SR 167 Corridor Plan
Technical Memorandum 7

Appendix C:

Environmental Screening Technical Memorandum

Purpose

An environmental screening was conducted to assess the potential affects of the long term and short term traffic improvement options along the SR 167 corridor. This assessment was based on existing conditions, which were derived from numerous sources including local, state, and federal databases and geographic information systems (GIS) maps as well as some field data collected for on-going or recently completed projects along the corridor. This is an initial screening of identified options along with other engineering considerations; it is not intended for use for environmental regulatory approvals. Due to the high-level screening that was conducted and nature of the data used, numerous assumptions were made to conduct this environmental screening, which are documented in the methodology sections under the subsections for each environmental issue.

Background

Although there are a total of five long term traffic improvement options, there are basically only two different project footprints for the five long term options, an 8-lane footprint and a 10-lane footprint. Options 2 and 2a both have the same footprint for 8 lanes total. Options 4, 4a, and 5 all have the same footprint for 10 lanes total. Technical Memorandum #5: Therefore, the environmental analysis will only be conducted on the 8-lane and 10-lane footprints. Some of the assumptions used in the design of the footprints for the long term options include:

- All on-ramps will be realigned to facilitate adequate acceleration, and widened (if necessary) for 2-lane on-ramps with a ramp meter plus a High Occupancy Vehicle (HOV) by-pass.
- All off-ramps will be adjusted to maintain adequate deceleration distance, while maintaining the existing lane configuration.
- All bridges will be replaced that cross over SR 167 and don't provide 75 feet horizontal clearance.
- All bridges carrying SR 167 will be widened with liquefaction retrofit (without being torn down or rebuilt.)
- Widening will occur, where possible, within the median otherwise widening will occur outside the median.
- Retaining walls will be used along the mainline to avoid or reduce effects to sensitive areas.

- The proposed project effects do not include potential effects from construction of stormwater management systems, as the systems are developed on a project-by project basis.
- Both the 8-lane and 10-lane footprints include the seven short term options.

The following short-term options were evaluated for environmental constraints:

1. Stage 4 HOV/HOT Lane (Southbound King County HOV Completion funded by the 2005 legislature)
2. Stage 5 King County HOV/HOT Lane/ Stage 5 Pierce County HOV/HOT Lanes
3. 180th to 84th General Purpose (GP) Lanes
4. SR 516 to 277th Auxiliary (Aux) Lanes
5. SR 18 Interchange (IC) Improvements
6. South 180th Street Interchange (IC) Improvements
7. SR 410 and SR 512 Interchange (IC) Improvements

Environmental Screening

An environmental screening was performed on each of the short term and long term options by taking the existing conditions in GIS format and overlaying the project's area of analysis on the existing condition to calculate an area of effect.

In order to calculate the effects of the short term and long term options on environmental resources, we defined areas of analysis that account for the current preliminarily designed highway footprint and the area of land likely to be required for:

- development of fill,
- slopes,
- retaining walls,
- noise walls,
- signs,
- other facilities; and
- the area likely to be subject to projects effects other than physical disturbance.

No design for stormwater facilities has been completed at this time, and the environmental effects of the required stormwater systems could lie outside the currently defined areas of analysis. The current areas of analysis assume that the future stormwater system will incorporate some form of infiltration features along the side of the highway, as currently exist in the form of Ecology embankments and ditches.

In general, two different areas of analysis were defined for use in screening of project effects on environmental elements. A **compact** analysis area was used in determining project effects on environmental elements only affected by physical disturbance. The compact area of analysis was defined to include the proposed project footprint plus 50 feet on either side of the highway.

An **extended** analysis area was used in determining project effects on environmental elements which could be affected by noise, visual disturbance, and/or changes in stormwater quantity and quality, in addition to physical disturbance. The extended analysis area was defined to include the proposed project design footprint plus 300 feet on either side of the highway.

The following exhibit summarizes whether project effects on the investigated environmental elements were calculated using the compact or standard analysis area.

Environmental Element	Compact Analysis Area	Extended Analysis Area
Wetlands and Wetland Buffers	X	
Floodplains	X	
Fish Habitat		X
Wildlife & Upland Habitat		X
Streams & Riparian Corridors	X	
Air Quality		X
Noise Quality		X
Groundwater	X	
Geology	X	
Hazardous Materials		X
Historic & Cultural Resources	X	
Land Use	X	
Section 4(f)	X	
Socio-economics & Environmental Justice*		X

* *The socio-economic and environmental justice analysis was performed on a 660-foot-area (or 1/8 mile). This issue requires a more broad scale analysis in order to compare population trends.*

At the end of this section on environmental screening, the long term options are ranked based on their overall cost

effectiveness. The ranking of options was based on each option's presumed effects on environmental resources as calculated via the environmental screening exercise and the resulting affect, whether it is cost, type of permitting required, actual affects to resources, and mitigation costs.

The short term options are not ranked, because these projects are all pieces of the long term option that will be constructed and the screening will not effect the decision to build these projects, but serves as a basis of understanding the short term options' environmental effects.

Wetlands

The project area has many large wetlands and rivers that were formed within the floodplain of the Green, White, and Puyallup rivers. The continual movement of the river channels over the landscape along with yearly flooding from these rivers deposited rich soils throughout the Kent Valley, creating and sustaining rich wetlands. These wetlands contribute to water quality and flow regulation for the rivers, which supported large runs of fish, including salmon and trout. Any proposed project that may affect wetlands or their buffers must adhere to federal, state, and local regulations regarding wetland affects and water quality affects.

How were project effects on wetlands and buffers evaluated?

Using Geographic Information System (GIS) software, the **compact** analysis area was overlaid upon wetland data layers to determine areas of potential effect for wetlands and wetland buffers. The data layers included delineated wetland data and estimated wetland locations from the following sources.[1]

The delineated data layer sources include:

- Stage 3 wetland delineation data,
- Stages 4 and 5 wetland delineations completed as of September 2006,
- The I-405 delineation from the SR 167/ I-405 interchange to S. 180th Street, and
- Minor wetland delineation data from local cities.

- The estimated wetland locations include data from:
- The SR 167 Watershed Characterization Study (WSDOT, 5/05),
- National Wetland Inventory Maps, which is derived from aerial mapping,
- King County aerial mapping, and
- Pierce County aerial mapping.

Not all of the wetlands in the study area have been delineated or rated. Therefore, for the purposes of this evaluation, it was assumed that all wetlands in the study area are Class 2 wetlands, which are highly functioning wetlands. Class 2

[1] There have been four major wetland affects analyses that have been conducted on the SR 167 Corridor between December 2005 and the publication of this report. Appendix A provides a summary of the different assumptions and resulting affects for each of the analyses conducted.

wetlands require 300 foot buffers according to the Washington State Department of Ecology guidance (Granger et al. 2005); however local jurisdictions typically have less stringent buffer requirements. Subsequently, we used a 300 foot buffer for all wetlands.

What are the potential affects of the project on wetlands and buffers?

When looking at the area of analysis for the long term options, most of the effects on wetlands are in the central portion of the study area between 277th Street in Kent and 15th Street NW in Auburn. The following exhibits show the location of wetlands within the project area.

Long Term Option Affects on Wetlands

Project Name	Wetlands Affected Area (Acres)	Wetland Buffers Affected Area (Acres)
8 Lane	131	203
10 Lane	141	218

Five out of the seven short term options would potentially affect wetlands as shown in the following exhibit.

Short Term Option Affects on Wetlands

Project Name	Wetlands Affected Area (Acres)	Wetland Buffers Affected Area (Acres)
180th Street Interchange	12	23
180th Street to 84th Street GP Lanes	24	37
SR 516 to 277th Street Aux Lanes	3.8	14
SR 18 Interchange	26	19
Stage 4 HOV Lanes	12	29
Stage 5 HOV Lanes	4.3	18
SR 410/ 512 Interchange		1.7

Floodplains

The project area is within the Green River Valley, an area with a long history of flooding. We evaluated how these proposed roadway improvement projects could potentially increase the extent, frequency, and intensity of future floods. Floodplains and related flooding pose dangers to human activities and the built environment, but they also provide many benefits to the environment. Floodplains filter pollution through natural processes, are floodwater storage areas, and are fish and wildlife habitat.

Floodplains are normally divided and categorized by estimating how often a flood is likely to occur in that part of the floodplain. Floodplains are typically described as 100-year floodplains, 500-year floodplains, or floodways.

More on floodplains

A 100-year floodplain is an area of land that would be inundated by a flood that has a 1 percent chance of occurring in any given year.

A 500-year floodplain is an area of land that would be inundated by a flood that has a .2 percent chance of occurring in any given year.

For most waterways, the floodway is where flood water is likely to be deepest and fastest. It is the area of the floodplain that should be kept free of obstructions to allow floodwaters to move downstream.

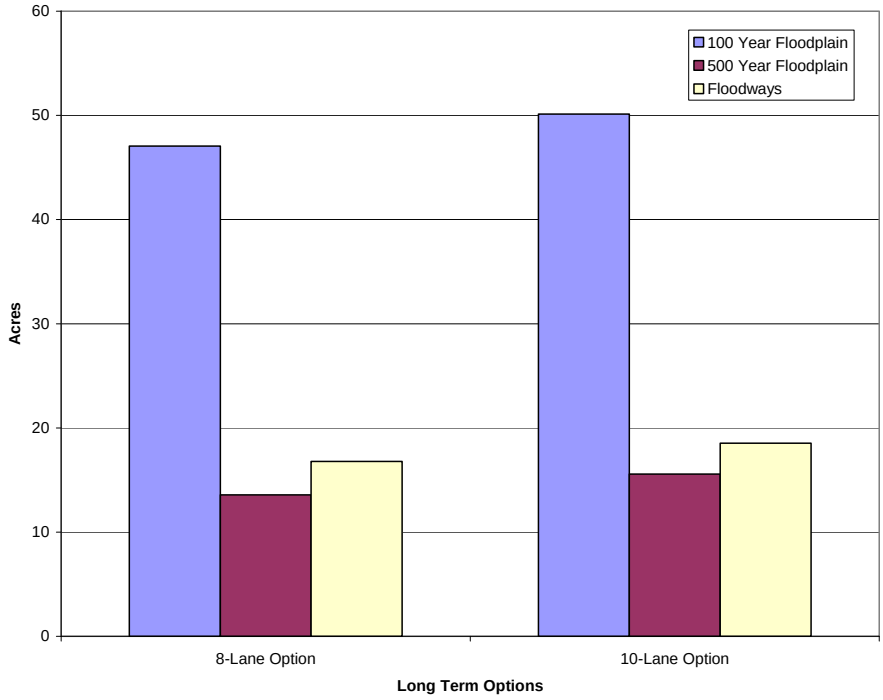
How were project effects on floodplains evaluated?

