CHAPTER 6 MEASURES TO AVOID, MINIMIZE, OR MITIGATE EFFECTS

This chapter presents proposed measures to avoid or minimize adverse environmental effects of the I-405, NE 8th Street to SR 520 Improvement Project. This chapter does not address those elements of the environment that had negligible environmental effects as detailed in Chapter 5. WSDOT incorporates many best management practices into the design that also avoid or minimize adverse effects. In addition, WSDOT will meet the commitments in its I-405 Corridor Program NEPA/SEPA Final Environmental Impact Statement (EIS) Record of Decision.[13]

What measures will be taken to avoid, minimize, or mitigate construction effects?

Traffic and Transportation

WSDOT will coordinate with the local agencies to prepare a Traffic Management Plan prior to lane closures or making any traffic flow changes. The City of Bellevue, the public, school districts, emergency service providers, and transit agencies will be informed of changes through a public information process. WSDOT will make every effort to minimize traffic delays or disruptions during construction. Lane closures will occur in off-peak hours whenever possible, and will be coordinated with local agencies.

What is transportation demand management (TDM)?

A varied collection of methods to reduce or modify travel demand and encourage more efficient use of the transportation system.

Transportation demand management (TDM) strategies will form an important part of the construction management program. TDM strategies in the I-405, NE 8th Street to SR 520 Improvement Project area will be implemented prior to construction to increase public awareness and participation in HOV travel. The major focus will be on expanding vanpooling and vanshare opportunities.

[13] *WSDOT, 2002b.*

Noise and Vibration

To reduce construction noise and vibration at nearby residences, WSDOT will incorporate the following activities, where practicable:

- Limit the noisiest construction activities (e.g., pile driving) to between 7 a.m. and 10 p.m. to reduce construction noise levels during sensitive nighttime hours;
- Equip construction equipment engines with adequate mufflers, intake silencers, and engine enclosures to reduce their noise;
- Turn off construction equipment during prolonged periods of nonuse to eliminate noise;
- Where possible, locate stationary equipment away from residences to decrease noise;
- Require the use of Occupational Safety and Health Administration (OSHA)-approved ambient sound-sensing backup alarms to reduce disturbances from backup alarms during quieter periods;
- Identify vibration-sensitive facilities located adjacent to the project;
- Prepare a vibration monitoring and mitigation plan; and
- Coordinate construction activities with adjacent property owners to minimize and avoid potential vibration-related effects, when possible.

Communities, Businesses, and Public Services

To avoid and/or minimize effects on communities, businesses, and public services, WSDOT will:

- Continue active public involvement and work with neighborhood associations and community service providers to inform them of temporary changes in traffic circulation or access;
- Maintain emergency vehicle access to Overlake Hospital Medical Center during construction;
- Coordinate with any displaced resident or business owner to provide relocation assistance in compliance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended;

- Relocate Washington Women in Need, a human service agency that provides assistance to low-income women, within the same neighborhood;
- Coordinate with business owners and the City of Bellevue to mitigate or compensate for parking losses;
- Maintain access to businesses during business hours throughout the construction period;
- Post appropriate signs that communicate revised access information to potential customers;
- Coordinate with utility service providers to avoid effects on existing utilities and, where unavoidable, minimize disruption in service during utility relocation;
- Coordinate with Overlake Medical Center and Group Health Cooperative to prevent any disruptions in utility service; and
- When relocating water lines, notify and coordinate with fire departments prior to any breaks in service to establish alternate supply lines.

Visual Quality

Mitigation measures will be implemented during project construction to help maintain and/or restore the visual character. Where the local terrain and placement of light poles allow it, light and glare effects associated with nighttime construction activities will be reduced by shielding freeway lighting and using downcast lighting so that lighting sources will not be directly visible to the corridor neighbors. Site disturbance will be minimized to protect native plants and trees. Visual effects will be reduced further by restoring (revegetating) areas as construction is completed (in stages) rather than waiting for the entire project to be completed.

Water Resources

WSDOT will use standard BMPs to avoid and reduce potential effects from this project during construction. These BMPs are designed in accordance with the WSDOT HRM. Some of the potential BMPs and construction practices that will be used as part of the project are listed below:

- WSDOT will prepare and implement a Temporary Erosion and Sedimentation Control (TESC) plan. A TESC plan consists of structural and operational measures to control

What is a silt fence?

A silt fence consists of a temporary sediment barrier made of synthetic fabric stretched between posts, with a shallow trench located upslope. The silt fence is staked into the ground to prevent water from running under the fence.

What is a sediment trap?

A sediment trap consists of a temporary ponding area formed by an earthen embankment or an excavation. Both silt fences and sediment traps are designed to slow the flow of water, allowing sediment to settle out.

the transport of sediment. Structural measures consist of the construction of temporary structures to reduce the transport of sediment, such as silt fences or sediment traps.

