary)

Major Highway

Local Arterial

City Boundary

Percent Above City Average

- 0.2% - 3.0%
- 3.1% - 10.0%
- Over 10%

City of Lynwood, "Two or More" Population Average: 0.04%

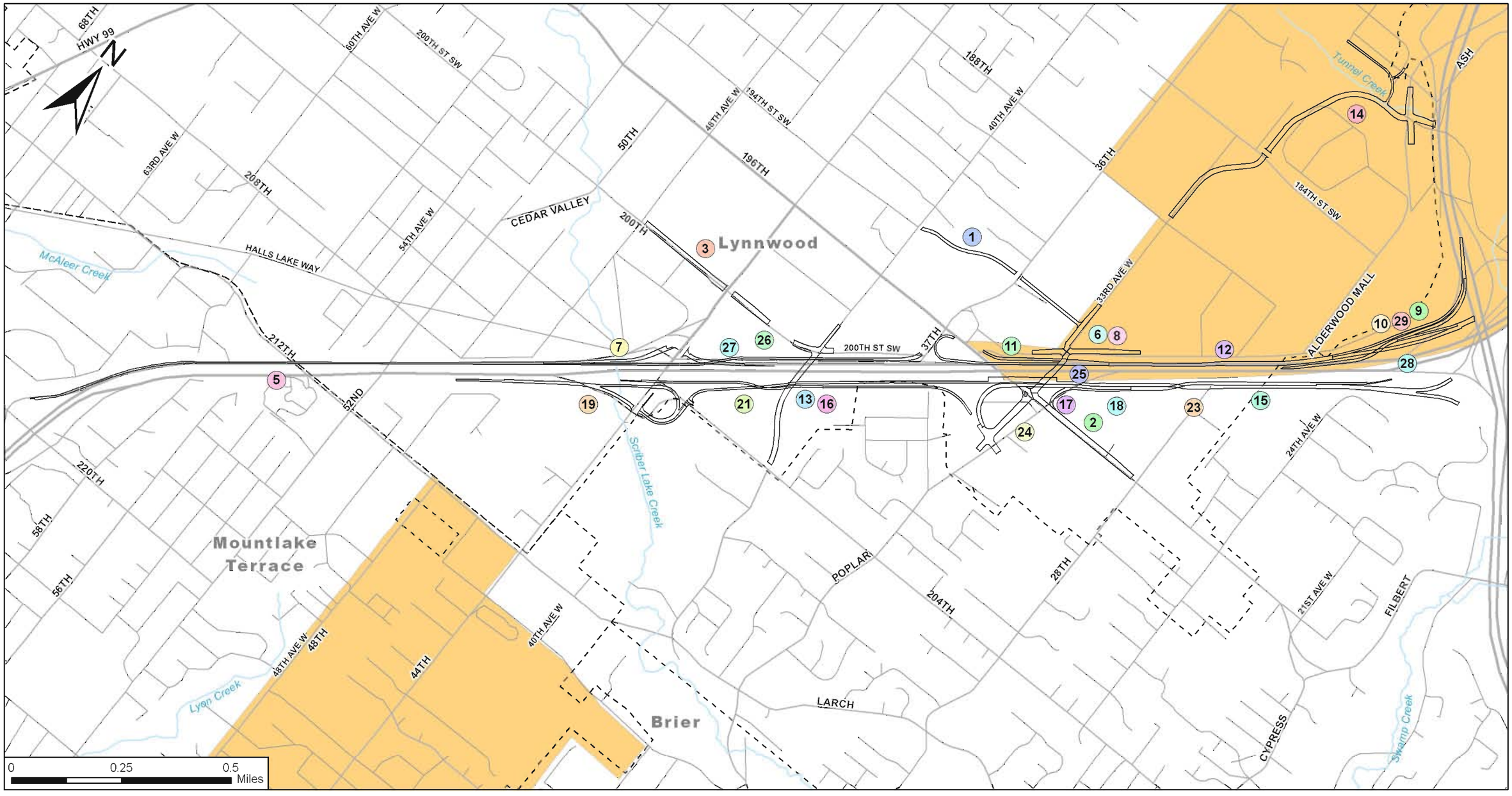
Source: U.S. Census Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Figure 16 -- Areas with 5 Percent or More Korean Speakers (By Census Tract)

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

Project Segment

Segment Number
(Color will vary)

Major Highway

Local Arterial

City Boundary

Tracts With 5% or More Korean Speakers

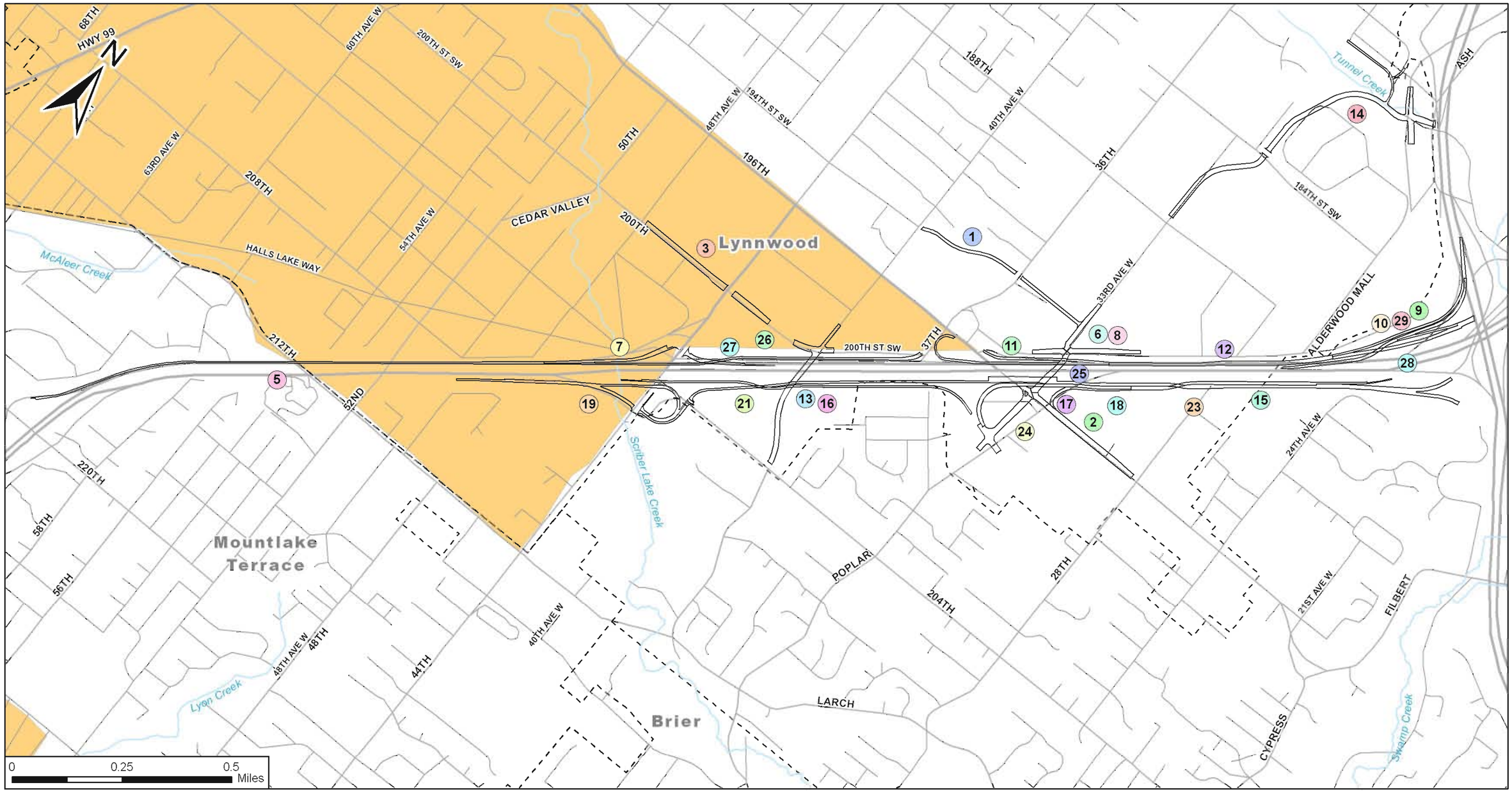
Source: U.S. Census Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Figure 17 -- Areas with 5 Percent or More Spanish Speakers (By Census Tract)

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

Project Segment

Segment Number
(Color will vary)