Using GIS, the **compact** analysis area was overlaid upon floodplain data layers to determine the areas of potential effect. The data layers consisted of data from Flood Insurance Rate Maps (FIRM) made by the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP).

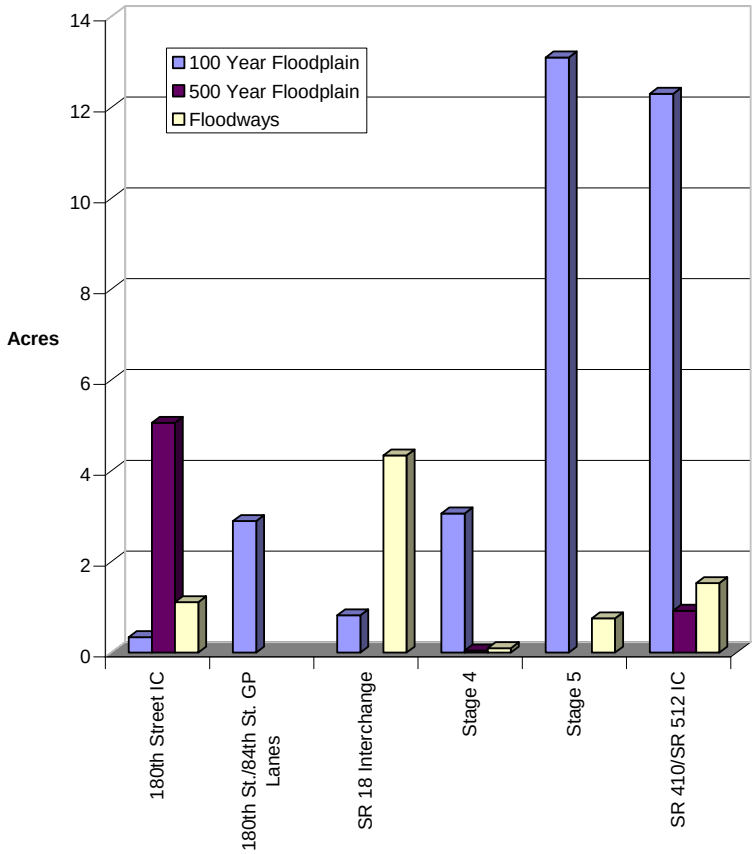
What are the potential affects of the project on floodplains?

When looking at the area of analysis for the long term options, most of the effects on the floodplain resources are in the Sumner and Puyallup area. The following exhibits show the location of floodplains and floodways within the project area. The following charts depict the differences in the projects affects on floodplains.

Long Term Option Affects on Floodplains



Short Term Option Affects on Floodplains



Long Term Options Effects on Floodplain Resources

Projects	100 Year Floodplain	500 Year Floodplain	Floodways
8 Lane	47	14	17
10 Lane	50	16	19

Short Term Options Effects on Floodplain Resources

Project	100 Year Floodplain	500 Year Floodplain	Floodways
180th Street IC	0.3	5.1	1.1
180th St./84th St. GP Lanes	2.9		
SR 18 Interchange	0.8		4.3
Stage 4	3.1	0.0	0.1
Stage 5	13.1		0.8
SR 410/SR 512 IC	12.3	0.9	1.5

Fish Habitat

Numerous protected fish species use the streams within the project area including Chinook salmon, Coho salmon, chum salmon, pink salmon, sockeye salmon, steelhead, cutthroat trout, Dolly Virden/bull trout. Fish species that were of concern in this study included endangered, threatened, and candidate species and state priority species.

How were project effects on fish habitat evaluated?

Using GIS, the **extended** analysis area was overlaid upon fish and aquatic resource data layers to determine the areas of potential effect. The fish and aquatic resources data was requested from the WDFW Priority Habitat and Species (PHS) data specific to the project area. PHS maps and data document priority species' use of priority habitat within the project area. This data includes state endangered, threatened, sensitive, and candidate species, groups of animals considered vulnerable, and species of recreational, commercial, or tribal importance that are considered vulnerable. We also reviewed information on protected species for King and Pierce counties from the National Oceanic and Atmospheric Administration (NOAA) Fisheries and the U.S. Fish and Wildlife Service (USFWS). Based on this information, the team prepared a project-specific species presence and distribution list identifying the federally listed species, proposed species, and candidate species, and designated and proposed critical habitat that are potentially present in the project vicinity. The following exhibit lists the fish species found within the study area:

Protected Fish Species in the Project Area

Common Name	DPU/ESU	ESA Status		Habitat Status	Source
		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 trout (summer, winter), *O mykiss*	*NA*	Not warranted	Food fish	Federal – TBD; State - any occurrence	WDFW, NOAA
Cutthroat trout, *O. clarki*	*NA*	Not warranted	Game Fish		WDFW, NOAA, King Co.
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

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.

http://wdfw.wa.gov/hab/phsvert.htm#fish

http://www.nmfs.noaa.gov/pr/species/esa.htm#fish

http://dnr.metrokc.gov/wlr/waterres/salmon/trout.htm

http://www.fws.gov/endangered/wildlife.html

http://www.nwr.noaa.gov/Salmon-Habitat/Critical-Habitat/

A windshield survey was completed by Entrix staff on December 2, 2005 to confirm the data gathered from various state and federal sources listed above and to identify the presence of existing biological conditions within the project area. The primary focus of the survey was to the identify and confirm the presence of wetland and riverine habitats and the potential for threatened and endangered species to occur in those habitats within the project area.

Project Affects on Protected Fish Species

Given the species occurrence data for the project vicinity, as described above, the team determined protected fish species that could potentially be indirectly affected by the proposed

project via stormwater discharges or indirect runoff from the proposed projects, for example. Sensitive 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. The projects' effects on fish due to potential stormwater discharges or runoff were calculated in GIS by overlaying the **extended** analysis area upon protected fish species data layers from WDNR and the other data sources listed above.

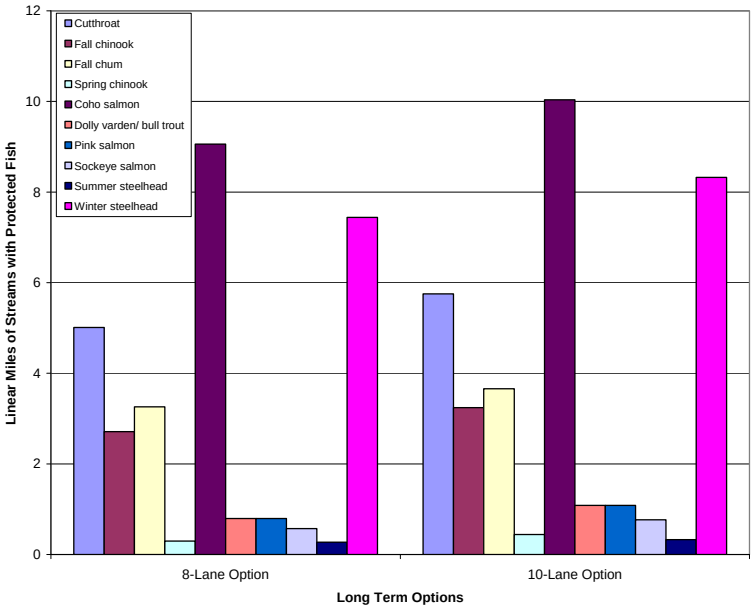
The locations of protected fish species in streams and rivers within the project vicinity were also mapped along with the locations of existing culverts and bridges requiring repair or replacement. If structural repair would be required in or near a stream with protected fish, the repair would be considered to affect the species. The projects' effects on fish due to potential in-water work were also calculated in GIS by overlaying the **extended** analysis area upon the following data layers:

- Protected fish species data layers from WDNR and the other data sources listed above,
- Culvert location data from WSDOT,
- Culverts with potential barriers gathered from WDNR.[2]
- Bridge data was collected from WSDOT.[3]

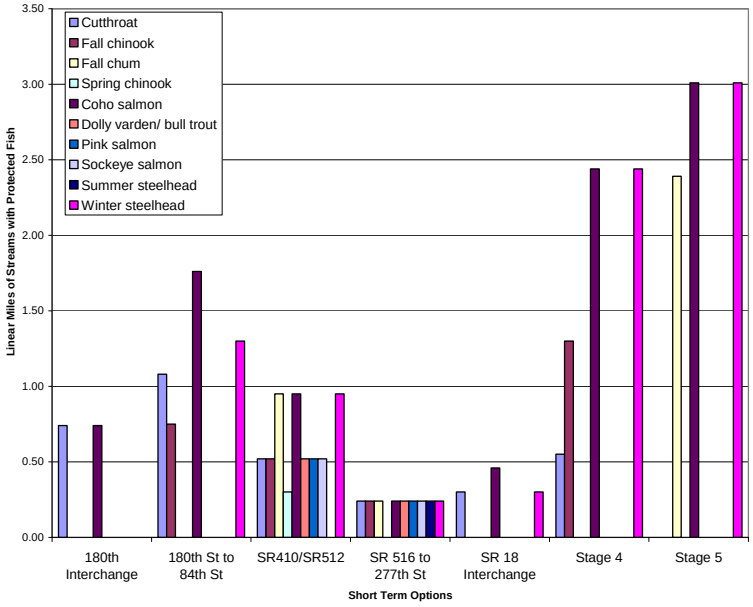
Will the projects effect protected fish species?

Potential stormwater discharges and runoff from both the 8-lane and 10-lane long term options could affect all of the 10 protected fish species in streams, rivers, or creeks within the area of analysis for the long term options. The following exhibits show the distribution of these fish throughout the study area.

[2] Culverts with a partial barrier may require modification or replacement. Culverts with a complete barrier are likely to require replacement. Culverts with an unknown status have not yet been evaluated.
[3] Bridges will only have to be widened for the ten lane option.



Potential stormwater discharges and runoff from six of the seven short term options could affect protected fish species. The following exhibits show the distribution of these fish throughout the study area.



How will the projects' proposed structural improvements effect protected fish species?

The 8-lane options will not require widening of bridges over or near water bodies, however, the 10-lane options will require widening or modification of eight bridges that cross fish-bearing water bodies. None of the short term options will require bridge modifications.

The 8-lane and 10-lane options will require potential modification of four culverts in the north end of the project that have partial barriers (24, 23, 7, and 16) and four culverts in the south end of the project that have partial barriers (0, 2, 10, and 27). The north end culverts are north and south of the 180th Street Interchange in Renton. The south end culverts are between 8th Ave E and 24th Ave E in Auburn. The four culverts near the 180th Street Interchange in Renton do not cross fish bearing streams; therefore should not affect protected species.