- If the structural and operational BMPs listed in the HRM do not adequately control the discharge quality to meet the state requirements, then other methods may be used. Such methods may include, but not be limited to, chemical treatment of stormwater or the use of flow-through sand (or similar media) filtration systems. These advanced treatment systems could be used on an as-needed basis.
- Where construction must occur within stream channels, it will occur "in the dry" (stream flows will be temporarily diverted around the work site, where practicable, to prevent turbidity). In-stream work is expected to occur in the unnamed tributary to Sturtevant Creek. A hydraulic project approval (HPA), issued by the Washington Department of Fish and Wildlife (WDFW), will list the requirements for performing in-stream work.
- WSDOT will treat construction site runoff such as overland flow across a vegetated surface, temporary curbing to prevent clean runoff from flowing across the disturbed areas, and stormwater ponds as temporary settling/holding ponds.
- WSDOT will limit construction disturbances to the minimum area needed, the shortest duration, and an appropriate distance away from water bodies, as practical. Seasonal work windows will be identified and implemented.
- WSDOT will use structural BMPs such as silt fencing, landscaping, erosion matting, hydro mulching, soil tracking, detention/sediment trap basins, and vegetated buffers as described in the HRM, as appropriate.
- WSDOT will reduce the use, transfer, and storage of hazardous materials in sensitive areas. A Spill Prevention, Control, and Countermeasures (SPCC) plan will be established for construction activities and will also detail the procedures that will be followed in the event of a spill to prevent or minimize effects on groundwater.

- WSDOT will identify and develop staging areas for equipment repair and maintenance away from all drainage routes. WSDOT will require that washout from concrete trucks not be dumped into storm drains or onto soil or pavement that carries stormwater runoff. Thinners and solvents will not be used to wash oil, grease, or similar substances from heavy machinery or machine parts. WSDOT will designate a washdown area for equipment and concrete trucks.

Due to the flooding problems in Valley Creek, flow control mitigation measures will have to be implemented to prevent any temporary increases in flow rates to the stream.

WSDOT will design and implement a construction dewatering plan if needed. The dewatering plan will consist of measures for temporarily lowering the groundwater table below levels of construction excavation. WSDOT will be required to obtain a National Pollutant Discharge Elimination System (NPDES) permit. WSDOT will require that water encountered during construction meets the standards specified in the NPDES permit prior to discharge to a surface water body. If necessary, sediment ponds will be used to allow sediment to settle out, thereby improving water quality, prior to discharge.

Ecosystems

The construction BMPs for protecting water quality and water resources described above will also protect wetlands, aquatic resources, and wildlife habitat. WSDOT will minimize effects during construction by following construction BMPs specified in the HRM and by implementing TESC and SPCC plans to prevent sediment and spilled materials from entering streams. Construction staging and stockpiling areas will be located at a specified distance away from streams, which will also prevent any spills and sediment from entering streams or stream buffers. Other measures to minimize effects on wetlands, aquatic resources, and wildlife habitat during construction include:

- WSDOT will adhere to project conditions identified in the project Biological Assessment[14] to protect fish and other aquatic species.
- Streams, wetlands, and their associated buffers will be labeled on the construction plans and in the field.
- Clearing limits will be demarcated with orange barrier fencing wherever clearing is proposed in or near critical areas.
- WSDOT will implement construction BMPs (such as silt fencing or sedimentation ponds) to avoid disturbing sensitive areas during the development and use of staging areas, access roads, and turnouts associated with resurfacing activities.
- WSDOT will not allow in-water work to occur except during the seasonal work windows established to protect fish.
- WSDOT will minimize the amount of vegetation clearing to retain as many trees as practicable.

What measures will be taken to mitigate effects of operation?

Traffic and Transportation

WSDOT will coordinate with the City of Bellevue to revise the signing that will direct drivers to the reconfigured on-ramps to northbound I-405 and SR 520. WSDOT will also perform public outreach to inform drivers of the changes to the roadway network.

Noise and Vibration

An existing noise barrier that runs along northbound I-405 from approximately NE 15th Street to the SR 520 on-ramp must be removed to accommodate the proposed improvements. A replacement noise barrier will be constructed to reduce noise levels below the NAC at 17 residences that currently benefit from the existing noise barrier. The replacement barrier will be approximately 1,585 feet long and will be approximately at

[14] *WSDOT, 2007b.*

the same elevation as the existing noise wall. The new barrier will be constructed atop a planned retaining wall.

No measures are needed to mitigate for vibration effects during project operation.

Communities, Businesses, and Services

No measures are needed to mitigate effects on communities, businesses, and services during operation.

Visual Quality

To address the type of disruption to the visual environment that will occur during operation, light and glare effects will be reduced by shielding freeway lighting and using downcast lighting.