Major Highway

Local Arterial

City Boundary

Tracts With 5% or More Spanish Speakers

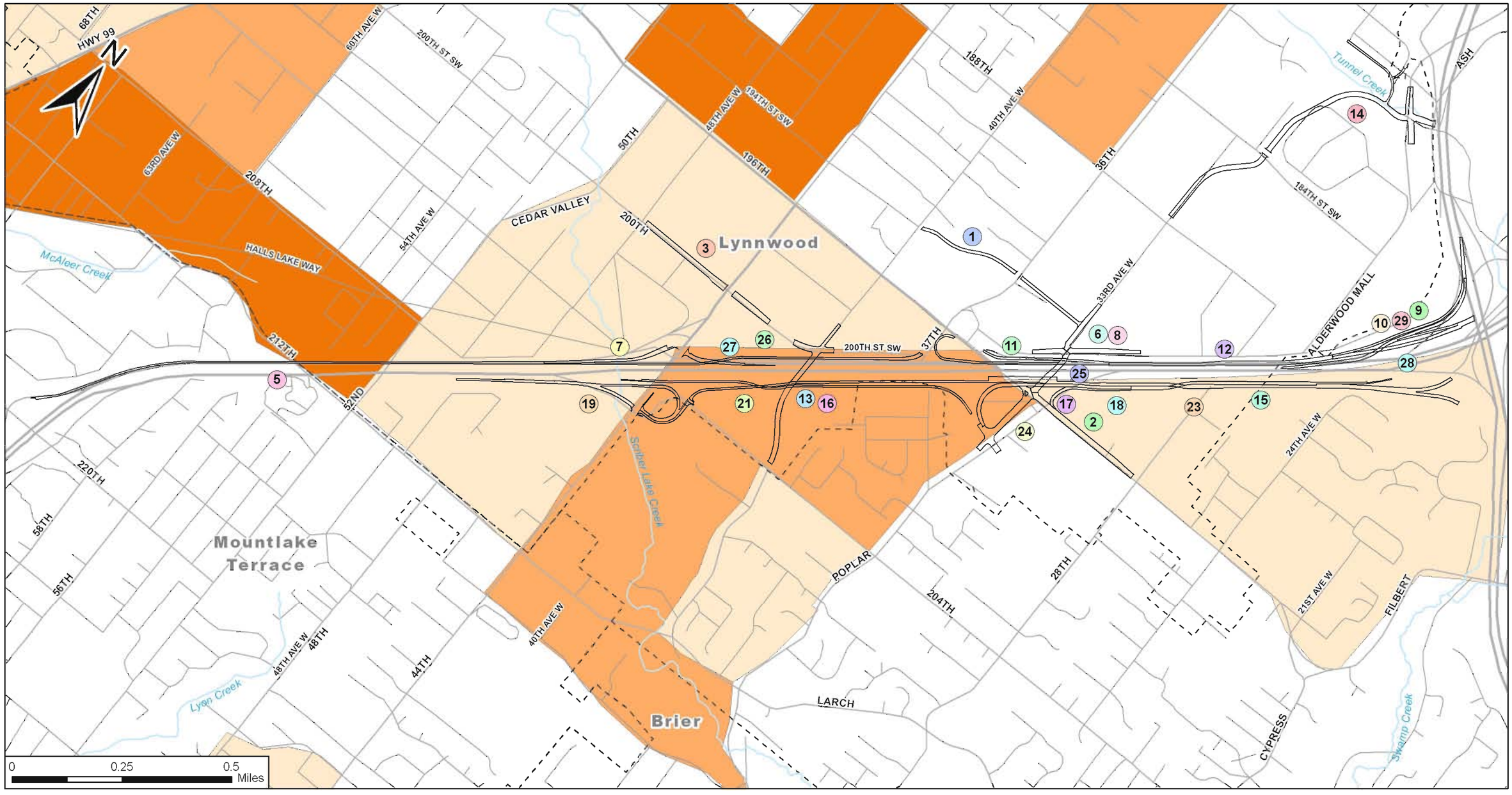
Source: U.S. Census Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Figure 18 -- Percent of People in Poverty Above City Average (By Census Block Group)

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

Project Segment

Segment Number
(Color will vary)

Major Highway

Local Arterial

City Boundary

Percent Above City Average

- 0.3% - 3.0%
- 3.1% - 10.0%
- Over 10%

City of Lynwood, Average Poverty Level: 9.5%

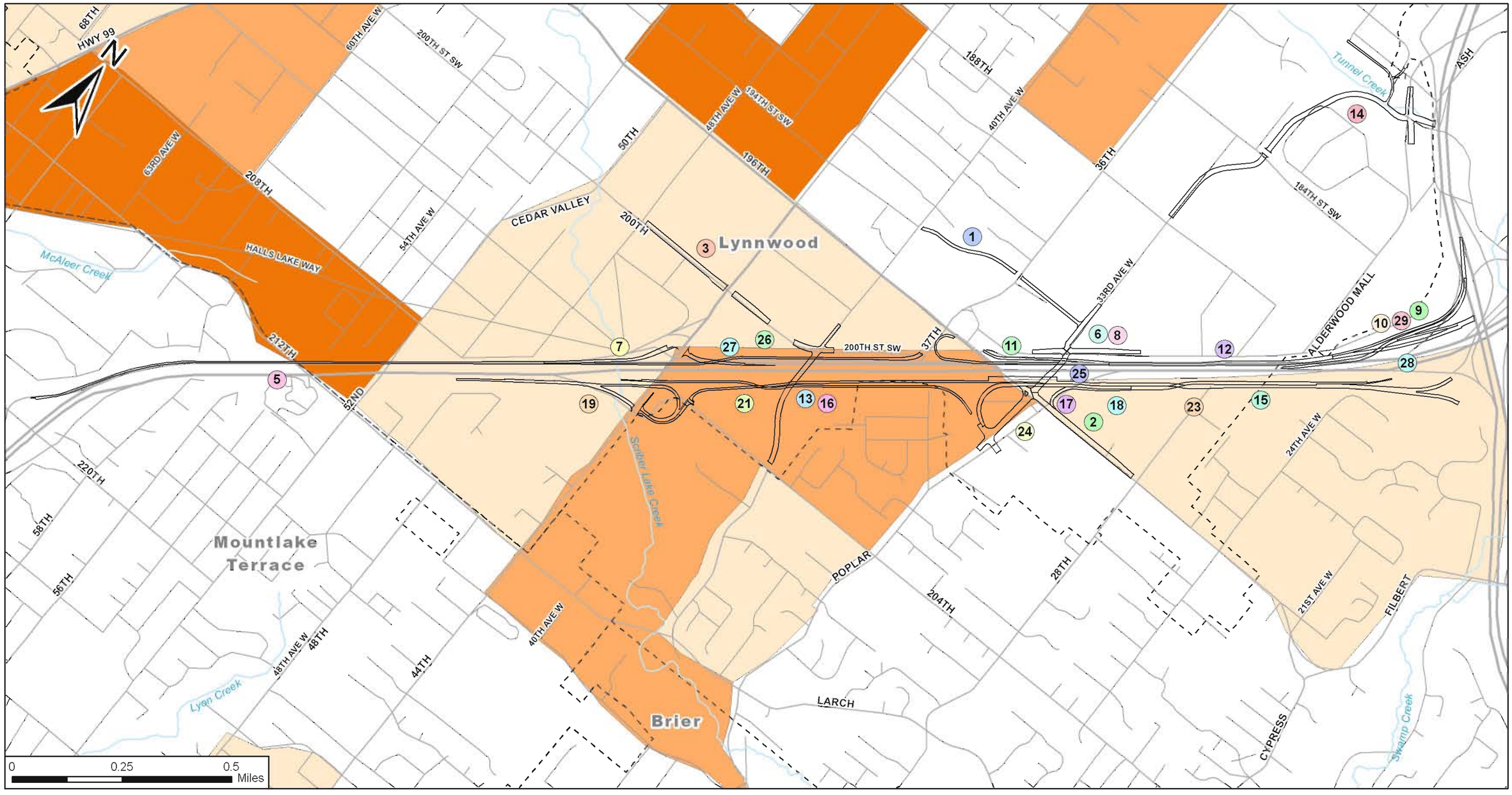
Source: U.S. Census Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Figure 19 -- Percent of Minors In Poverty Above City Average (By Census Block Group)

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

Project Segment

5 Segment Number
(Color will vary)

Major Highway

Local Arterial

City Boundary

Percent Above City Average

- 0.3% - 3.0%
- 3.1% - 10.0%
- Over 10%

City of Lynwood, Average Poverty Level: 10.3%

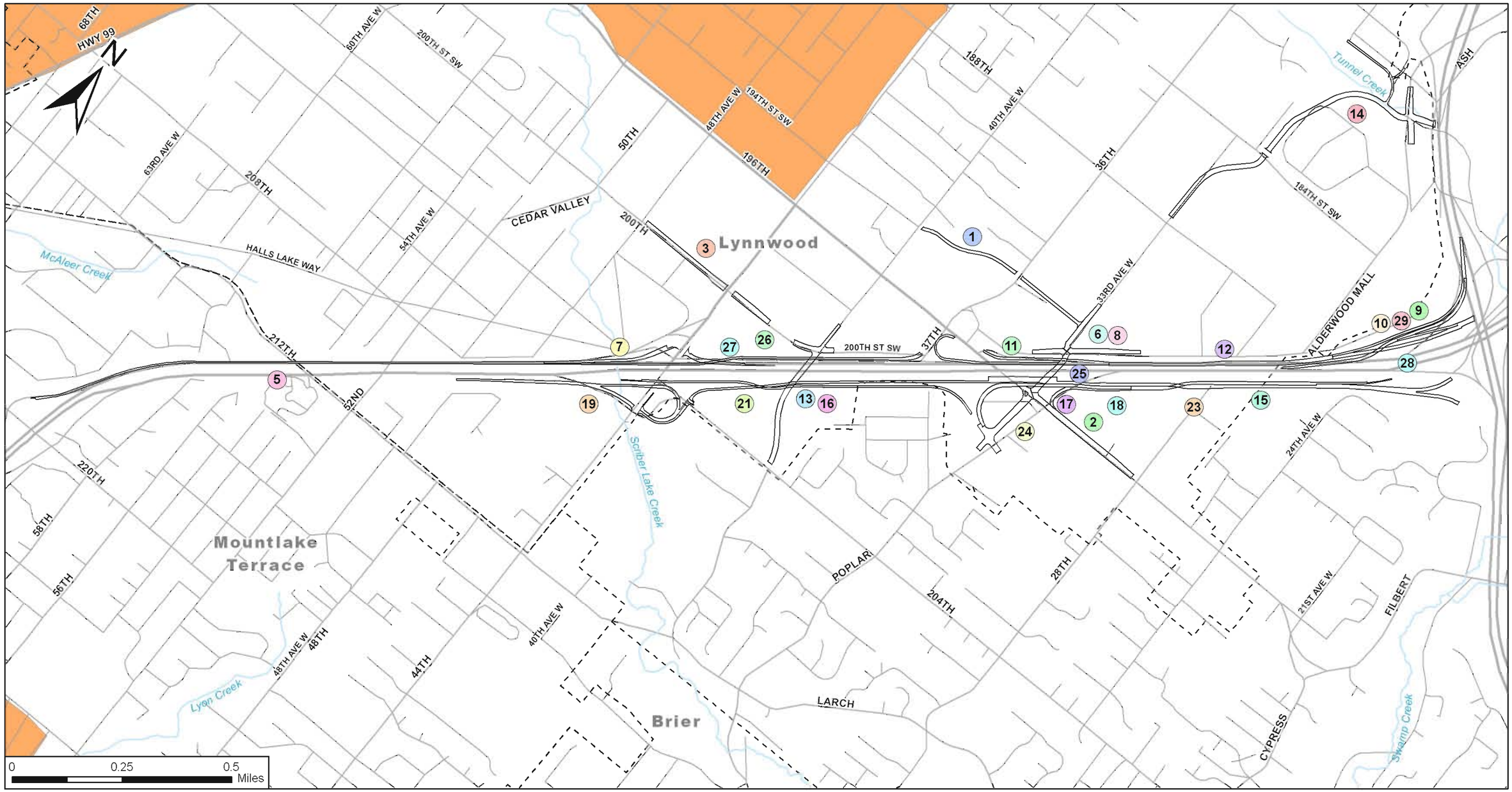
Source: U.S. Census Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Figure 20 -- Percent of Disabled People Above City Average (By Census Block Group)