Fish located near proposed structural improvements

Bridge/ Culvert Number	Crossing	Fish	Project Name
167 / 038	24th St. E.	Steelhead	10-lane
167 / 115	W Main St	Coho, Cutthroat	10-lane
167 / 117	37th St NW	Steelhead, Chinook, Coho, Cutthroat	10-lane
167 / 129	S. 212 St.	Chinook, Coho, Cutthroat	10-lane
167 / 130	S. 208th St.	Chinook, Coho, Cutthroat	10-lane
167040E	8th St E	Coho, chum	10-lane
167121E	Green River	Steelhead, Chinook, Coho, Cutthroat, Sockeye, Chum, Bulltrout, Pink	10-lane
167121W	Green River	Steelhead, Chinook, Coho, Cutthroat, Sockeye, Chum, Bulltrout, Pink	10-lane
Culvert 0	8th St E	Coho	8-lane, 10-lane, Stage 4
Culvert 27	8th St E	Coho, chum	8-lane, 10-lane, Stage 4
Culvert 2	8th St E	Steelhead	8-lane, 10-lane, Stage 4
Culvert 10	8th St E	Coho, chum	8-lane, 10-lane, Stage 4

Wildlife

Numerous protected species exist within the project area. Priority habitats are the habitat that those species live in or need to survive. Wildlife and wildlife habitat are important components of an ecosystem's health and function. The presence of wildlife in urban landscapes depends on the availability of suitable habitat, and vegetation is an integral component of that habitat. Vegetation provides food and shelter for wildlife including birds, small mammals, and amphibians.

The primary types of wildlife habitat that exist in the study area include urban natural open space, waterfowl concentrated areas, and riparian zones. Urban open space areas typically provide habitat for small rodents, birds, coyote, opossum, raccoons, crows, hawks, owls, gulls, killdeer, blackbirds. The waterfowl typically found in this area consist of Canada goose and mallard. The forested riparian areas typically provide habitat for marsh wren, song sparrow, northern flickers, belted kingfisher, red-winged blackbird, red-tailed hawk, various small rodents, beaver, raccoon, coyote, frogs, and salamanders. (Forested riparian habitat was evaluated in the previous section.) Some of these species occur in more than one habitat type.

Most of the prevalent wildlife species identified in the projects' area of analysis are birds. All wildlife in the project area currently exists in an urban environment and is adapted to urban noise levels. However, resident wildlife can be affected during construction by noise or if their habitat is used for staging areas and they may relocate temporarily until sometime after the project is completed.

How were project effects on wildlife and habitat evaluated?

The methodology for wildlife screening and data sources are similar to that of fish and aquatic resources. However, the occurrences of specific wildlife species in the project vicinity have not been mapped or tabulated in GIS layers. Therefore, the project team has evaluated effects on wildlife habitat more generally. The acreages of wildlife habitat that could be affected by project elements were calculated in GIS and tabulated for use in this report. We evaluated two types of wildlife habitat including urban natural open space and waterfowl habitat. We gathered wildlife and wildlife habitat data from WDNR and USFWS. The U.S. Fish and Wildlife

Service (USFWS) identified a number of protected species potentially found in the project area. These species include:

Occurrence of Threatened, Endangered, and Other Wildlife of Special Interest in the Project Area

Species	Status	Locations	Time of Year
Western Pond Turtle	State Listed Endangered Species	Individual occurrence in 1993 approximately 5 miles from project area. Female captured and put into captive breeding program.	This species is considered extirpated from this region of Washington, including the project area. Occurrence in the project area or vicinity is highly unlikely.
Oregon Spotted Frog	Federal Candidate Species, State Listed Endangered Species	No known occurrence in the project area. Documented to occur in Pierce County prior to 1984.	Occurrence in the project area or vicinity is highly unlikely.
Bald Eagle	Federally Listed	The closest bald eagle territory with active nest is approximately 1.3 miles west of the project area. There are no documented winter roosts in the project area or vicinity.	Individuals may occasionally use the project area for foraging or daytime roosting throughout the year.
Peregrine Falcon	Federal Species of Concern, State Priority Species	No known occurrence in the project area.	Individuals may occasionally use the project area for foraging or daytime roosting throughout the year, but particularly during the winter.
Red-Tailed Hawk	State Species of Special Interest	Individuals have been recorded using the project area for foraging and daytime roosting.	Individuals may occasionally use the project area for foraging or daytime roosting throughout the year.
Great Blue Heron	State Priority Species	Individuals have been recorded using the project area for foraging. Rookeries and roosting concentrations have historically been found in the project vicinity.	Courtship and nesting occurs from February 15 to July 31.
Hooded Merganser	State Priority Species	Individuals have been observed in the riparian areas and wetlands in the project area.	Individuals may occasionally use the project area for foraging or daytime roosting throughout the year.
Wood Duck	State Priority Species	Individuals have been observed in the riparian areas and wetlands in the project vicinity.	Individuals may occasionally use the project area for foraging or daytime roosting throughout the year.
Pileated Woodpecker	State Priority Species	Individuals have been recorded using upland forested areas in the project vicinity.	Individuals may occasionally use the project area for foraging or daytime roosting throughout the year.
Band-Tailed Pigeon	State Priority Species	No known occurrence in the project area	Individuals may occasionally use the project area for foraging or daytime roosting throughout the year.
Yellow-Billed Cuckoo	State Priority Species	No known occurrence in the project area.	This species is considered extirpated from Washington. Occurrence in the project area or vicinity is highly unlikely and would be limited to migratory vagrants.

Source: WDFW, Washington State Department of Fish and Wildlife; Priority Habitat Species Database, 2006.

The projects' effects on wildlife habitat were calculated in GIS by overlaying the **extended** analysis area upon the wildlife habitat data layers.

What are the potential effects of the projects on wildlife and wildlife habitat?

The following data summarizes potential project effects on wildlife habitat.

Long Term Option Affects on Wildlife Habitat

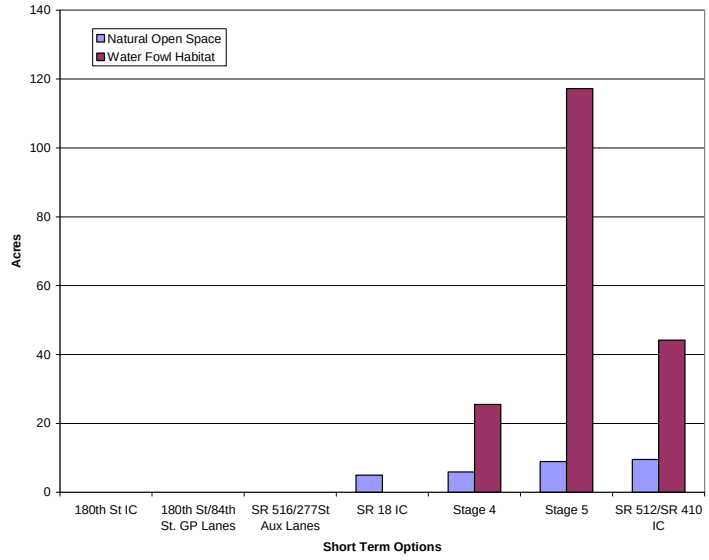
Option Name	Urban Natural Open Space	Waterfowl Concentrations
8 Lane	22	139
10 Lane	33	156

All of the potential long-term options will affect areas with urban natural open space and waterfowl concentrations.

Short Term Option Affects on Wildlife Habitat

Option Name	**Urban Natural Open Space**	**Waterfowl Concentrations**
SR 18 Interchange	5	0
Stage 4	17	26
Stage 5	9	117
SR 410/ SR 512 IC	10	44

Short Term Option Affects on Wildlife Habitat



Streams and Riparian Corridors

The proposed projects can affect streams by filling streams or deteriorating stream buffers containing riparian zones. Filling streams directly affects fish utilizing that stream, water quality, and wildlife habitat. Riparian vegetation provides shade for aquatic habitat, cooling the temperature of the water for fish. Vegetation also provides bank stabilization, which leads to erosion and flood control and water quality protection.

How were project effects on streams and riparian corridors evaluated?

Two questions were evaluated for this topic and their methodologies are explained below.

How will streams, creeks, or rivers be affected by the project?

Using GIS software, the **compact** analysis area was overlaid upon stream data layers to determine areas of potential effect. The data layers included stream data gathered from the Washington Department of Natural Resources. The GIS analysis calculated the linear feet of streams, creeks and rivers that would be affected by the proposed projects. If streams are filled by a project and require mitigation or relocation, then a Section 404 Water Quality permit will be required and the Army Corps of Engineers would have jurisdiction of the project. The typical trigger for significant affects of filling streams is a half an acre of loss. However, the stream data that is available in GIS does not display streams as polygons; therefore an area of affect could not be calculated, but the number of linear feet of affect could be calculated. Therefore, we used conservative assumptions about the widths of streams (based on stream-type criteria from WAC 222-16-031), as follows:

Stream Type	Estimated Width per WAC 222-16-031[4]	Calculated width of streams for screening
1	>20 feet	30
2	20 feet or more	20
3	2 feet or more	10
4	Intermittent <2 feet	2
5	Intermittent <2 feet	2
9	Unclassified Water Feature	2

[4] WAC 222-16-031 - Interim water typing system. Until the fish habitat water type maps are available, waters will be classified according to the interim water typing system.

For the effects analysis, we multiplied the calculated width of the stream by its length of affect to develop the affected area.

How will riparian corridors be affected by the project?
The proposed projects' effects on riparian corridors were estimated by determining acreage of non-forested and forested riparian habitat the projects would disturb. The projects' effects on forested and non-forested riparian zones were calculated in GIS by overlaying the **compact** analysis area upon riparian zone data gathered from the Watershed Characterization study's SR 167 forested/non-forested areas of the riparian zone data layer (WSDOT, May 2005).

What are the potential effects of the projects on streams and riparian corridors?

How will streams, creeks, or rivers be affected by the project?
The result of this analysis shows that the 8-lane option would affect 2.6 acres of streams and the 10-lane option would affect 2.8 acres of streams. The acreage of affected streams under both options would trigger the need for a Section 404 Individual Permit. The effects on streams under both options would be mitigated as required for permitting.

Long Term Option Affects on Streams

Option Name	Area of Effect (acres)
8-Lane	2.6
10-Lane	2.8

The short term options would affect between 0.07 acres and 0.82 acres of streams. Three of the project would likely require a Nationwide Army Corps Permit for Section 404 Water Quality including Stage 4, Stage 5, and possibly the 180th St to 84th St General Purpose Lanes project. The effects on streams under these options would be mitigated as required for permitting.