The NE 8th Street to SR 520 Improvement Project is being planned, developed, and designed in accordance with Context Sensitive Solutions (CSS) guidelines. These guidelines provide an approach that incorporates community values while meeting local, regional, and national requirements for the safe, efficient, and effective movement of people and goods. CSS considers the elements of mobility, safety, environment, and aesthetics throughout the project. To adhere to these guidelines, the proposed project is being developed to fit its physical surroundings and preserve these elements.

The application of CSS guidelines reduces the need for additional mitigation of visual effects. Measures that are typical for transportation projects, such as retaining existing natural vegetation to the maximum extent practical and planting new vegetation to screen constructed elements, have been incorporated within the CSS of I-405 and related transportation features.

Water Resources

Stream mitigation for the effects on the unnamed tributary to Sturtevant Creek and its buffer will occur at Sturtevant Creek. The stream mitigation site is located along Sturtevant Creek near the southeast quadrant of the intersection of NE 4th Street and I-405, as shown on Exhibit 4-2, sheet 1 of 6. It is a 200-foot-long reach of Sturtevant Creek, directly downstream (south) of the culvert under NE 4th Street (see photo). The site is approximately 0.4 acres in size.

The Sturtevant Creek mitigation site located south of NE 4th Street

The mitigation design will include placing large woody debris in the stream and other channel enhancements; revegetating a

portion of the stream buffer; and removal and control of invasive plant species. This stream mitigation will help to decrease flooding, improve water quality via sediment removal, and provide improved habitat for fish and other aquatic life.

The project will be designed and constructed to meet all current federal, state, and local standards for stormwater management. Design criteria are based on requirements as set forth in the *Highway Runoff Manual*[15] and the *Hydraulics Manual*.[16] Additional design guidance and project-specific design criteria will be obtained through the permitting process and prior agency coordination.

The water quality and quantity controls described in Chapter 4 are conceptual and will be revisited as the design continues; however, the level of stormwater management will be equal to or better than that described in this EA. With proper design, implementation, and maintenance of BMPs, stream crossings, and highway runoff control facilities, there will be no need for additional measures to minimize effects on water quality and quantity.

The project will have no adverse effects on floodplains; therefore, no floodplain mitigation is required.

To minimize the effects from groundwater drawdown due to the installation of underdrains and permanent dewatering facilities, WSDOT will include special provisions in the design, such as discharging drain flow back into affected surface water and wetlands. WSDOT has well-established design and construction practices for managing the types of groundwater conditions anticipated for the project. With the implementation of these practices and by following standard BMPs, potential negative effects on groundwater resources will be minimized.

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[15] *WSDOT, 2006a.*

[16] *WSDOT, 2006b.*

Ecosystems

Wetlands

To compensate for the permanent effects on wetlands resulting from the I-405, NE 8th Street to SR 520 Improvement Project, WSDOT will provide mitigation at a wetland mitigation site located in Kelsey Creek Park, north of the intersection of Richards Road and the Lake Hills Connector in Bellevue, Washington.[17] The location of the mitigation site is shown on Exhibit 4-1. The site will be used as mitigation for several concurrent WSDOT projects along the I-405 corridor; therefore, only a portion of the site will be used to mitigate for effects on wetlands for the I-405, NE 8th Street to SR 520 Improvement Project. Of the 2.4-acre wetland restoration area, less than 0.5 acres will be proposed as mitigation for this project.

Wetland mitigation at Kelsey Creek Park

The Kelsey Creek Park mitigation site is being constructed by excavating an upland area adjacent to Kelsey Creek to an elevation that will match the existing topography of the adjoining wetland. The excavated area is being replanted and enhanced to provide a high functioning wetland. The mitigation site will be transformed from a forested upland area to an emergent wetland complex (adjacent to the existing Kelsey Creek wetland complex). WSDOT is grading the mitigation site to facilitate wetland hydrology, and enhancing wetland habitat by constructing habitat structures and replanting adjacent upland areas with forest-type vegetation.

Aquatic Resources

Stream mitigation for the unnamed tributary to Sturtevant Creek will occur at Sturtevant Creek and will be designed to meet these goals:

- Increased hydrologic connectivity with two small riparian wetlands;
- Increased fish-rearing habitat; and
- Improved stream buffer conditions.

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[17] *WSDOT, 2006c.*

The project will meet these goals through installing large woody debris and other in-stream channel enhancements. The stream's buffer will be revegetated with plant species native to the area and invasive vegetation will be removed and controlled.

Wildlife Habitat

Mitigation measures to offset negative effects will include the revegetating of all temporarily disturbed soils resulting from construction activities. Planted shrubs and tree species will be maintained for a period to ensure the revegetation of target cover types are achieved. Planting will occur in areas that provide connectivity to existing wildlife habitat but still meet safety and maintenance standards set forth by WSDOT. WSDOT will prepare and implement a revegetation plan for the project.