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

Project Segment

Segment Number
(Color will vary)

Major Highway

Local Arterial

City Boundary

Percent Above City Average

0.0% - 3.0%

3.1% - 10.0%

Over 10%

City of Lynwood, Average
Percentage of Disabled People: 20.7%

Source: U.S. Census Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

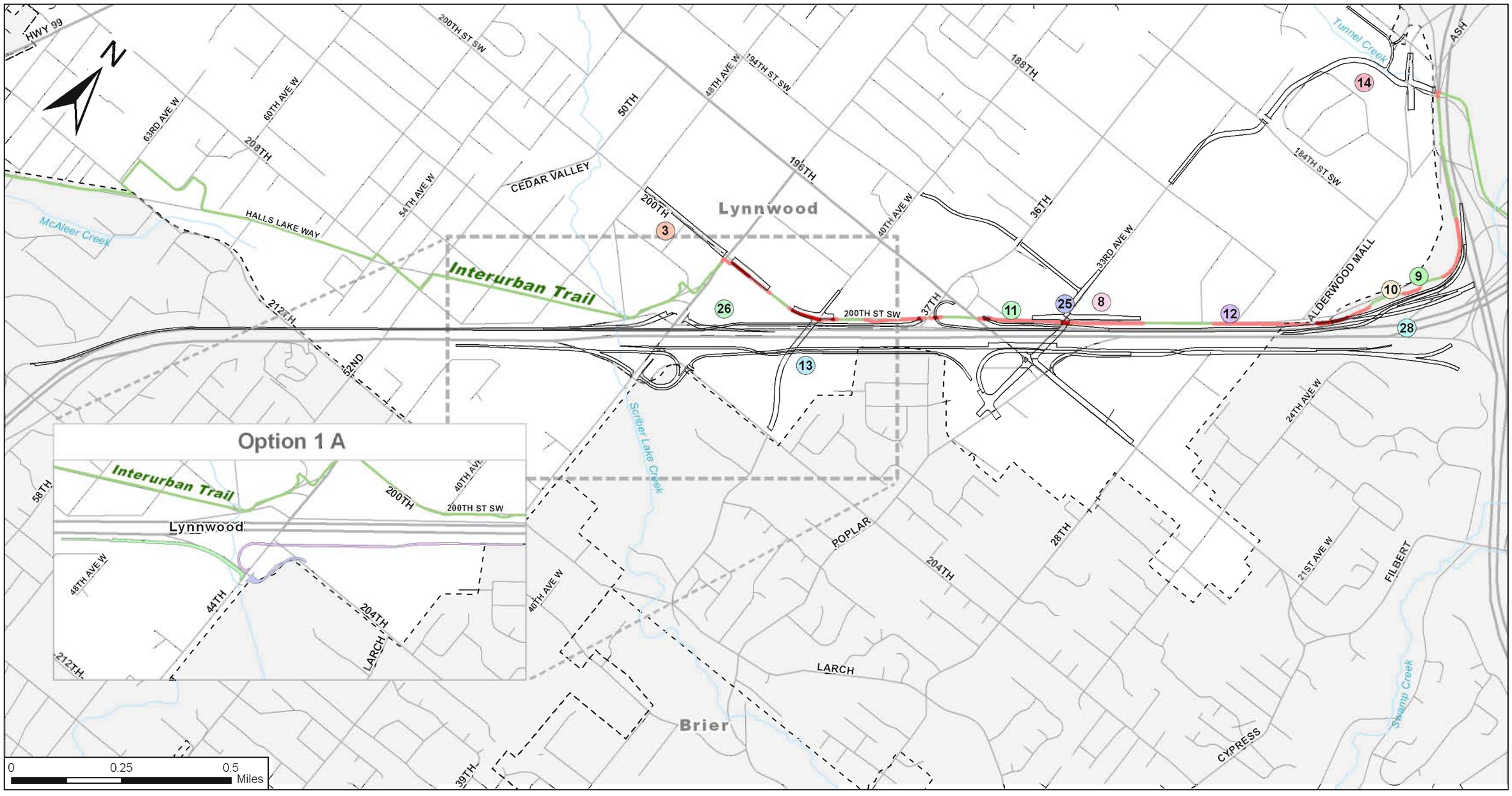
Appendix A

Figure 21 -- Parks & Recreation

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

5 *(Color will vary)* Project Segments & Numbers

City Boundary

Major Highway

Local Arterial

Trails Within Design Footprint

Trails Within 50ft Area of Analysis

Non-Impacted Trails

! *Segment numbers are only shown for segments that intersect the Parks and Recreation data layers.*

Source: Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

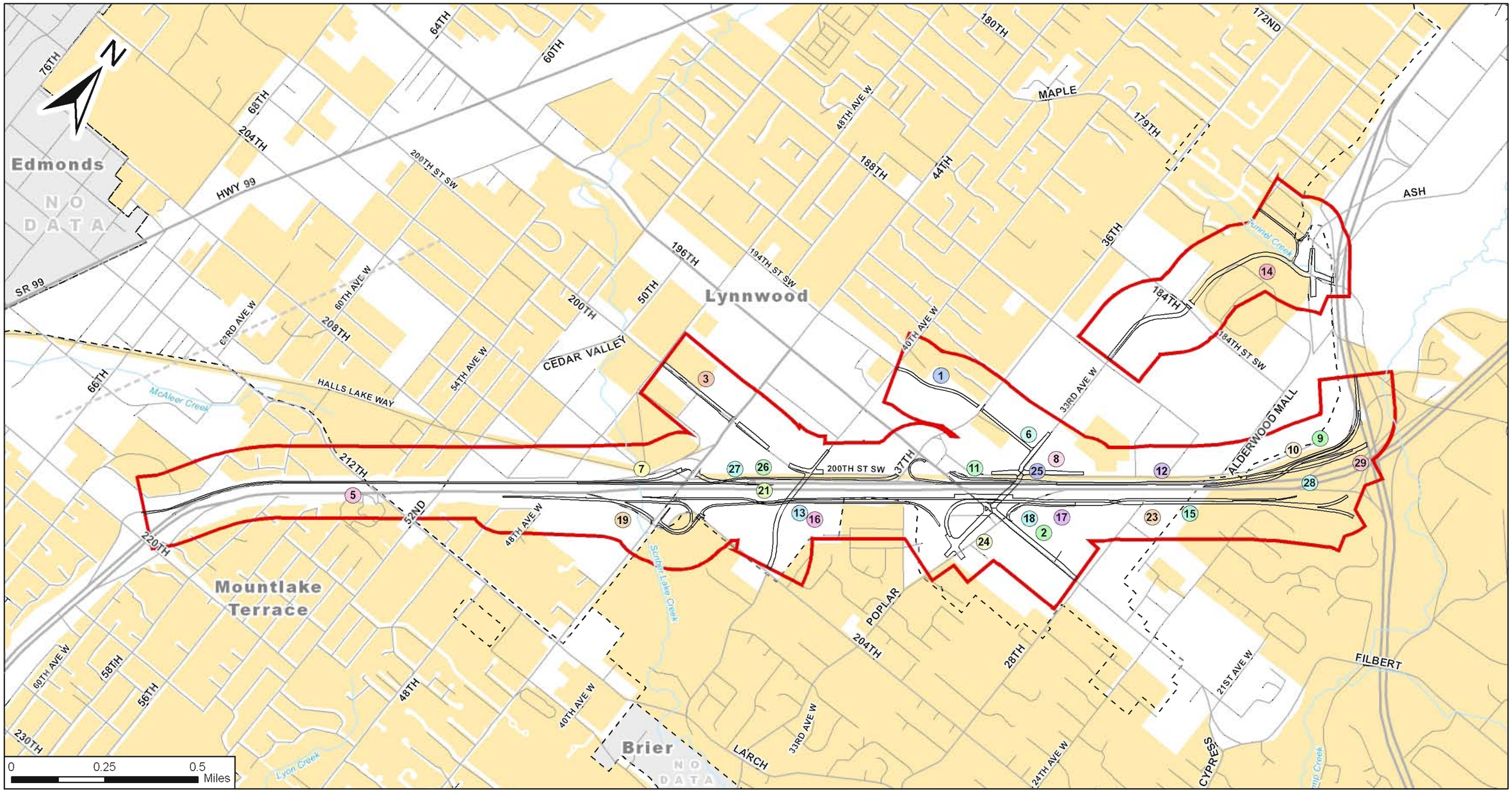
Appendix A

Figure 22 -- Noise

Lynnwood City Center Access Study Environmental Screening

CITY OF Lynnwood

Perteet



April 20, 2007

(Color will vary)

- Project Segments & Numbers
- City Boundary
- Major Highway
- Local Arterial
- Half Mile Noise Buffer
- Sensitive Receptors Area (Based on Zoning)

Source: Washington Department of Fish and Wildlife; Snohomish County; City of Lynnwood.