Short Term Option Effects on Streams

Short-Term Project	**Affected Area (ac)**
180th Street IC	0.07
180th St. to 84th St. GP Lanes	0.49
SR 516 to 277th Street Aux Lanes	0.09
SR 18 Interchange	0.12
Stage 4	0.82
Stage 5	0.51
SR 410/SR 512 IC	0.31

How many acres of riparian corridor will be affected by the project?

The following exhibit summarizes the riparian vegetation and riparian forest affects for the long term options.

Long Term Option Effects on Riparian Corridor

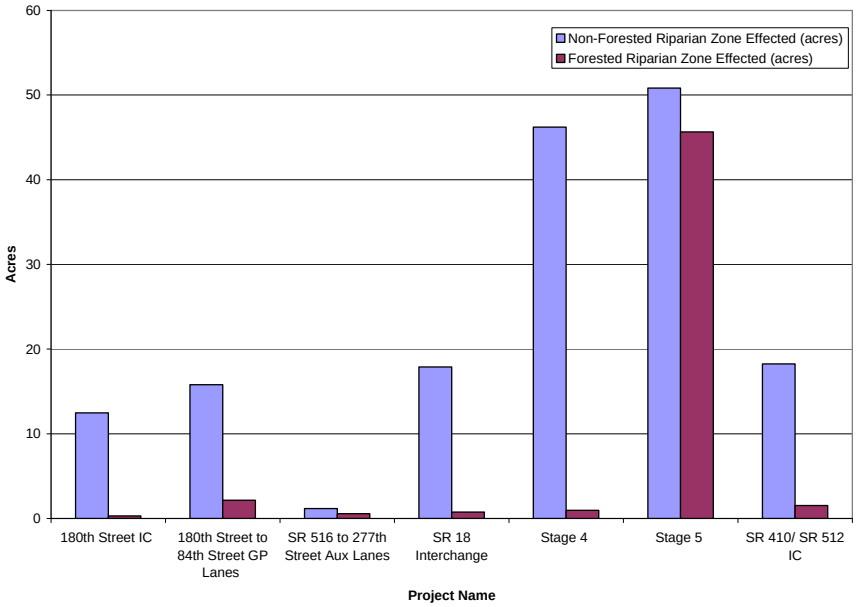
Option Name	**Non-Forest Riparian Effected (acres)**	**Riparian Forest Effected (acres)**
8 Lane	190	9
10 Lane	205	10

The following exhibit summarizes the riparian vegetation and riparian forest affects for the short term options.

Short Term Option Effects on Riparian Corridor

Option Name	**Non-Forested Riparian Zone Effected (acres)**	**Forested Riparian Zone Effected (acres)**
180th Street IC	12	0.3
180th Street to 84th Street GP Lanes	16	2.1
SR 516 to 277th Street Aux Lanes	1.2	0.6
SR 18 Interchange	18	0.8
Stage 4	46	0.9
Stage 5	51	46
SR 410/ SR 512 IC	18	1.5

Short Term Option Effects on Riparian Corridor



Air Quality

Air quality is a function of many factors, including climate, topography and airborne pollutants produced by manmade and natural sources. In the case of roadway projects, an automobile traffic causes air pollution.

The EPA's National Ambient Air Quality Standards (NAAQS) set limits on the concentration levels of certain air pollutants. The NAAQS are comprised of two sets of standards: the primary standards, which are intended to protect public health; and the secondary standards, which are intended to protect the natural environment. In addition to these standards, the Department of Ecology and PSCAA have adopted state and local ambient air quality standards that are equivalent to or more stringent than the EPA's NAAQS.

The EPA has established three designations that are used to identify the status of compliance with air quality regulations. The three designations are: attainment area, maintenance area, and nonattainment area. Transportation projects that are located in maintenance and nonattainment areas must meet the conformity requirements set out in the Federal Clean Air Act and the Washington Clean Air Act. The proposed projects are subject to these conformity requirements because they are located in a maintenance area for ozone and carbon monoxide (CO). In nonattainment and maintenance areas, the Federal Clean Air Act and the Washington Clean Air Act require transportation projects to conform to the State Implementation Plan (SIP). The SIP is the state's plan for meeting and maintaining compliance with the NAAQS. Conformity with the SIP means that transportation activities will not produce new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS.

Washington State's Growth Management Act requires that "regionally significant" projects be included in the Regional Transportation Plan (RTP) and the Transportation Improvement Program (TIP). A general description of the long term option for the SR 167 corridor is included in the RTP along with short term options between SR 516 to 277th and the 180th Street Interchange. The SR 167 Corridor Study is included in the TIP. Both the RTP and TIP have been found to conform to the SIP. Because the project area is in a maintenance area for ozone, the inclusion of the SR 167

Project in the RTP and TIP is sufficient to demonstrate that it has met the conformity requirement for ozone. Furthermore, all of the long term alternatives and short term options are designed to reduce corridor congestion, and therefore would not be projected to have adverse localized effects on air quality.

The project is also in a maintenance area for CO. Projects in nonattainment and maintenance areas for CO are required to perform project-level air quality and dispersion analysis for project related intersections where traffic delays may result in increased CO levels. For this screening analysis, no CO modeling was performed; however, any design options or alternatives that include signalizing intersections may require a hot-spot analysis to assure conformity if the level of service is "D" or lower.

How were project effects on air quality evaluated?
We contacted the WSDOT Air, Noise, and Energy Department for guidance on the air quality analysis requirements. After reviewing the project and its status in the TIP and RTP, it was determined that no air modeling would be required during the screening process, because the proposed projects improve traffic flow and reducing idling time, thereby potentially improving air quality in the area of the improvement.

What effects might projects have on air quality?
An overall review of the proposed project found that none of the long-term options or the short term options would adversely affect the air quality for pollutants, including greenhouse gases and toxic air pollutants. The roadway improvements would have an overall effect of improving traffic flow and reducing idling time. Because the projects would add capacity to SR 167, air quality in the project area is projected to improve when compared to the alternative of not making any improvements to the highway.

Localized air quality effects may still occur in areas where heavy traffic congestion occurs, causing vehicles to slow down or even stop for short time periods. When heavy congestion occurs, more pollutants are emitted from vehicles on project roadways. Under certain meteorological conditions, such as a temperature inversion, the pollutants can build up to unhealthy concentrations and may exceed the ambient air quality standards.

Noise Quality

Environmental noise may interfere with a broad range of human activities in a way that degrades public health and welfare. Examples include when noise adversely affects a person's hearing, mental state (e.g., causing annoyance), or the ability to engage in important activities such as sleeping or communicating. Traffic and construction noise analyses are required by law for federally funded projects, and by state of Washington policy for other funded projects that:

- Involve construction of a new highway,
- Substantially change the horizontal or vertical alignment, or
- Increase the number of through traffic lanes on an existing highway.

State policy also requires the review and consideration of noise abatement on projects that substantially alter the topography surrounding a state highway.

What is hertz (Hz)?

The unit used to measure the frequency of noise is called hertz (Hz). Frequency is measured in terms of the number of changes in air pressure that occur per second.

What is a decibel (dB)?

The unit used to measure the loudness of noise is called a decibel (dB). A range from 0 to 120 dB is the typical range of hearing.

What is Leq?

Equivalent sound pressure level - the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.

How were project effects on noise quality evaluated?

Using GIS software, the extended analysis area was overlaid upon aerial photographs to determine areas of potential effect. Using previously measured and modeled noise levels along SR-167, noise affects are likely for residential land uses within 300 to 400 feet of the centerline of the highway, which coincides with the size of the extended area of analysis. Actual noise levels vary due to ground cover, shielding from existing structures and topographical conditions between the highway and the noise sensitive land uses. Based on this, locations with potential for noise affects were identified and evaluated for noise mitigation measures.

There are numerous criteria that noise levels must be compared to in order to determine whether mitigation measures are necessary.

Noise Criteria

Regulatory Agency/Rule	Criteria	Sensitive Receptor
FHWA (23 CFR 772)	67 dBA (exterior hourly Leq)	Residences, churches, schools, recreational uses, and similar areas
FHWA (23 CFR 772)a	72 dBA (exterior hourly Leq)	Other developed lands such as commercial and industrial uses
WSDOT Noise Abatement Criteria	66 dBA (exterior hourly Leq)	Residences, churches, schools, recreational uses, and similar areas
WSDOT Noise Abatement Criteria	71 dBA (exterior hourly Leq)	Other developed lands such as commercial and industrial uses

[a] FHWA also requires noise abatement to be considered if future noise levels are projected to result in a "substantial increase" over existing noise levels.
[b] The proposed projects will have to meet the WSDOT noise abatement criteria (NAC), which FHWA have approved for use on highway projects in the state of Washington. WSDOT's NAC further clarify the FHWA traffic noise criteria. WSDOT clarifies the meaning of "approaches" by requiring noise abatement to be considered when predicted project-related noise levels approach the criteria level within 1 dBA.
WSDOT also clarifies the meaning of "substantial increase" by considering 10 dBA to be a substantial increase if the resulting noise level is greater than 50 dBA. Noise levels of 75 dBA Leq and higher are defined as "a severe exceedance of the NAC" for outdoor activity areas, while for indoor areas, this level of exceedance is reached at noise levels of 60 dBA Leq. A NAC exceedance is also considered severe if future design year noise levels are predicted to increase 15 dBA or higher over existing noise levels. There are no NAC exceedances established for undeveloped lands.

What is the potential effect of the long-term options on the noise quality?

Both the 8-lane and 10- lane long-term options are likely to have noise effects along the SR-167 corridor. Noise walls would be utilized throughout the corridor and would likely eliminate most noise affects. Both options would have some residual noise affects in areas of very low density, where noise walls would not meet the WSDOT cost or effectiveness criteria. Because the 10-lane option would have a wider foot-print and move traffic closer to the residents, it is likely the noise wall heights would be 1 to 2 feet higher than under the 8-lane option. This is expected to result in a 10% to 15% increase in the cost of noise mitigation for the 10-lane option when compared to the 8-lane option. There are no other major differences between these two options.

What is the potential effect of the short-term options on the noise quality?

The level of potential for noise affects for the short-term options depended greatly on the location of the proposed improvements. For example, the SR 18 Interchange Improvements would not result in any noise affect to noise sensitive properties. However, the SR 410/ SR 512 Interchange Improvements project would result in noise affect to the residential area north of the new ramps. Noise mitigation may be more costly for the SR 410/SR 512 Interchange short term option than for other options, because of

the added cost of providing noise mitigation on the sections of the highway that are on structures.

In general, the options with the highest potential for noise affects are the options that add a lane of traffic (Stage 4, Stage 5) and the SR 410/ SR 512 Interchange Improvement option. Most of the other options are in areas with primarily commercial and industrial land uses, or in an area where noise mitigation would be easier to implement.

Groundwater

It is important to protect groundwater from contaminants such as polluted surface water runoff from roads, because groundwater is used as potable water supply in areas along the project alignment. The following regulatory designations have been assigned to groundwater resources:

- Sole-Source Aquifers
- Wellhead Protection Areas
- Critical Aquifer Recharge Areas

Each of these groundwater resources are protected by local, state, and federal regulations.

Roadways are not prohibited land uses in areas where there are sole source aquifers, wellhead protection areas, or CARAs; as long as stormwater is managed in ways that are consistent with the approved stormwater manual for the project such as the county stormwater manual or the WSDOT stormwater manual. However, two issues are paramount in considering the effects of a roadway project on groundwater resources:

- Limiting the amount of contaminated water that enters an aquifer, and
- Limiting the amount of impervious surface over groundwater resources, which will negatively affect groundwater recharge.

All of these groundwater resources are directly affected by the amount of pervious surface areas that are reduced in size by development. Therefore, this section also evaluates the amount of pervious surfaces that will be affected by the proposed projects. The proposed projects will convert pervious surface, such as soil and vegetation, to an impervious surface such as pavement. Increased impervious surface areas lead to increases in stormwater runoff, which can affect the quality of groundwater and surface water.

What is a Sole-Source Aquifers

The Environmental Protection Agency may officially designate an aquifer "which is needed to supply 50 percent or more of the drinking water for a given aquifer service area, and for which there are no reasonably available alternative sources should the aquifer become contaminated" as a "sole-source aquifer" (EPA, 1995). In Washington State, Ecology administers the sole-source aquifer program. The proposed project alignment does not lie directly over a sole source aquifer. However, the boundary of

Central Pierce County Aquifer, a sole-source aquifer, is located about 0.2 miles south of the project area.

What is a Wellhead Protection Area?

As part of the Safe Drinking Water Act, states are required to implement a wellhead protection program to guard groundwater-fed public water systems. In Washington State, the wellhead protection program is administered by the Washington State Department of Health. Requirements of the program include delineation of a "wellhead protection area for each well, well field, or spring" (Washington State Department of Health, 1995). A wellhead protection area is defined as that area around a well in which a contaminant could travel to the wellhead within a given time frame (typically 1-year, 5-years, and/or 10-years). Wellhead protection areas in King County include designated areas around two wells in the vicinity of the project alignment. In Pierce County, one designated wellhead protection area overlaps with the proposed project area.

What is a Critical Aquifer Recharge Area?

Critical Aquifer Recharge Areas (CARAs) are part of local critical areas ordinances, which are required under the GMA. The purpose of protecting CARAs is to protect and provide adequate recharge and protection to aquifers used as sources of potable (drinking) water. A lack of potable ground water is as harmful to public health and safety as is ground water contamination. In King County, there is a large CARA just south of the Green River on the west side of SR 167. In Pierce County, the entire study area is within a CARA.

How were project effects on groundwater evaluated?

Using Geographic Information System (GIS) software, the **compact** analysis area was overlaid upon groundwater data layers to determine areas of potential effect. The data was gathered from the following sources.

Sources of Groundwater GIS Data

Data Layer	Source of Data
Critical Aquifer Recharge Area	King and Pierce Counties
Wellhead Protection Zones	Department of Health
Sole Source Aquifers	Department of Ecology

How were project effects on pervious surfaces evaluated?
Using Geographic Information System (GIS) software, the **compact** analysis area was overlaid upon surface water data layers to determine areas of potential effect. The data layers included engineering drawings created by WSDOT and Perteet engineers. The engineers calculated the existing impervious surface and proposed new impervious surface for each proposed project by calculating the area of each project's polygon.

To screen this issue, we looked at the WSDOT Highway Runoff Manual (HRM) requirements for new roadway project. The HRM requires the following measures if the project adds 50 percent or more to the existing impervious surfaces within the project limits.

- Runoff Treatment
- Flow Control
- Protect Wetlands
- Incorporate Watershed-Based/Basin Planning Into Stormwater Management Plan
- Develop a Operation and Maintenance

These measures are difficult to design and costly to implement, but in the long run will maintain or even improve groundwater and surface water quality. If a project adds less than 50% of the existing impervious surface area, then fewer requirements are imposed on the project, because it is assumed to have less potential to result in adverse effects on surface water. Under these less stringent requirements, however, potential adverse effects on groundwater and surface water quality may not be fully minimized.

What are the potential effects of the projects on the groundwater?

Long Term Options

When looking at the area of analysis for the long term options, most of the effects on the CARAs are in the southern portion of the study area in the Sumner and Puyallup areas. There are 76 acres of well head protection areas that should potentially be affected by the 10 lane option. There are 86 acres of well head protection areas that would potentially be affected by the 10 lane option. There are no sole source aquifers within the area of analysis for the long term options. The following exhibit describes the number of acres of groundwater resources that would potentially be affected by the long term options.

Project Name	WPA Area w/in Footprint (Acres)	CARA Area w/in Footprint (Acres)
8 Lane	183	237
10 Lane	194	245

Short Term Options

Four of the seven short term options could potentially affect groundwater resources. When looking at the area of analysis for the short term options, the potential effects on the CARAs are primarily in the south end of the project in the Sumner and Puyallup area. There are a number of 10-year wellhead protection zones along the SR 167 corridor that should be protected from groundwater contaminants. There are no sole source aquifers within the potential project areas. The following exhibit describes the number of acres of groundwater resources that would potentially be affected by the short term options.

Project Name	WPA Area w/in Footprint (Acres)	CARA Area w/in Footprint (Acres)
180th Street to 84th Street GP	30	0
SR 18 Interchange	1	0.1
Stage 4	37	26
Stage 5	37	49
SR 410/ SR 512 IC	39	154

The SR 410/ SR 512 Interchange could have the most effects on groundwater resources of all short term options and the 180th Street to 84th Street general purpose lanes project would have the least affect on groundwater resources.

What are the potential effects of the projects on pervious surfaces?

The 8-lane and 10-lane option footprints will increase the existing total impervious surface area by more than 50%,

which means those projects would be required to meet the more stringent stormwater runoff requirements listed above.[5]

Long Term Option Affects on Pervious Surfaces

	Affected Area (ac)	Difference (percent)
Current Roadway	*333*	
New Impervious surface:		
8 Lane option	231	69%
10 Lane option	260	78%

The short term options will increase the existing total impervious surface area by less than 50%, which means those projects would not be required to meet the more stringent stormwater runoff requirements listed above.

Short Term Option Affects on Pervious Surfaces

	Affected Area (ac)	Difference (percent)
Current Roadway:	*333*	
New Impervious surface:		
180th Street IC	19	6%
180th St. to 84th St. GP Lanes	10	3%
SR 516 to 277th Street Aux Lanes	4	1%
SR 18 Interchange	9.5	20%
Stage 4	47	14%
Stage 5	22	7%
SR 410/SR 512 IC	68	21%

[5] The impervious surface area data was calculated from the current new impervious surface area footprint, without any additional area of analysis.

Geologically Hazardous Areas

Geological issues are essential to civil and structural engineering projects as it is necessary to determine:

- How much work will be required for cuts and fills and other construction activities,
- The need for retaining walls, bridge foundations, and
- If there are potential landslide areas.

This information will be necessary to determine the type of measures that will be necessary to mitigate potential soils and geology affects.

King and Pierce Counties lie within the Puget Sound Lowland, an area that is subject to daily seismic activity, although most of that activity is not detectable, and the area is also historically subject to very large earthquakes. The most recent large earthquake was the February 28, 2001 Nisqually Earthquake. Due to all the potential affects of seismic activity, the affects of seismicity must be mitigated to the extent possible via regulatory requirements, including preparation of site-specific seismic studies for essential facilities and lifelines and adherence to building codes that require earthquake resistant design and construction. In this screening, we evaluated the potential effects of three primary types of geological hazards:

- Seismic Hazard Areas
- Liquefaction Areas, and
- Steep Slopes or Landslide Hazard Areas

The amount of the project area that exists within seismic hazard areas, liquefaction areas, and areas with steep slopes (greater than 40%) are areas where special design considerations and geotechnical studies are likely to be required for the roadway and structures.

What are seismic hazards areas?

Those areas within the project area that are subject to severe risk of earthquake damage as a result of ground shaking/ground motion, surface faulting, subsidence and uplift, seismically induced landsliding and settlement, soil liquefaction, and tsunami. Severe risk of damage is loosely defined as the potential for damage that is structural rather than cosmetic in nature. In order to reduce the affect of seismic events, it is necessary to analyze specific project sites' periodicity, design structures accordingly, and by implement building codes that require earthquake resistant construction.

What is liquefaction?

It 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. In other words, solid ground turns to a jellylike material that can cause landslides and massive structural damage. Shallow liquefaction zones can also cause severe damage to structures whose foundation support has suddenly become fluid. Liquefaction caused basement floors to break and be pushed upward in Seattle and Puyallup during the 1949 earthquake. Other basements cracked open and completely filled with water and silt. Lighter structures may float in liquefied soil. Pilings without loads may float upwards. Heavy structures, such as retaining walls and multi-story buildings, may tilt in response to the loss of bearing strength by underlying soil.[6]

What are landslide hazard areas?

Areas of the landscape that are at high risk of future failure based on various local conditions including soil type, slope gradient and groundwater regime. The landslide hazard GIS data was compiled on the basis of regional geologic mapping. The GIS data cannot be accurately used to determine the presence or absence of liquefiable soils beneath any specific locality. This determination requires a site-specific geotechnical investigation performed by a qualified practitioner. Therefore, we also analyzed **steep slopes** to ensure that this issue was analyzed conservatively. Slopes that are steeper than 40% grade are typically at high risk for landsliding.

How were project effects on geologically hazardous areas evaluated?

Using Geographic Information System (GIS) software, the **compact** analysis area was overlaid upon geology data layers to determine areas of potential effect. The data layers included:

- Seismic data was collected from the King County Seismic Hazards GIS layer and the Pierce County Potential Seismic Hazard GIS layer.
- Liquefaction data was gathered from the Washington Department of Natural Resources and steep slope and topographic data was gathered from King County and Pierce County.