Technical Memo #11

Lynnwood City Center Access Study
Fatal Flaw Analysis and Phasing Recommendations

TO: **David Mach, P.E., Project Manager, City of Lynnwood**

FROM: **Peter De Boldt, P.E., Project Manager**
Jamie Son, Design Engineer

DATE: **August 21, 2007**

RE: **Fatal Flaw Analysis and Phasing Recommendations**

This memorandum summarizes the fatal flaws and recommended phasing of the concepts identified from the initial screening described in Technical Memorandum #7, and provides an order of magnitude cost opinion in Appendix A at the end of this memorandum. The Collector-Distributor alternatives that were examined and the reasons they were not carried forward are listed in Appendix B. Phasing recommendations are presented following the fatal flaw analysis. Preliminary design deviations are also listed in this memorandum following the phasing recommendations. Concepts carried forward from the initial screening were refined based on further traffic analysis summarized in Technical Memorandum #8 and the design criteria (see Appendix C and D) used to lay out the preliminary geometrics described in Technical Memorandum #9.

Based on these analyses, a summary of the concepts with fatal flaws is as follows:

Local System Improvements

Concept	Description	Fatal Flaw
Concept 44	A new east-west corridor along 194th St SW linking SR99 to Alderwood Mall Blvd.	Property impacts to residential neighborhoods and park lands considered undesirable between 44th Ave W and SR99.
Old Concept 10	New connection along 195th Pl SW between 36th Ave W and Alderwood Mall Blvd. Note this concept was revised from the description in Technical Memorandum #7 as the new east-west corridor along 194th St SW between 33rd and 40th Ave W. Concept 10 with the revised concept description is a recommended concept for future construction.	This option attracts traffic volumes which are considered too low to be cost effective.

Concept 56	New loop connection between WB 196th St SW to Alderwood Mall Blvd (examined as part of combination of concepts with Concepts 10 and 44 to create a new east-west corridor along 194th Street SW linking SR99 to Alderwood Mall Boulevard).	• Low traffic demand for this concept. • Existing church and other buildings restrict placement of the ramp. • Cannot fit adequate design radius for ramp between 195 Pl SW and 196th St SW.
Combination of Concepts 38, 41 and I	A new east-west corridor to link SR99 to the SR525/Alderwood Mall Boulevard interchange which would include widening of Maple Road.	This option attracts traffic volumes which are considered too low to be cost effective and impacts to residential neighborhoods considered undesirable.

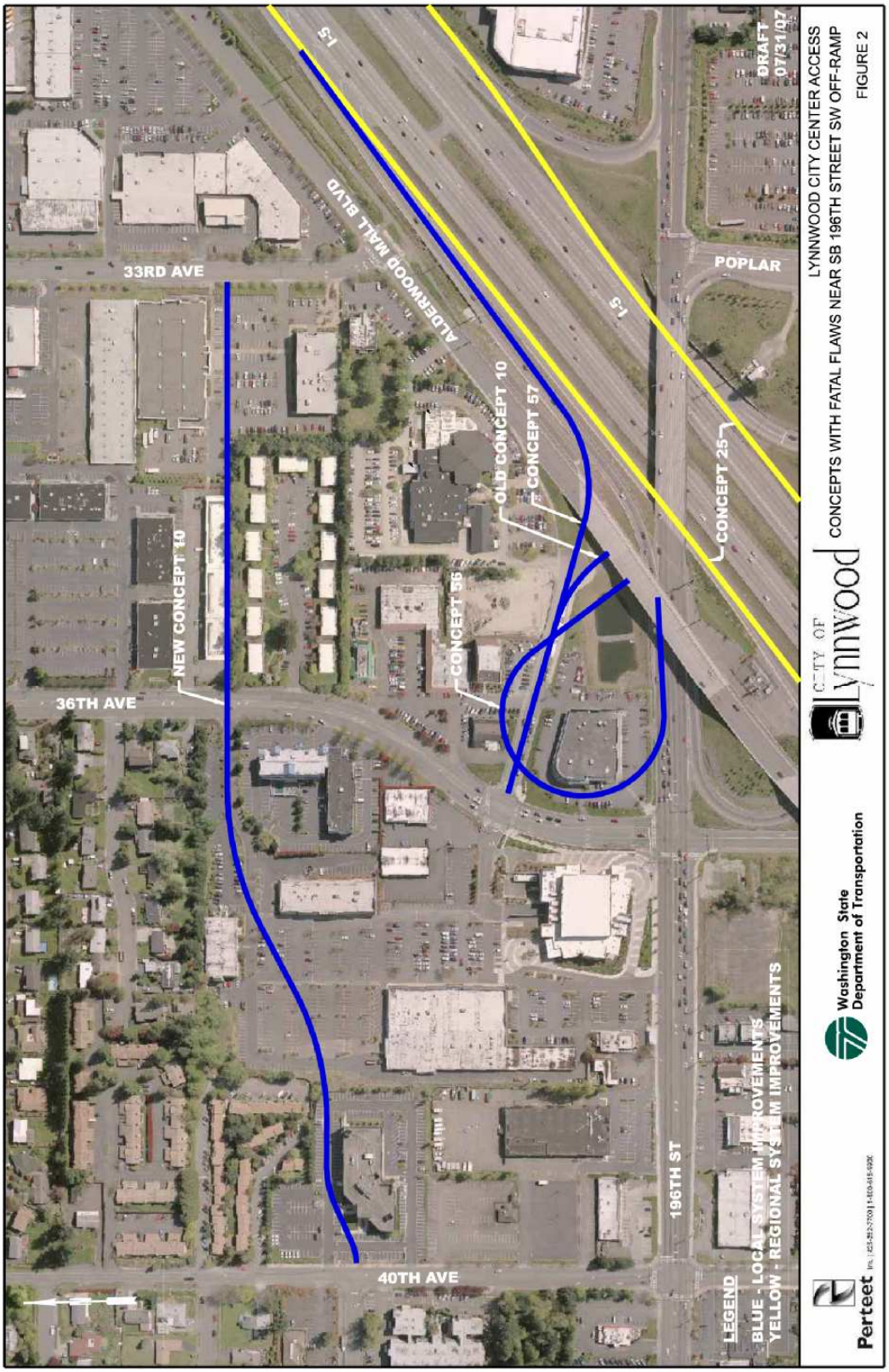
Local and Regional System Improvements

Concept	**Description**	**Fatal Flaw**
Concept 57	New off-ramp from existing SB I-5/196th off-ramp to 195th Pl SW/36th Ave W (examined as part of combination of concepts with Concepts 10 and 44 to create a new east-west corridor along 194th Street SW linking SR99 to Alderwood Mall Boulevard).	• Insufficient weave distances and safety concerns due to high traffic volumes predicted for this concept which would require a minimum of 3 lanes between 196th St and I-405/SR525 interchanges. • Two auxiliary lanes required along I-5 and under I-405/SR525 to accommodate the forecasted traffic volume. Existing bridge piers on I-405/SR525 allow room to fit an extra lane on I-5 but require I-5 to be rechannelized by a minimum of 6 feet to the east.
Concept VI	A new ramp from southbound I-5 to Alderwood Mall Blvd.	Not geometrically feasible due to location of existing and proposed ramps in the area.
Concept 25	A north- and southbound collector-distributor (CD) system on I-5 to connect Lynnwood interchanges. A modified version of this concept is recommended as a Braided Ramp System discussed in Technical Memorandum #8 and #9.	• Insufficient weave distances and safety concerns due to proposed number of CD lanes required to support traffic volumes. • Existing bridge piers constrain the number of lanes that will fit under the existing structures. • High traffic volumes and necessary weaves would create back-ups into mainline and create safety concerns.

Figure 1 identifies those concepts that had a fatal flaw. Figure 2 provides an enlarged view of the area around the southbound 196th Street SW off-ramp which includes the surrounding Concepts 10, 56 and 57.

Figure 1 – Concepts with Fatal Flaws

Figure 2 – Concepts with Fatal Flaws near SB 196th Street SW Off-ramp



Fatal Flaw Analysis

The following descriptions provide additional background as to why the concepts summarized above were deemed fatally flawed.

Concept 44

Concept 44 (see Figure 1) would create a new east-west corridor along 194th Street SW linking SR99 to Alderwood Mall Boulevard via Concept 10. A portion of Concept 44 would impact a neighborhood of single family homes between 44th Avenue W and SR99 as well as Wilcox/Scriber Lake Park. These impacts were determined to be significant so this concept was dropped from further consideration.

Old Concept 10

The former description of Concept 10 (see Figures 1 and 2) as illustrated in Technical Memorandum # 7 would have extended 195th Place SW at 36th Avenue W to Alderwood Mall Blvd. This concept is forecasted to generate a maximum of 300 vehicles traveling to Alderwood Mall Blvd during the PM peak hour in 2032. The traffic volume is considered too low to be cost effective.

Concept 10 has been revised as a new east-west corridor along 194th Street SW between 33rd and 40th Avenue W. Concept 10 with the revised concept description is recommended for future construction.

Concept 56

Concept 56 (see Figures 1 and 2) is a new loop connection between WB 196th Street SW to Alderwood Mall Blvd and was examined as part of a combination of concepts with Concepts 10 and 44 to create a new east-west corridor along 194th Street SW linking SR99 to Alderwood Mall Boulevard. The traffic model indicates low demand for access to Alderwood Mall Blvd from SB I-5 at this location so construction of this connection is not considered cost effective. A maximum of 200 vehicles is expected to travel from 196th onto Alderwood Mall Blvd during the PM peak hour in 2032.