[6] Best Available Science, Volume I: Review of Science Literature, King County Executive Report, February 2004. http://www.metrokc.gov/ddes/cao/#best

- The steep slopes data was derived from the Pierce County steep slopes layer and the King County steep slopes layer was generated from King County 5ft contours layer. The contours were converted to 25 foot grid slope layer using ESRI Spatial Analyst.

What is the potential effect of the long-term options on geologically hazardous areas?

Seismic Hazards Areas

The proposed long term and short term options lie within an area with a high level of seismic activity. The following exhibits summarize the potential project effects on seismic hazard areas. When looking at the area of analysis for the long term options, most of the effects are located in the south end of the area of analysis, near Auburn, Sumner, and Puyallup.

Long Term Option Affects on Seismic Hazards

Project	Area (Acres)
8 Lane	225
10 Lane	232

Three of the seven short term options are likely to effect seismic hazard areas, as shown in the following exhibit.

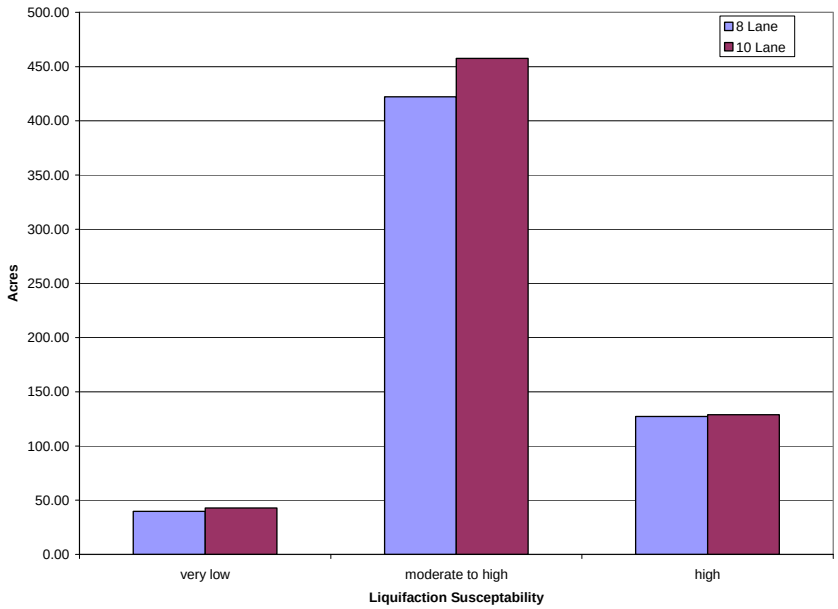
Short Term Option Affects on Seismic Hazards

Project	Affected Area (Acres)
Stage 4	29
Stage 5	45
SR 410/ SR 512 IC	147

Liquefaction Susceptible Areas

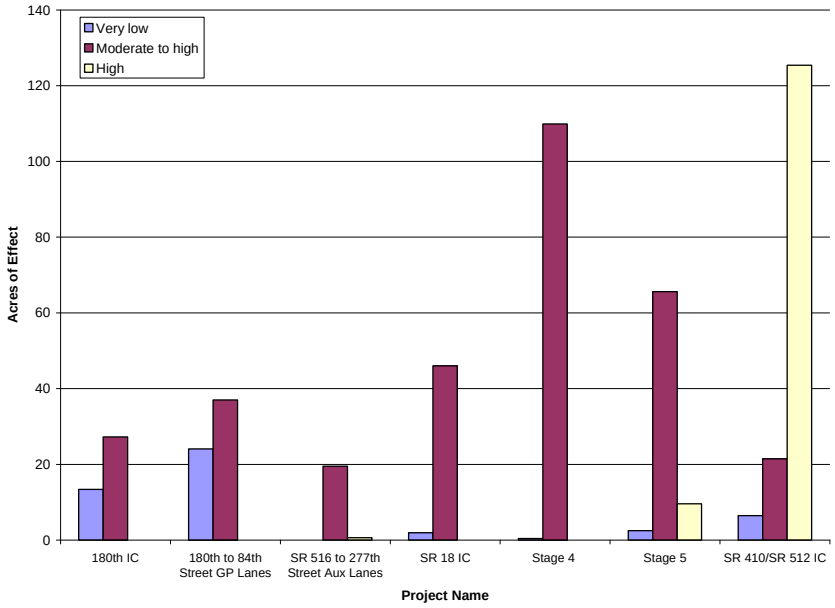
The proposed long term and short term options lie within an area with a high number of liquefaction susceptible areas. The following exhibits summarize the potential project effects on liquefaction susceptible areas. When looking at the area of analysis for the long term options, the liquefaction susceptible areas are spread throughout the corridor, but with most of the moderate to highly susceptible areas in the south end of the corridor.

Project	Very low	Moderate to high	High
8 Lane	40	422	127
10 Lane	43	458	129



Six of the seven short term options would potentially affect liquefaction susceptible areas. The short term option with the highest liquefaction susceptibility is the SR 410/SR 512 Interchange Improvements project, which has more than 125 acres of the project footprint in a high susceptibility area.

Project	Liquefaction Susceptibility (acres)		
	Very low	Moderate to high	High
180th IC	13	27	
180th to 84th Street GP Lanes	24	37	
SR 516 to 277th Street Aux Lanes		20	0.6
SR 18 Interchange	2	46	
Stage 4	0.4	110	
Stage 5	2	66	10
SR 410/SR 512 IC	6	21	125



Landslide Hazard Areas/Steep Slopes

The proposed long term and short term options lie within an area with steep slopes and landslide hazard areas. The following exhibits summarize the potential project effects on landslide hazard areas. When looking at the area of analysis for the long term options, the landslide hazard areas are spread throughout the corridor, but most of the slopes are in the south end of the corridor.

Long Term Option Affects on Steep Slopes

Project	Affected Area (Acres)	
	Less than 40%	Greater than 40%
8 Lane	2.7	33
10 Lane	2.9	35

Short Term Option Affects on Steep Slopes

Project	Affected Area (Acres)	
	Less than 40%	Greater than 40%
180th IC	0.1	1.7
180th St. to 84th St. GP Lanes	0.2	3.6
SR 516/ 277th St. Aux Lanes	0	0.1
SR 18 IC	0	0.1
Stage 4	0	5.6
Stage 5	0.3	2.7
SR 410/ SR 512 IC	2.4	21

Hazardous Materials

Hazardous material is a general term used to describe hazardous substances, solid waste, hazardous waste or dangerous waste, and contaminated environmental media. The concern with hazardous material is that a release or threat of release of contaminants during or after construction of the project could harm human health or the environment. It is important to avoid the hazardous materials during construction activities and identify areas that require additional investigation before right-of-way acquisition. There are a wide variety of types of hazardous waste sites that are regulated by numerous local, state, and federal agencies.

How were project effects on hazardous materials evaluated?

Environmental Data Resources (EDR) performed a comprehensive database search of local, regional, state, and federal hazardous waste storage sites and generators and hazardous waste cleanup sites for a half-mile area surrounding the project area. The database query summarizes the type of regulations that the sites are bound by and sometimes contain the status and brief summary of the environmental cleanup projects. We evaluated sites in five basic categories:

- **Federal Cleanup Sites** – Those on the National Priority List or Superfund list and sites regulated by the Resource Conservation and Recovery Act corrective action program.
- **State Cleanup Sites or Potential Sites** - These include sites regulated by the Model Toxics Cleanup Act, which can include regulated facilities and volunteer cleanup sites
- **UST/LUST/AST Sites** – These sites may have or had underground storage tanks (USTs), above ground storage tanks (ASTs), or leaking underground storage tanks (LUSTs).
- **Closed Sites with Institutional Controls** – Closed sites have typically met the cleanup goals set by the regulatory agency. Sometimes these sites still have on-site contamination that is monitored long term and contained with institutional controls such as underground walls that prohibit contaminated soil and groundwater from moving further, or an asphalt or concrete cap on the site to prohibit contact with contaminated soil beneath it. Institutional controls are

typically written into the deed of the property so that they are not disrupted or changed in the future.

- **Other Sites** – There are numerous other sites that were inventoried by the EDR database search that typically have less environmental affect than those described above.

Using GIS software, the **extended** analysis area was overlaid upon hazardous materials data layers to determine areas of potential effect. The data layers included the five categories of hazardous materials described above.

This is a good first screening of the potential contamination issues that may exist within the project area, but if potential concerns are identified, further research may be required before construction of the project to determine how to address the issues.

What are the potential effects of the projects on hazardous materials?

Summaries of the long term and short term project affects on hazardous materials sites are shown in the following exhibits. In addition, the following exhibits show the location of these sites.

Long Term Option Affects on Hazardous Materials

Project	Federal Cleanup Sites	State Cleanup Sites or Potential Sites	UST/LUST Sites or Potential Sites	Other	Closed Sites & Sites w/Institutional Controls
8 Lane	65	14	33	27	3
10 Lane	75	22	45	32	5

Short Term Option Affects on Hazardous Materials

Project	Federal Cleanup Sites	State Cleanup Sites or Potential Sites	UST/LUST Sites or Potential Sites	Other	Closed Sites & Sites w/Institutional Controls
180th IC	20	6	11	8	0
180th St to 84th St GP Lanes	30	3	12	11	0
SR 516 to 277 Street Aux Lanes	6	3	4	1	0
SR 18 Interchange	0	2	2	3	1
Stage 4	0	0	1	4	1
Stage 5	0	0	1	3	0
SR 410/ SR 512 IC	0	0	0	0	0

Cultural & Historical Resources

The proposed project occurs in an area that is a place of cultural significance for Native Americans as well as early settlers. There are a number of important historical, archeological, and cultural places within the vicinity of the project that should be protected by Section 106 of the National Historic Preservation Act either as a property that is registered with or is eligible for registering with the National Registry of Historic Places (NRHP). The NRHP eligible properties possess a quality of significance in American history, architecture, archaeology, and culture. This is possible in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, material, workmanship, feeling, and association. In addition, properties determined eligible for listing:

A. Are associated with events that have made a significant contribution to the broad patterns of our history; or
B. Are associated with the lives of persons significant in our past; or
C. Embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. Has yielded, or may be likely to yield, information important in prehistory or history (36 CFR Part 60), such as archaeological sites.

Buildings less than 50 years old do not meet the NRHP criteria unless they are of exceptional importance, as described in the National Park Service Bulletin No. 22, "How to Evaluate and Nominate Potential National Register Properties That Have Achieved Significance Within the Last 50 Years."

How were project effects on cultural and historical resources evaluated?

Using GIS software, the **compact** analysis area was overlaid upon historical data layers to determine areas of potential effect. The data layers were developed from research conducted by Entrix at the Department of Archaeology and Historic Preservation (DAHP) in Olympia, Wash., and local jurisdictions. DAHP resources included sites listed on the national, state or local historic registers and to obtain information about previously inventoried resources within the areas of analysis. The local jurisdictions Kent, Auburn,

Puyallup, and Sumner provided information on previously recorded resources and information about local historic preservation regulations. The historic preservation offices of King and Pierce Counties provided a list of county landmark resources. Archaeological and historical resources identified during research were mapped for reference in the field. Two of Entrix's cultural resources specialists then conducted a windshield survey of the areas on September 8, 2006, to determine how the properties might be affected by proposed options changes.

When project alternatives are more defined, additional research should be conducted at DAHP and King and Pierce counties to identify previously inventoried resources within the proposed project's area of potential effect.

What are the potential effects of the projects on archaeological resources?

No identified archaeological sites are located in the current study area.

What are the potential effects of the projects on historical resources?

In their windshield survey, Entrix cultural resource specialists noted the highest concentrations of potential historic resources near the SR 167 interchanges in Kent, Auburn, Sumner, and Puyallup. The highest density of older buildings, and therefore potential historic resources, is in the vicinity of Puyallup. Kent lies closest to the SR 167 and historical resources are located adjacent to the road, which could be affected by the proposed projects. The cities of Auburn, Sumner, and Puyallup lie farther from the highway. The community of Algona lies alongside the roadway but structures in this area appear modern. Scattered historic resources including some working and some abandoned dairies lie between SR 167 and the east ridge, near the West Valley Highway.

Although there are a number of historical places near the areas of analysis, there are no sites within the area of analysis.

Land Use

Development projects often either need to acquire land for a project that requires re-zoning or change adjacent land uses significantly enough that it may have a long term zoning affect on neighboring properties. It is important to ensure that projects are consistent with local land use plans and policies. Proposed projects that are determined to be inconsistent with local land use plans and projects may not efficiently receive permits or licenses necessary for project completion.

How were project effects on land use evaluated?
Using GIS software, the **compact** analysis area was overlaid upon land use data layers to determine areas of potential effect. The data layers included 2002 aerial photographs and land use zoning GIS data from local jurisdictions. For analysis purposes, it was assumed that if a project needed to acquire at least half of an adjacent property that the entire parcel would be purchased and the land use of the entire parcel would change.

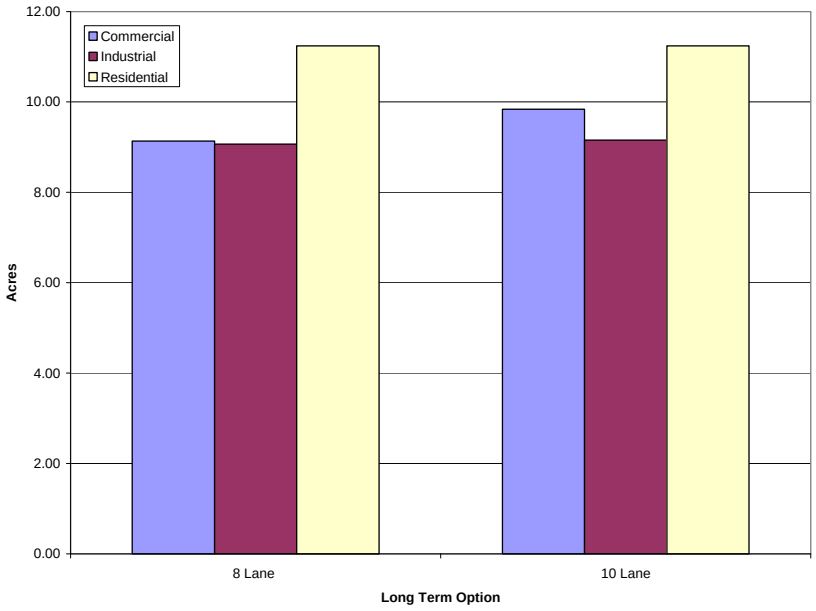
What are the potential effects of the projects on land use?
Land uses along SR 167 are primarily commercial, industrial, and agricultural. Most of the land along the project area is commercial or light industrial use. Much of the agricultural land along the freeway is transitioning to industrial. There are also some residential areas and government-held open space along the highway. In the north end of the project, through Kent, the west side of the highway is predominantly industrial, while the east side is residential. In the central project area, has an agricultural area south of the Green River on the west side of the highway, then it is predominantly industrial on both sides of the highway. In the south end of the project area, there is more of a mixture of land uses, primarily commercial, industrial and residential uses. The land uses are depicted on The exhibits below show aerial photographs and zoning maps from the project area municipalities and counties.

When looking at the area of analysis for the long term options, most of the effects on land use are in Kent, unincorporated Pierce County, and Sumner.

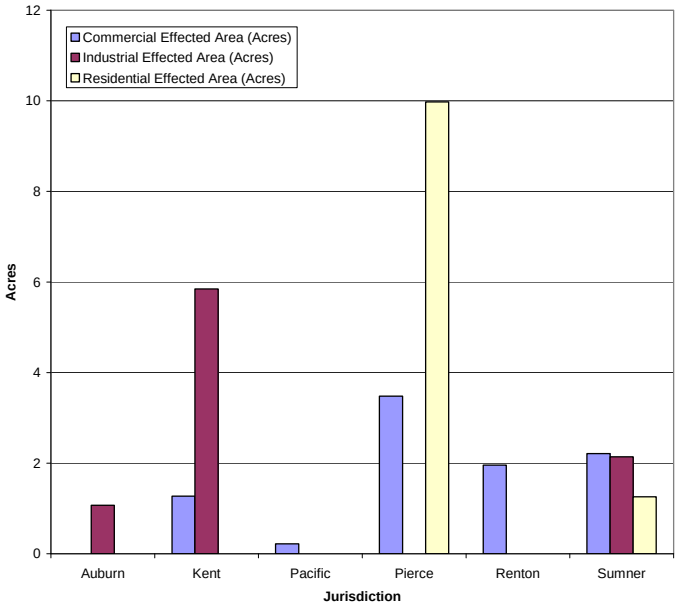
Long Term Option Effects on Land Use by Zoning Category

Project Name	Commercial Effected Area (Acres)	Industrial Effected Area (Acres)	Residential Effected Area (Acres)
8 Lane	9.13	9.06	11.24
10 Lane	9.84	9.16	11.24

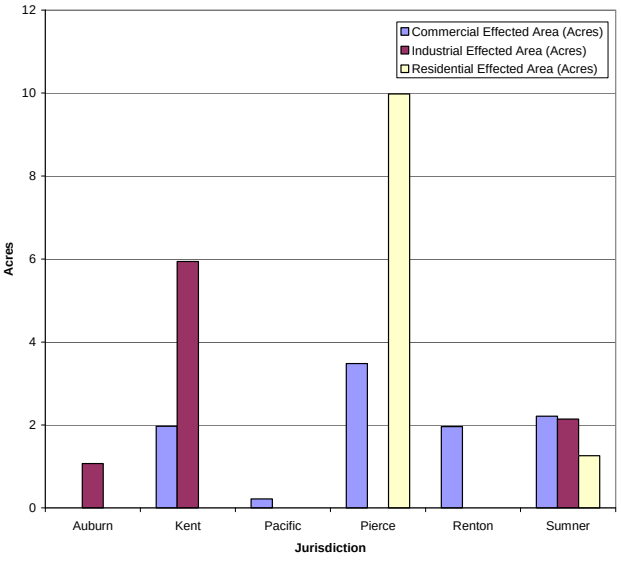
Long Term Option Effects on Land Use by Zoning Category



8-Lane Long Term Option Effects on Land Use by Local Jurisdiction



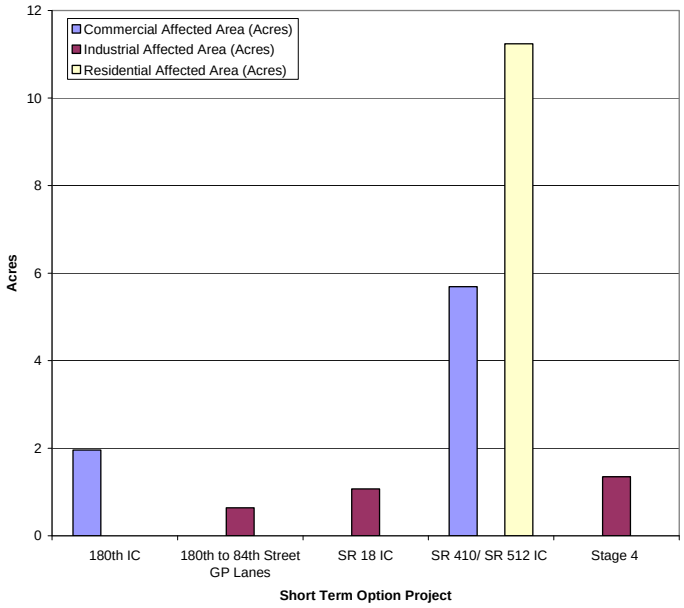
10-Lane Long Term Option Effects on Land Use by Local Jurisdiction



Four of the seven short term options would potentially have effects on land use. Most of the changes are likely to occur in commercial and residential areas.

Short Term Option Effects on Land Use by Zoning Category

Project Name	Commercial Effected Area (Acres)	Industrial Effected Area (Acres)	Residential Effected Area (Acres)
180th St. IC	1.96		
180th St. to 84th St. GP Lanes		0.64	
SR 18 IC		1.07	
Stage 4	3.39	0.14	
SR 410/SR 512 IC	5.69		11.24



Section 4(f) Resources

The proposed projects are located near a number of public lands such as parks, recreational areas and wildlife refuges and historic sites, which are protected by Section 4(f) of the Department of Transportation Act of 1966 (49 United States Code Section 303) that 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. The potential 4(f) resources that may be affected by the proposed projects include:

- Auburn Environmental Park
- Cleveland Park
- Commons Playfield
- Foster Park
- Interurban Trail
- Naden Park
- Panther Creek
- Renton Wetlands
- Riverview Park
- Willis Street Greenbelt and
- Historic sites

How were project effects on 4(f) resources evaluated?
Using GIS software, the compact analysis area was overlaid upon the 4(f) data layers to determine areas of potential effect. The data layers included GIS data layers for parks, recreational areas and wildlife refuges and historic sites gathered from the local jurisdictions and the state. Effects of the proposed project on 4(f) resources could include the following:

- Complete or partial acquisition of the protected public property to give additional right-of-way to highway improvements.
- Relocation of a trail.
- Addition of a highway underpass or overpass along a trail.
- Effects related to the proximity of park or recreational land to a project. WSDOT analyzed a number of potential proximity-related or construction use effects in this report including:
    - Increased levels of traffic noise or air pollution
    - Changed, reduced, or lost access
    - Degraded visual setting

- Changes in the nature of the surrounding land use that could affect the continued viability, integrity, use, or value of the resource, and that could degrade the overall experience at the resource.