Additionally, there are a number of buildings in the area including a church that restrict the placement of a new loop ramp. One option that was looked at with the intent of avoiding impacts to surrounding buildings was to place a loop ramp between 195th Place SW and 196th Street SW. The minimum radius that is required to meet the minimum ramp design speed of 25 mph and at an 8% maximum superelevation rate is 175 feet. The maximum radius that will fit between 195th Place SW and 196th Street SW is approximately 150 feet. This radius would result in a design speed of 20 mph at the same superelevation rate.

Combination of Concepts 38, 41 and I

A combination of Concepts 38, 41 and I (see Figure 1) were added by the City as worth considering. The combination of these concepts would create a new continuous east-west corridor that would link SR99 to the SR525/Alderwood Mall Pkwy interchange and possibly relieve congestion on 196th Street SW. It would be more effective than just concepts 31 and I alone originally identified in the October 2006 SST meeting. Widening Maple Road (Concept I) is an important component of these combined concepts since improving Maple Road would provide improved access to the SR525/Alderwood Mall Pkwy interchange. The traffic demand model forecasted an additional 200

vehicles during the PM peak hour in 2032 (totaled from both directions) using Maple Road with this new continuous east-west corridor concept. This combination of concepts was not pursued because the low number of trips generated by the traffic demand model with the difficulty in constructing a new arterial through the residential neighborhoods was not considered cost effective.

Concept 57

Concept 57 (see Figures 1 and 2) is a new off-ramp from the existing SB I-5/196th off-ramp to the intersection of 195th Place SW and 36th Avenue W. In addition to Concept 56, this concept was examined as part of a combination of concepts with Concepts 10 and 44. Concept 57 was not pursued for further analysis because the traffic demand model forecasted over 3300 vehicles during the PM peak hour in 2032 using the 196th Street off-ramp with this concept. A minimum of 3 lanes would be required between the 196th Street and I-405/SR525 interchanges to support this amount of traffic. Furthermore, two auxiliary lanes would be required along I-5 and under I-405/SR525 to channel the forecasted traffic volume onto the new off-ramp. The existing bridge piers on I-405/SR525 allow enough room to fit one extra lane of traffic on I-5 by rechannelizing this section of I-5 by a minimum of 6 feet to the east. Further lane additions along I-5 under I-405/SR525 are not possible without making changes to the existing I-405/SR525 overcrossing.

Concept VI

Concept VI (see Figure 1) would create a new ramp from southbound I-5 to Alderwood Mall Blvd close to the intersection with Alderwood Mall Pkwy. This concept is not geometrically feasible because of the location of existing and proposed ramps in the area. Due to requirements in ramp connection spacing, Concept VI would have to begin near the Alderwood Mall Blvd overcrossing or cross over the I-405/SR525 overcrossing. The Alderwood Mall Blvd crossing is too close to the desired intersection connection with Alderwood Mall Pkwy to fit a new ramp with adequate vertical curves. If Concept VI began before I-405/SR525, the new ramp would have to cross over I-405/SR525. The location of where the new ramp could start is then restricted by vertical curve requirements which would push the beginning of the new ramp even further north where it would be restricted by an existing off-ramp and the Maple Road overcrossing. By this point, the new ramp would be undesirably large.

In order to build a CD system, the beginning of the new ramp for Concept VI would be restricted to where all lanes on the CD from I-405/SR525 and I-5 merge together. By this point, there is not enough room to achieve the necessary gain in elevation to connect from the beginning of the new ramp to Alderwood Mall Blvd.

Concept 25

Concept 25 (see Figures 1 and 2) is a north- and southbound collector-distributor (CD) system on I-5 used to connect the Lynnwood interchanges. Due to fatal flaws in the CD system, a modified version of this concept is recommended as a braided ramp system discussed in further detail in Technical Memorandum #8 and #9. Several variations of the CD system were analyzed as listed in Appendix B. Two of the variations are discussed below to provide greater depth for the type of flaws that came to surface when looking at the CD system.

- *Alternative A: A CD system for I-405, SR525, 196th Street SW, and 44th Avenue W*

- *Alternative B: A CD system between 196th Street SW and 44th Avenue W and direct access between I-405 and I-5*

In both sets of alternatives, a high volume of traffic is expected within a limited amount of space between access points. This presents a challenge in providing sufficient weave distances. In Alternative A, both the south- and northbound directions between I-405 and 196th Street SW would need to support over 5,000 vph. This would require a minimum of four lanes through these sections, with more lanes likely due to the weaving traffic.

Since a four lane section between I-405 and 196th Street SW would not likely allow for adequate weave distances and would compromise safety, the CD system was modified into Alternative B. In this alternative, direct access between I-405/SR525 and I-5 was maintained, unlike Alternative A which strictly used the CD system to provide for these connections. Additionally in Alternative B, the CD connection was eliminated for traffic entering from 196th Street SW to exit onto 44th Avenue W and vice versa. By making these changes to the CD system, the volume of traffic between I-405 and 196th Street SW was reduced from that of Alternative A but remained high at 3,500 vph in the southbound direction and 3,900 vph in the northbound direction. Both directions would require at least three lanes to support traffic within the short distance. With this layout, there is still insufficient distance for northbound traffic to merge onto the I-405/SR525 interchange.

Another major design issue with both alternatives involves the number of additional lanes needed on I-5 when it passes under I-405. In Alternative A, the northbound direction would need to merge over 2,800 vph into I-5, which would require a two lane ramp merging onto the mainline. The lanes merge back into mainline I-5 at the I-405 underpass. This is also the case in the southbound direction where over 2,500 vph would need to access the CD system from mainline I-5. Again, two additional lanes would be needed to pass under I-405. With the existing placement of support columns under I-405, there is not enough room for the addition of two merge lanes on either side of mainline I-5.

The same problem exists for Alternative B in the northbound direction which would still require at least two additional lanes on I-5. For the southbound direction, one additional lane would be required. In this case, mainline I-5 would have to be rechannelized by at least 6 feet to the east to fit an extra lane between the existing I-405 support columns. Doing so would leave approximately 3 feet on both sides of I-5 for shoulders.

Furthermore, in both alternatives, traffic operations and safety would be compromised along mainline I-5. The high volume of traffic entering the CD system would create back-ups along the mainline which in turn would decrease safety in this area.

Technical Memorandum #10 examined the environmental impacts of the recommended concepts. Table 1 summarizes the anticipated types of environmental impacts for each concept and some of the anticipated permits or environmental documents.

Table 1 – Anticipated Environmental Impacts

	JURISDICTION		RESOURCES					REGULATIONS											
								LOCAL			STATE			FEDERAL					
Project Name	**CITY OF LYNNWOOD**	**SNOHOMISH COUNTY**	**WETLAND**	**STREAMS**	**BUFFER STREAM/WETLAND**	**STEEP SLOPES**	**FLOOD PLAINS**	**SEPA**	**CRITICAL AREA COMPLIANCE**	**GRADING PERMIT**	**DOE NPDES (NEW IMPERVIOUS SURFACE IN SQ.FT.)**	**STATE HISTORIC PROPERETIES**	**WDFW HPA**	**NEPA**	**CORPS 404 WETLAND FILL**	**ESA**	**SECTION 106**	**ENVRONMENTAL JUSTICE**	**PARKS SECTION 4f**
Concept 2 - Braiding of I-405 SB/SR525 SB/196th Ramps[1]	X	X	X		X	X		X	X	X	X 358,000			X	X	X	X	X	X
Concept 9 - Poplar Way Overcrossing of I-5	X					X		X	X	X	X 364,000								X
Concept 6: New Arterial across soon-to-be former Lynnwood H.S.	X	X	X		X			X	X	X	X 309,000				X	X	X		
Concept V – 200th Street Widening[1]	X							X		X	X 116,000								
Concept 25a – Completion of I-5/44th Avenue Interchange	X	X	X	X	X	X	X	X	X	X	X 462,000		X	X	X	X	X	X	
Concept 10 – 194th Street Extension	X					X		X	X	X	X 79,000								
Concept 25a - Braiding of NB 196th to I-5 on ramp and NB I-5 to SB I-405 off ramp	X	X	X	X	X	X		X	X	X	X 517,000		X	X	X	X	X	X	X
Concept 11 – 40th /Larch Extension Undercrossing of I-5[1]	X							X		X	X 136,000								

[1] Assumes that the projects have no federal funding.

There were no fatal flaws identified due to environmental reasons. In addition, these concepts do not result in wetland impacts above the impact levels of a United States Army Corps of Engineer's nationwide permit.

Furthermore, the two alternatives for the completion of the I-5/44th Avenue interchange to accommodate access to and from the north were comparable in terms of environmental screening.

Phasing Recommendations Summary

Phasing of the concepts will be dependent on future funding opportunities. This may mean that some concepts will move forward before others due to the availability of specific funds for a project or due to a particular development opportunity. To acquire federal funding for the preferred concepts, it is important that new roadways not currently on the federal aid system need to be identified by the City of Lynnwood for inclusion on the federal aid system, and adopted by the Puget Sound Regional Council (PSRC). This should be done by the City following the WSDOT document *Guidelines for Amending Urban Boundaries and Functional Classification.*

Concept 1, the proposed SB I-5 off-ramp to WB SR525, was canceled by WSDOT effective June 21, 2007 due to lack of support within WSDOT to complete the system interchange in this area. This project would have completed a missing movement at the system interchange, and provided an alternate access into Lynnwood from the north. The demand model for the proposed off-ramp to WB SR525 forecasted a range of 150 to 500 vehicles during the PM peak hour in 2032 which was considered too low by WSDOT to demonstrate a need for the new off-ramp to WB SR525.

The forecasted traffic volumes varied depending on the placement of the proposed off-ramp along I-5. The 164th Interchange through Ash Way currently provides an alternative route off I-5 to the Alderwood Mall area as well as a connection onto SR525. The demand model suggested that the further south the proposed WB SR525 off-ramp was placed from the 164th Interchange, the more likely drivers would be to continue using the existing route into Lynnwood from the 164th off-ramp. Drivers would continue exiting onto 164th Street SW in order to avoid congestion along I-5 south of the 164th Interchange. Therefore to reduce congestion leading to the proposed off-ramp, an auxiliary lane just south of the 164th Interchange was explored that would connect onto the new off-ramp. The combination of an auxiliary lane with the new off-ramp to WB SR525 produced the higher range in the traffic demand model of 500 vehicles. Nevertheless, these volumes were still regarded as too low by WSDOT to justify providing additional TPA funds to construct the project.

Suggested phasing of the remaining projects described in Technical Memorandum #9 are as listed below. Note that some of the "Local" System Improvements have as much benefit to the "Regional" system as to the local arterial system. Both of the I-5 crossings fall into this category because of their benefits to the nearby interchanges.

1. Concept 2: Braiding of I-405 SB/SR525 SB/196th ramps (current WSDOT TPA project). This project would both improve safety (addressing a high collision area), and capacity in this segment of I-5.
2. Concept 9: Poplar Way overcrossing of I-5 between 33rd Avenue W and 196th Street SW. This project has benefits to relieve congestion at the I-5/196th Interchange ramps that is affecting I-5 mainline operations, and on the local arterial system.
3. Concept 6: New arterial across soon-to-be former Lynnwood High School site linking the SR525/Alderwood Mall Blvd interchange and 184th Street SW. This improves access to the Alderwood Mall area as well as to the future Lynnwood City Center area by providing an alternate route to Alderwood Mall Parkway. (Note: Concept description has been revised from Technical Memorandum #9 as the concept is now better defined).

4. Concept V: 200th Street SW widening from 3 to 5 lanes between 44th Avenue W and 48th Avenue W. This was a "missing link" to the other improvements already planned for in the widening of 200th Street SW between 40th Avenue W and SR99.
5. Part of Concept 25a: Completion of I-5/44th Avenue interchange to include NB on-ramp and SB off-ramp. This will require braiding of the SB 196th on-ramp to I-5 from the new SB 44th Avenue off-ramp. This is an important project for improving access into the Lynnwood City Center. More traffic currently access Lynnwood from the north than from the south, yet this interchange currently only provides access to and from the south. As Lynnwood continues to grow as the South Snohomish County urban center, the limited access to and from the north will contribute to increased congestion at the 196th interchange.
6. Concept 10: 194th Street SW connection between 33rd and 40th Avenue W. This project would provide new access from the northern portion of the City Center to the Alderwood Mall area and likely relieve congestion on 196th Street SW. (Note: Concept description revised from Technical Memorandum #7 as this concept was modified to address fatal flaws).
7. Part of Concept 25a: Braiding of NB 196th to I-5 on-ramp and NB I-5 to SB I-405 off-ramp. This project would both improve safety (addressing a high collision area), and capacity in this segment of I-5.
8. Concept 11: 40th Avenue W undercrossing of I-5 between 40th Avenue W and Larch Way. This project has benefits to help relieve congestion at the I-5/44th Avenue ramps that could affect I-5 mainline operations, and provides an alternate route to and from the City Center area across I-5.

Discussion of Phasing Recommendations

As listed above in the Phasing Recommendations Summary, the highest priority concept is the braiding of I-405 SB/SR525 SB/196th ramps. This project is already a funded WSDOT TPA project. This project would both improve safety by addressing a High Accident Corridor (HAC), and capacity in this segment of I-5. As discussed in the Collision Analysis from Technical Memorandum #4, WSDOT has recently ranked the corridor between 196th Street SW and I-405/SR525, as well as the corridor between I-405/SR525 and 164th Street SW as being the 2nd and 3rd worst collision corridors in Washington State based on a calculated annual cost to society.

Within these HACs, collision rates are highest at on-ramps and off-ramps with the SB I-5 off-ramp to 196th Street, and the I-405/SR525 on-ramp to SB I-5 having among the highest collision rates in the Study Area. In addition, the southbound direction along I-5 between the 196th Interchange and the I-405/SR525 Interchange had over twice the number of collisions compared to the northbound direction. The Collision Analysis concluded that the high rate of collisions will continue to increase unless capacity improvements and/or interchange improvements are completed. Therefore, the braiding of the I-405 SB/SR525 SB/196th ramps is expected to decrease the rate of collisions in this area.

The second concept recommended for construction is the Poplar Way freeway overcrossing which provides the greatest relief for traffic operations. The additional north-south arterial provided by the Poplar Way crossing over I-5 would free up traffic on 196th Street SW by providing another route in this area. 196th Street SW is used both as an interchange and a local freeway crossing to travel across Lynnwood. With the added capacity served by two I-5 crossings, the interchange at 196th

Street SW could carry more vehicles getting onto and off of I-5 and lower delay times for vehicles. Improvements to LOS and delay times are as follows:

Intersection	Description	2032 Baseline (LOS, Delay)	2032 Local (LOS, Delay)	2032 Local + Regional (LOS, Delay)
196th St /36th Ave	SB on-ramp	F, 120s	F, 82s	E, 80s
Poplar/ Alderwood Mall Pkwy	NB on-/off-ramp	E, 65s	D, 43s	D, 38s
Poplar/ 196th St	NB on-ramp	D, 40s	E, 61s	D, 41s

LOS and delay times become worse for the Poplar Way and 196th Street SW intersection from baseline to local because the Poplar crossing would add another leg to the north side of the intersection and create added use for that intersection. Overall improvements along the 196th interchange would decrease backups in this area along I-5, lowering the traffic volume on I-5 between the off-and on-ramps. There is no net change on I-5 south and north of the interchange.

The third highest priority item is a new arterial across the soon-to-be former Lynnwood High School site. The proposed route would run from the intersection of Maple Rd and Alderwood Mall Pkwy through the existing high school site down to the Alderwood Mall area at 184th Street SW and 33rd Avenue W. In addition, a portion of this concept would run from the area north of the high school site around 33rd Place W and 179th Street SW to the Alderwood Mall area, providing an alternative route to access the mall area for neighborhoods north of the high school.

In effect, redeveloping the high school site route provides broader access improvements to the Alderwood Mall area as well as the proposed Lynnwood City Center area. This concept provides an alternative route to Alderwood Mall Pkwy which provides service for traffic to and from I-405/SR525, Maple Road and to I-5.

In this area, improvements to LOS and delay times were examined for the intersection of Alderwood Mall Pkwy and Maple Road as shown below:

Intersection	2032 Baseline (LOS, Delay)	2032 Local (LOS, Delay)	2032 Local + Regional (LOS, Delay)
Alderwood Mall Pkwy and Maple Rd	F, 125s	E, 67s	E, 65s

Traffic analysis verifies that congestion along Alderwood Mall Pkwy in this area would dramatically improve through a reduction in delay time.

This concept would also take advantage of the current plans to redevelop the high school. There is already a development proposal underway for the past 6 to 8 months. By working in conjunction with plans already in progress, working on this concept now could best incorporate the overall vision for the area around the high school.

The fourth concept that is recommended is widening of 200th Street SW between 44th and 48th Avenue W from mainly 3-lanes into 5-lanes. This would provide the "missing link" to the other improvements already planned widening of 200th Street SW between 40th Avenue W and SR99.

In addition, there are heavy left turning movements from northbound 44th Avenue W onto westbound 200th Street SW. Therefore, widening 200th Street SW would relieve traffic on the intersection of 44th Avenue W and 200th Street SW. Reduction in delay time due to the 200th Street SW widening as well as from other local improvements in the area (mainly the proposed 40th Avenue undercrossing) is illustrated below:

Intersection	2032 Baseline (LOS, Delay)	2032 Local (LOS, Delay)	2032 Local + Regional (LOS, Delay)
44th Ave and 200th St	F, 220s	F, 132s	F, 205s

As shown, local improvements reduce delay time by nearly 90 seconds.

The fifth concept that is recommended is completion of the I-5/44th Avenue interchange to include a NB on-ramp and a SB off-ramp. This is an important project for improving access into the Lynnwood City Center from I-5 access, and to complete missing directional access connecting at this interchange. In the northbound direction, the new on-ramp from 44th Avenue W would require realignment and braiding of the 196th off-ramp with the 44th on-ramp in order to avoid weaving conflicts between drivers trying to enter I-5 from 44th Avenue W and drivers trying to exit I-5 to 196th Street SW. Therefore, the existing 196th off-ramp would shift further south of its current location so that the off-ramp begins before the proposed 44th on-connection with I-5. The 196th off-ramp would braid with the 44th on-ramp so that the 196th off-ramp crosses over the new 44th on-ramp. In the southbound direction, the off-ramp at 44th Avenue W would require braiding with the 196th on-ramp. Therefore, the existing 196th on-ramp would have to be realigned in order to cross over the new 44th off-ramp and the realigned 196th on-ramp would merge onto I-5 further south from its current location.

In the southbound direction, an off-ramp at 44th Avenue W will decrease traffic volumes at the 164th Street SW, 196th Street SW, and 220th Streets SW off-ramps by providing an additional access point into Lynnwood from I-5. In the northbound direction, an on-ramp at 44th Avenue W will increase traffic along I-5 between 44th Avenue W and I-405 but will complete the interchange and provide a connection that does not currently exist.

The sixth concept that is recommended is the 194th Street SW connection between 33rd and 40th Avenue W. This concept would provide a connection between the proposed City Center and Alderwood Mall area. Traffic analysis for intersections at this area was not recorded but would likely affect traffic along 196th Street SW by providing another east-west corridor as an alternative to 196th Street SW.