The 4(f) resources are depicted on the following exhibits, which show aerial photographs and outlines of the 4(f) property within the project area. Most of the 4(f) properties are in the north and central portions of the project area.

What are the potential effects of the long-term options on 4(f) resources?

The long term option footprints will affect less than an acre of 4(f) properties. Both the long term options will have effects on the same three parks, as shown below.

Long Term Options Total Affects on Parks and Trails

Project	Affected Area (Acres) in Parks	Affected Area (Acres) on Trails
8 Lane	9.5	1,161
10 lane	12.0	1,249

More specifically, the long term options' potential affects are located in these parks and trails:

Park Name	8 Lane Option Affected Area (Acres)	10 Lane Option Affected Area (Acres)
Auburn Environmental	5.5	6.2
Cleveland Park	0.2	0.2
Commons Playfield	0.5	0.7
Interurban Trail Sit	0.7	0.8
Naden Park	0.4	0.4
Panther Creek	1.7	3.1
Renton Wetlands	0.0	0.1
Riverview Park	0.4	0.6
Total Effect	9.5	12.0

What are the potential effects of the short-term options on 4(f) resources?

The short term option footprints will have no effects on 4(f) properties. The short term option footprints with a 300 foot setback will affect 4(f) properties. The potential effects are shown below.

Short Term Options Total Affects on Parks and Trails

Project	Affected Area (Acres) in Parks	Affected Area (Acres) on Trails
180th Street IC	1.7	
180th St. to 84th St. GP Lanes	0.2	67
SR 516/ 277th St. Aux Lanes	0.2	527

More specifically, the short term options' potential affects are located in these parks and trails:

Park Name	180th IC	180th St to 84th St. GP Lanes	SR 516/ 277th St. Aux Lanes	Subtotals
Panther Creek	1.7	0.1		1.9
Cleveland Park		0.1		0.1
Riverview Park			0.2	0.2
Totals	1.7	0.2	0.2	

Socio-economics and Environmental Justice

Environmental justice needs to be addressed like any other environmental concern, using identification, avoidance, minimization and finally mitigation. To correctly identify potential inequities, the environmental justice analysis requires preliminary census research and may require more detailed studies of communities/populations in combination with effective community outreach. This process is intended to ensure that projects are developed in a manner that avoids disproportionately high and adverse effects on minority and low-income populations.

How were project effects on socio-economics and environmental justice evaluated?

We reviewed U.S. Census Bureau data for low-income and minority populations for King and Pierce Counties and Washington State. The data census tract data was collected for areas located within 660 feet or 1/8 mile of the 10-lane long term option footprint. Data was obtained from the U.S. Census Bureau, Census 2000. There were 30 census tracts identified in the Study Area; 22 in King County and 8 in Pierce County. The minority population data were obtained from Summary File 1, and included P7, Race, Total Population, and P11, Hispanic or Latino, Total Population. The low-income population data were obtained from Summary File 3, P92, poverty status. The census data shows the quantity of minority and low-income populations, and GIS maps show graphically where these populations are located in the counties.

On December 2, 2005, Entrix performed a windshield survey of the project area to verify the data in the GIS maps. The windshield survey revealed that the census data as shown in the GIS maps appeared to be relatively consistent with the project area environment. Verifying percentages of minority or low-income populations from a windshield survey alone, however, is insufficient to ascertain the reality of the locations of low-income or minority populations.

Evaluating Census data is a first-step in the environmental justice analysis process. Further investigations through community outreach and interviews with local officials, particularly regarding the census tracts noted below, would provide more accurate information regarding potential environmental justice populations.

What are the potential effects of the long-term options on socio-economics and environmental justice?

The U.S. Census Bureau follows the Office of Management and Budget's Statistical Policy Directive 14 to determine poverty status based on income level. Poverty status can be used as a measure of low income for environmental justice analyses. Poverty thresholds do not vary geographically, but do vary according to size of family unit. The following table shows the number and percentage of households below the poverty level in 2000 in King and Pierce Counties, respectively, including family and non-family households. The percentage of households with incomes below the poverty level in 2000 in King County is 9% and in Pierce County is 10.5%.

Low-Income Populations

Seven census tracts in King County and two in Pierce County have greater than county average poverty level in 2000. The low income populations are generally distributed throughout the areas of analysis, as shown below.

Comment [c1]: map

Populations Below State Average Poverty Level (1999)

County	Tract No.	Percentage of Households Below Poverty Level
King	292.01	12.54%
King	292.03	9.82%
King	305.01	30.89%
King	308.01	13.51%
King	309.02	10.95%
Pierce	706	11.18%
Pierce	734.01	10.62%

Minority Populations

The Hispanic and Latino Population data is included in this table because these data are collected separately from race data and must be evaluated independently from race data. To avoid double counting, the U.S Census Bureau collects data for Hispanic and Latino populations separately from race data. Therefore, the non-white population is tallied separately. Non-white populations were calculated by subtracting the "white only" population from total population.

The Hispanic and Latino totals were obtained from Summary File 1, P11, Hispanic and Latino – Total Population. These data are separate from the Race data, which was obtained from Summary File 1, P7, Race – Total Population. In King County, seven of the census tracts show minority (non-white) populations of greater than 24% (King County total). In Pierce County, none of the census tracts show minority (non-white) populations of greater than 22% (Pierce County total). These include:

Minority Populations Greater than the State Average

County	Tract No.	Minority Populations Greater than County Average
King	293.05	30.83%
King	293.03	38.44%
King	258.01	37.64%
King	292.04	28.64%
King	262	38.17%
King	292.03	36.57%
King	292.01	28.57%

There are four census tracts with Hispanic or Latino populations greater than the King County total of 5.5% and the Pierce County total of 5.5%. These include:

Hispanic or Latino Populations Greater than Washington State Average

County	Tract No.	Hispanic/Latino Populations Greater than County Average
King	297	5.67%
King	298.01	6.35%
King	305.01	6.48%
King	309.02	6.75%
King	309.01	6.90%
King	292.04	7.55%
King	308.01	10.93%
King	262	11.20%
King	292.03	11.68%
King	292.01	14.01%
Pierce	734.01	6.00%
Pierce	734.03	6.15%
Pierce	733.01	8.74%

Summary

Comment [cm2]: Should be same as what is in the report text – so copy from edited report text

After screening the short term options and the long term options, we have ranked the long term options based on their overall cost effectiveness. The ranking of options was based on each option's presumed effects on environmental resources as calculated via the environmental screening exercise and the resulting affect, whether it is cost, type of permitting required, actual affects to resources, and mitigation costs.

The following exhibit summarizes the results of the environmental screening of the long term options. Nearly all of the screening results are relatively similar between the two long term options. The ten lane option typically has a slightly higher effect on environmental resources than the eight lane option due to its larger footprint. Some of the more obvious differences are that the ten lane option has more significant impacts to:

- Wetland buffers
- Protected fish
- Fish and wildlife habitat, and
- Hazardous materials

In general, the 10-lane option may have more mitigation costs due to the impacts related to wetland buffers and fish and wildlife habitat, as well as potential additional work to identify hazardous materials sites.

In addition, the 10-lane option will require major bridge modifications or replacements; whereas the 8-lane option will not. This is a costly endeavor, but would bring the bridges up to current seismic standards.

Evaluation Criteria	8-Lane Option Effects	10-Lane Option Effects
Wetlands		
How many acres of wetlands will be affected by the project?	131	141
How many acres of wetlands buffers will be affected by the project?	203	218
Floodplains		
How many acres will the long term options effect in the 100 year floodplain?	47	50
How many acres will the long term options effect in the 500 year floodplain?	14	16
How many acres will the long term options effect in the floodway?	17	19
Fish Habitat		
How many fish species will be affected by proposed in-water work (culverts, bridges)?	3	10
How many fish species may potentially be affected by project stormwater or runoff in the area of analysis?	10	10
How many acres of non-forested riparian zone will be affected by the project?	668	760
How many acres of forested riparian zone will be affected by the project?	66	86
Wildlife		
How many acres of wildlife habitat in the form of urban natural open space will be affected by the project?	22	33
How many acres of waterfowl habitat will be affected by the project?	139	156
Streams and Riparian Corridors		
How many acres of streams, creeks, or rivers might the long term options effect?	2.6	2.8
How many acres of forested riparian might the long term options effect?	9	10
How many acres of non-forested riparian areas might the long term options effect?	190	205
Air Quality		
How will the project effect air quality?	NA	NA
Noise Quality		
How will the project affect the long term exterior noise levels of sensitive receptors in the area of analysis?	Moderate	Moderate
How will the project effect construction noise levels for sensitive receptors in the area of analysis?	Moderate	Moderate
Groundwater Resources		
How will the project effect wellhead protection areas? (acres)	183	194
How will the project affect Critical Aquifer Recharge Areas (CARA)? (acres)	237	245
How will the project affect sole source aquifers? (acres)	0	0
How much more impervious surface area wills the long term options contribute to the existing roadway?	69%	78%

Evaluation Criteria	8-Lane Option Effects	10-Lane Option Effects
Geologically Hazardous Areas		
How will the project affect seismic hazard areas? (acres)	225	232
How will the project effect high liquefaction hazard areas? (acres)	28	29
How will the project effect steep slopes of greater than 30%? (acres)	33	35
Hazardous Materials		
How many hazardous waste sites are within the area of analysis of the proposed project?	142	179
Cultural and Historic Resources		
How will the project effect archeological resources?	NA	NA
How will the project effect historic resources?	NA	NA
Land Use		
How will the project affect existing residential land use? (acres)	11	11
How will the project affect existing commercial land use? (acres)	9	10
How will the project affect existing industrial land use? (acres)	9	9
Section 4(f)		
How will the project affect Section 4(f) park properties?	9.5	12
How will the project effect Section 4(f) trail properties?	1,161	1,249
Socio-economics and Environmental Justice		
How will the project effect low-income populations? (number of census tracts effected)	9	9
How will the project effect minority populations? (number of census tracts effected)	7	7
Other		
How many culverts will need modification or replacement as a result of constructing the long term options?	8	8
How will the projects' proposed improvements to bridges effect fish bearing streams? (culverts & bridges over water)	0	8