The seventh concept that is recommended is braiding of NB 196th to I-5 on-ramp and NB I-5 to SB I-405 off-ramp. This project would both improve safety and capacity in this segment of I-5. The section between the 196th Street SW and I-405/SR525 interchanges is currently designated a HAC as discussed in the Collision Analysis from Technical Memorandum #4.

The final concept recommended is the 40th Avenue W crossing under I-5 between 40th Avenue W and Larch Way. This project would provide an alternative to 44th Avenue W to access the City Center and the Alderwood Mall across I-5. This project has the benefit of relieving congestion along 44th Avenue W especially at the I-5/44th Avenue ramps which in turn could improve I-5 mainline operations. In addition, access to the mall via Alderwood Mall Blvd could encourage usage of this underutilized road.

This is the most expensive concept to construct. This concept is viewed more as an item to be constructed within the next 20 years rather than the next 5 years. Improvements to traffic operations are as follows for the surrounding intersections:

Intersection	2032 Baseline (LOS, Delay)	2032 Local (LOS, Delay)	2032 Local + Regional (LOS, Delay)
40th Ave W and Alderwood Mall Blvd	n/a	E, 60s	D, 40s
44th Ave and 200th St	F, 220s	F, 132s	F, 205s

As discussed earlier for the 200th Street SW widening improvements, a combination of local street improvements around 40th and 44th Avenue W reduce delay time by close to 90 seconds, providing improvements at what is already a poorly functioning intersection.

Preliminary Design Deviations

Due to the fatal flaws in Concept 25 discussed earlier in this memorandum, the CD system was modified into a braided ramp system to connect the Lynnwood interchanges. In order to fit the necessary lanes under the existing 196th Street SW and Alderwood Mall Pkwy structures, the following shoulder width deviations may be required:

- Shoulder widths along northbound I-5 under 196th Street SW may need to be decreased on both the left and right side to 2 feet to fit in an auxiliary lane to exit onto I-405/SR525.
- Shoulder widths along northbound I-5 may need to be decreased on the right side to 2 feet under Alderwood Mall Pkwy.
- Shoulder width along the proposed exit ramp onto I-405/SR525 may need to be decreased on both the left and right side to 2 feet under Alderwood Mall Pkwy.
- Shoulder widths for the proposed I-405/ SR525 to southbound I-5 ramp may need to be decreased on the right side to 5 feet under Alderwood Mall Pkwy.

Endorsement

The Study Support Team has reviewed this technical memorandum, and concurs with it.

Study Support Team	Initial
FHWA Northwest Washington – Steve Saxton	
WSDOT NW Region - ~~Rick Mitchell~~ Martin Palmer	
WSDOT NW Region Traffic - Shuming Yan	
WSDOT HQ Access & Hearings Manager – Barb De Ste. Croix	
Snohomish County – ~~Jay Larson~~ Doug McCormick	
City of Lynnwood - Jeff Elekes	

APPENDIX A
ORDER OF MAGNITUDE COST OPINION

PLANNING LEVEL OPINION OF COST SUMMARY

Project Description:	Lynnwood Access Study	Client:	City of Lynnwood
Corridor Section:	Lynnwood City Limits	Date:	March-07
Location:	Lynnwood - Concept 25a - Braided Ramps	Date of Cost Index:	2007
		Calculated By/Entered By:	GLW
		Checked By:	GSS

Lynnwood City Limits

		ITEM				LOW	HIGH
I.		**LOCAL**					
		Concept 6 - Extend 33rd Ave to Alderwood Mall Parkway				$26,980,000	$34,480,000
		Concept 9 - New I-5 crossing btwn 33rd and Poplar				$27,390,000	$34,990,000
		Concept 10 - 194th St Extension				$13,600,000	$17,380,000
		Concept 11 - New I-5 crossing btwn 40th Ave and Larch Way				$33,140,000	$42,340,000
		Concept V - 200th St widening btwn 44th to 48th Ave				$7,170,000	$9,170,000
		LOCAL TOTAL				**$108,280,000**	**$138,360,000**
II.		**BRAIDED RAMPS - NB**					
		44th Off-Ramp-Loop onto 44th Option		($20,950,000 for Loop off of 44th		$18,510,000	$23,660,000
		44th On-Ramp				$9,610,000	$12,280,000
		196th Off-Ramp				$22,070,000	$28,200,000
		196th On-Ramp from Poplar				$2,350,000	$3,000,000
		196th On-Ramp from 196th				$10,930,000	$13,960,000
		Off-Ramp to I-405/SR525				$21,090,000	$26,940,000
		BRAIDED RAMPS (with Loop onto 44th Option) - NB TOTAL				**$84,560,000**	**$108,040,000**
III.		**BRAIDED RAMPS - SB**					
		*Concept 1: SB I-5 to SR 525 ramp**		*($45,000,000 for Flyover Options*		*$15,300,000*	*$24,600,000*
		Concept 2: WB/EB SR525 to SB I-5 On-Ramp				$13,080,000	$16,710,000
		Off-Ramp from I-5 to where merge with I-405/SR 525 Traffic				$13,440,000	$17,170,000
		EB 525 Ramp to merge point with I-5 and WB I-405/SR525 Ramps				$19,270,000	$24,620,000
		Merge point of I-5/I-405/SR 525 to Off-ramps for 196th				$4,600,000	$5,880,000
		Total for 525 to 196th Braided System			**$55,980,000**		
		196th Off-Ramp WB				$0	$0
		196th Off-Ramp EB				$0	$0
		196th On-Ramp				$21,190,000	$27,070,000
		44th Off-Ramp				$4,050,000	$5,180,000
		44th On-Ramp				$3,480,000	$4,450,000
		44th/196th Connection to 220th Off-Ramp				$16,350,000	$20,900,000
		BRAIDED RAMPS - SB TOTAL				**$110,760,000**	**$146,580,000**
IV.		**TOTAL ESTIMATED COST**					
		(ITEMS I, 14 & III)				**$303,600,000**	**$392,980,000**
V.		**FUTURE ESTIMATED COST**					
			Inflation	**Const. Year**	**Cost Index**	**Future Cost**	**Future Cost**
		FUTURE COST BASED ON INFLATION RATE	0.05	2012	2007	**$387,480,000**	**$501,560,000**

*The high end of this range is the WSDOT evaluation of the DMJM estimate for the at-grade concept.

The above opinion of cost is a planning level estimate only. It is based on best available information and scope at the time, not on the results of a detailed engineering study, and is supplied as a budgeting guide only. Perteet, Inc. does not guarantee or warrant the accuracy of this planning level estimate.

APPENDIX B
COLLECTOR-DISTRIBUTOR ALTERNATIVES EXAMINED

Collector-Distributor Alternative	Description	Measure Taken to Address Flaws	Major Reasons Not Used
A – SB: Full CD System	▪ I-5: chance to enter into CD north of I-405/SR525 Interchange to exit onto 196th, 44th and 220th ▪ I-405/SR525: all enter into CD with access to 196th, 44th, 220th and I-5 ▪ 196th: access to 44th, 220th and I-5 from CD o direct exit to 196th from CD o direct access from 196th to CD ▪ 44th: access to 220th and I-5 from CD o direct exit to 44th from CD o direct access from 44th to CD ▪ South of 44th, vehicles have option to exit onto I-5 or continue along auxiliary lane to 220th		Too much traffic pulled from I-5 leading to: - Too many lanes on CD to support adequate weave distances between interchanges - I-5 became underutilized
B – SB: CD Option for I-405/SR525 access directly to I-5 Combines Off-Ramps to 196th and 44th into single ramp and Combines On-Ramps from 196th and 44th into single ramp	▪ I-5: chance to enter into CD north of I-405/SR525 Interchange to exit onto 196th and 44th ▪ I-405/SR525: option to access I-5 near interchange or enter into CD with access to 196th and 44th ▪ 196th: access to I-5 from CD o direct exit to 196th from CD o direct access from 196th to CD ▪ 44th: access to I-5 from CD o direct exit to 44th from CD o direct access from 44th to CD	Reduced volume on CD by channeling traffic from I-405/SR525 to I-5 directly onto I-5, Plus eliminated direct access from 196th to 44th.	Continues to have too much traffic on the CD to satisfy weave distance requirements.

Collector-Distributor Alternative	Description	Measure Taken to Address Flaws	Major Reasons Not Used
C – SB: CD Option for I-405/SR525 access directly to I-5 On-Ramps to I-5 from 196th and 44th	▪ I-5: chance to enter into CD north of I-405/SR525 Interchange to exit onto 196th and 44th ▪ I-405/SR525: option to access I-5 near interchange or enter into CD with access to 196th and 44th ▪ 196th: direct access to I-5 o direct exit to 196th from CD o 196th On-Ramp to I-5 ▪ 44th: direct access to I-5 o direct exit to 44th from CD and CD ends o 44th On-Ramp to I-5	Reduced volume on CD by channeling traffic from I-405/SR525 to I-5 directly onto I-5, Plus reduced volume on CD by channeling traffic from 196th and 44th directly onto I-5.	Continues to have too much traffic on the CD to satisfy weave distance requirements. In addition, the new ramp from I-405/SR525 to I-5 would have weaving issues as traffic from the existing two I-405/SR525 ramps would shift lanes to enter the CD or I-5.
D – SB: Braided Ramp System On-Ramps to I-5 from 196th and 44th Off-Ramps from I-5 to 44th	▪ I-5: chance to enter into Braided Ramp System north of I-405/SR525 Interchange to exit onto 196th ▪ I-405/SR525: all enter into Braided Ramp with access to I-5 and 196th ▪ 196th: direct access to I-5 o direct exit to 196th from Braided Ramp o 196th On-Ramp to I-5 ▪ 44th: direct access from and to I-5 o 44th Off-Ramp from I-5 o 44th On-Ramp to I-5	Reduced volume by channeling traffic from 196th and 44th directly onto I-5, Plus pulled additional traffic to 44th off Braided Ramp System by creating 44th off-ramp from I-5.	Continues to have too much traffic on Braided Ramp System to satisfy weaving distance requirements. This option continues to carry the full volume from I-405/SR525.
E – SB: Braided Ramp System On-Ramps to I-5 from 196th and 44th Off-Ramps from I-5 to 44th Option for I-405/SR525 access directly to I-5	▪ I-5: chance to enter into Braided Ramp System north of I-405/SR525 Interchange to exit onto 196th ▪ I-405/SR525: option to access I-5 near interchange or enter into Braided Ramp System with access to 196th ▪ 196th: direct access to I-5 o direct exit to 196th from Braided Ramp o 196th On-Ramp to I-5 ▪ 44th: direct access from and to I-5 o 44th Off-Ramp from I-5 o 44th On-Ramp to I-5	Reduced volume by channeling traffic from 196th and 44th directly onto I-5, Plus pulled additional traffic to 44th off Braided Ramp System by creating 44th off-ramp from I-5, Plus pulled additional traffic from I-405/SR525 off Braided Ramp System with direct access onto I-5.	Existing bridge piers on I-405/SR525 allow one additional lane to go under this structure from each direction. Channelization is counterintuitive for NB I-405/SR525 traffic wanting to exit onto I-5 versus accessing the Braided Ramp System. Excavation required to create access for NB I-405/SR525 traffic exiting onto I-5 near I-405/SR525 interchange.

Collector-Distributor Alternative	Description	Measure Taken to Address Flaws	Major Reasons Not Used
F – SB: Braided Ramp System beginning south of SR525/I-405 Interchange On-Ramps to I-5 from 196th and 44th Off-Ramps from I-5 to 44th Option for I-405/SR525 access directly to I-5	▪ I-5: chance to enter into Braided Ramp System just south of I-405/SR525 Interchange to exit onto 196th ▪ I-405/SR525: option to access I-5 near interchange or enter into Braided Ramp System with access to 196th ▪ 196th: direct access to I-5 o direct exit to 196th from Braided Ramp o 196th On-Ramp to I-5 ▪ 44th: direct access from and to I-5 o 44th Off-Ramp from I-5 o 44th On-Ramp to I-5	Reduced volume by channeling traffic from 196th and 44th directly onto I-5, Plus pulled additional traffic off Braided Ramp System by creating 44th off-ramp from I-5, Plus pulled additional traffic from I-405/SR525 off Braided Ramp System with direct access onto I-5, Plus moved beginning of Braided Ramp System to south of I-405/SR525 crossing.	Channelization is counterintuitive for NB I-405/SR525 traffic wanting to exit onto I-5 versus access the Braided Ramp System. Excavation required to create access for NB I-405/SR525 traffic exiting onto I-5 near I-405/SR525 interchange. This alternative is still being examined as a possible recommendation.
G – SB: Braided Ramp System beginning south of SR525/I-405 Interchange On-Ramps to I-5 from 196th and 44th Off-Ramps from I-5 to 44th Option for partial I-405/SR525 access directly to I-5	▪ I-5: chance to enter into Braided Ramp System just south of I-405/SR525 Interchange to exit onto 196th ▪ SB I-405/SR525: option to access I-5 near interchange or enter into Braided Ramp with access to 196th ▪ NB I-405/SR525: all enter into Braided Ramp System with access to I-5 further down and access to 196th ▪ 196th: direct access to I-5 o direct exit to 196th from Braided Ramp o 196th On-Ramp to I-5 ▪ 44th: direct access from and to I-5 o 44th Off-Ramp from I-5 o 44th On-Ramp to I-5	Reduced volume by channeling traffic from 196th and 44th directly onto I-5, Plus pulled additional traffic off Braided Ramp System by creating 44th off-ramp from I-5, Plus pulled additional traffic from SB I-405/SR525 off Braided Ramp System with direct access onto I-5.	Two access points to I-5 from I-405/SR525-creates confusion and potential congestion/weaving hazards with the extra vehicles from SB I-405/SR525 potentially using the exit further down intended for NB I-405/SR525 traffic. This alternative is still being examined as a possible recommendation.

Collector-Distributor Alternative	Description	Measure Taken to Address Flaws	Reason Not Used
A – NB: Full CD System	▪ I-5: chance to enter into CD south of 44th Interchange to exit onto 44th, 196th, and I-405/SR525 ▪ 44th: access to I-405/SR525 and I-5 from CD o direct exit to 44th from CD o direct access from 44th to CD ▪ 196th: access to I-405/SR525 and I-5 from CD o direct exit to 196th from CD o direct access from 196th to CD ▪ Vehicles after the 196th Interchange have the option of exiting to I-405/SR525 or exiting to I-5 from CD		Too much traffic pulled from I-5 leading to: - Too many lanes on CD to support adequate weave distances between interchanges - I-5 became underutilized
B – NB: CD Off-Ramp from I-5 to I-405/SR525	▪ I-5: chance to enter into CD south of 44th Interchange to exit onto 44th and 196th ▪ 44th: access to I-405/SR525 and I-5 from CD o direct exit to 44th from CD o direct access from 44th to CD ▪ 196th: access to I-405/SR525 and I-5 from CD o direct exit to 196th from CD o direct access from 196th to CD Vehicles after the 196th Interchange have the option of exiting to I-405/SR525 or exiting to I-5 from CD	Reduced volume on CD by keeping traffic going to I-405/SR525 from I-5 on the mainline rather than on the CD.	Continues to have too much traffic on the CD to satisfy weave distance requirements
C– NB: Braided Ramp System Off-Ramp from I-5 to 44th, 196th, and I-405/SR525 On-Ramps to I-5 from 44th and 196th	▪ 44th: direct access to and from I-5 ▪ 196th: access to I-405/SR525 and I-5 from Braided Ramp System o direct exit to 196th from I-5 o access from 196th to I-405/SR525 and I-5 via Braided Ramp System	Reduced volume on Braided Ramp System by keeping traffic going to I-405/SR525 from I-5 on the mainline rather than on the Braided Ramp System, Plus pulled traffic to and from 44th as individual off and on-ramps, Plus pulled traffic to 196th as individual off-ramp.	

APPENDIX C
LYNNWOOD CITY CENTER ACCESS STUDY:
LOCAL SYSTEM IMPROVEMENTS
DESIGN CRITERIA

Design Year	2032
Functional Class of Roadway	AASHTO Low Speed Urban
Posted Speed	Varies
Design Speed	35 mph
Superelevation	2% Crown
Grade	10% maximum
Lane Width	11-12 feet
Sidewalk Width	6 feet
Intersecting Street Curb Radius	25 feet minimum
Vertical Curves	Crest Vertical Curve – AASHTO Equation 3-43 & 3-44, Exhibit 3-72 for K-values Sag Vertical Curve – AASHTO Equation 3-51 (for Comfort)

APPENDIX D
LYNNWOOD CITY CENTER ACCESS STUDY:
LOCAL AND REGIONAL SYSTEM IMPROVEMENTS
DESIGN CRITERIA

Design Year	2032
Functional Class of Roadway	Interstate Ramps and Mainline
Posted Speed	Varies for Ramps, 60 mph for Interstate Mainline
Design Speed	Varies for Ramps – see Appendix E and F 60 mph for Collector Distributor Roads 70 mph for Interstate Mainline Based on Figure 940-1 in WSDOT Design Manual
Superelevation	8% maximum
Grade	6% maximum for 35 to 40 mph 5% maximum for 45 mph and greater Based on Figure 940-2 in WSDOT Design Manual
Lane Width	15 feet for 1-lane Ramps 25 feet for 2-lane Ramps 12 feet for additional lanes Based on Figure 940-3 in WSDOT Design Manual
Shoulder Width	8 feet for Right side 2 feet for Left side for 1-lane Ramps 4 feet for Left side for multi-lane Ramps Based on Figure 940-3 in WSDOT Design Manual
Vertical Curves	Crest Vertical Curve – equations from Figure 650-4, and K-values from Figure 650-1 and 650-2 in WSDOT Design Manual Sag Vertical Curve –Equation from page 630-2 (for Comfort) in WSDOT Design Manual
Side Slopes	2:1 maximum

APPENDIX E: Northbound Ramp Design Speeds based on Figure 642-3c from WSDOT Design Manual, using 8% maximum super

Ramp Location	Radius	Design Speed
NB 44th Off-ramp (1A)	1035’	55 mph
NB 44th On-ramp (1A)	175’	25 mph
NB 44th Off-ramp (3A, EB)	1200’ (existing)	60 mph
NB 44th Off-ramp (3A, WB)	188’	25 mph
NB 44th On-ramp (3A)	225’	25 mph
	288’	30 mph
	985’	55 mph
NB 196th Off-ramp	950’	45 mph
	650’	45 mph
	500’ (existing)	40 mph
NB 196th On-ramp from Poplar	290’	30 mph
NB 196th On-ramp from 196th	100’ (existing)	20 mph
	325’	30 mph
	1200’	60 mph
NB I-405/SR525 off-ramp	1500’	65 mph
	1200’	60 mph
NB I-405/SR525 to SR525	688’ (existing)	45 mph
NB I-405/SR525 to I-405	681’ (existing)	45 mph

APPENDIX F: Southbound Ramp Design Speeds based on Figure 642-3c from WSDOT Design Manual, using 8% maximum super

Ramp Location	Radius	Design Speed
SB I-405/SR525 Braided Ramp	560’	40 mph
SB I-405/SR525 to I-5	536’	40 mph
	560’	40 mph
	733’	50 mph
SB 196th Off-ramp (WB)	495’ (existing)	40 mph
SB 196th Off-ramp (EB)	175’ (existing)	25 mph
SB 196th On-ramp	240’ (existing)	30 mph
	1200’	60 mph
SB 44th Off-ramp	440’	35 mph
SB 44th On-ramp	950’	50 mph