CHAPTER 7 LIST OF PREPARERS

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CHAPTER 8 GLOSSARY

Word or Term	Meaning
acre-foot	The volume of water required to cover 1 acre of land 1-foot deep (43,560 cu ft).
area of potential effects (APE)	This is the area in which historic properties, if they are present, could be directly or indirectly affected by the project.
best management practice (BMP)	Innovative and improved environmental protection tools, practices, and methods that have been determined to be the most effective, practical means of avoiding or reducing environmental impacts.
cumulative effect	The effect on the environment that results from the incremental effect of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such actions. Cumulative effects can result from individually minor but collectively noticeable actions taking place over a period of time.
decibel (dB)	A logarithmic based unit of measure of sound pressure.
delay	The increased travel time experienced because of circumstances that impede the desirable movement of traffic.
delineation	Establishing the boundaries of a wetland by applying adopted jurisdictional methods.
demand	The desire for travel by potential users of the transportation system.
direct effect	An effect caused by an action or alternative and occurring at the same time and location. Effects may be ecological, aesthetic, historic, cultural, economic, social, or health-related.
direct-access ramp	A freeway ramp that provides a direct connection to and from managed lanes for buses, carpools, and vanpools. This avoids the need to cross several lanes of general-purpose traffic, saving time and improving traffic flow and safety.
discharge	Runoff leaving an area via overland flow, built conveyance systems, or infiltration facilities; a rate of fluid flow; or a volume of fluid passing a point per unit of time.
displacement	Removal of a business, residence, or public facility from its existing location. In the context of transportation improvements, displacement is generally the result of property acquisition for right-of-way expansion or elimination of access to a property due to traffic revisions.
downstream	Referring to the direction of the flow of a stream or river.

Word or Term	Meaning
duration	The length of time of an event.
ecosystem	A community of organisms interacting with each other, and the environment in which they live.
effect	Something brought about by a cause or agent; a result. This may include ecological, aesthetic, historic, cultural, economic, social, health, or other effects, whether direct, indirect, or cumulative. Effects may include those resulting from actions that may have both beneficial and detrimental effects.
element	Within the context of a local government comprehensive plan, one of the functional chapters required by the Washington State Growth Management Act, including: land use, housing, capital facilities, utilities, rural development (counties only), transportation, economic development, and parks and recreation. Optional elements, e.g., subarea plans or other topics, may be addressed as well.
eligible	Refers to cultural resources that meet the National Park Service criteria for listing on the National Register of Historic Places.
emergency vehicle	Any vehicle used to respond to an incident or accident. Examples include police, fire, ambulance, maintenance vehicles, and incident response tow trucks.
emergent	A plant that grows rooted in shallow water or saturated soil, where most of the plant emerges from the water or above the ground surface and stands vertically.
emergent wetlands	Wetlands comprised of plants that are rooted in shallow water or saturated soil but have foliage that extends out of the water or above the ground surface.
emission	Pollution discharged into the atmosphere from smokestacks, other vents, surface, vehicles, and other sources.
endangered species	Any species that is in danger of extinction throughout all or a substantial portion of its range.
Endangered Species Act (ESA)	Federal legislation adopted to prevent the extinction of plants and animals.
environmental impact statement (EIS)	A document prepared under the National Environmental Policy Act and/or the State Environmental Policy Act that identifies and analyzes, in detail, environmental effects of a proposed action. As a tool for decision-making, the EIS describes positive and negative effects and examines reasonable alternatives for an undertaking.
environmental justice	The provisions of Executive Order 12898 that require each federal agency to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse health and/or

Word or Term	Meaning
	environmental effects on minority and/or low-income populations.
equivalent sound level (Leq)	The equivalent steady-state sound level in A-weighted decibels for a stated period of time, which contains the same acoustic energy as the actual time-varying sound level for the same period of time.
erosion	The wearing away of soil or rock by the action of running water, wind, ice, or geologic agents. For this analysis, erosion relates primarily to stormwater runoff.
express toll lane	A limited-access freeway lane that is actively managed through a variable toll system to regulate its use and thereby maintain express travel speeds and reliability. Toll prices rise or fall in real time as the lane approaches capacity or becomes less used. This ensures that traffic in the ET lane remains flowing at express travel speeds of 45 to 60 miles per hour. Toll prices may differ for carpools, transit, motorcycles, and single-occupant vehicles. Tolls for are collected electronically using overhead scanners that read a transponder inside the vehicle and automatically debit the operator's account.
Federal Highway Administration (FHWA)	One of several agencies in the U.S. Department of Transportation, the FHWA provides federal financial assistance to the states through the Federal Aid Highway Program, the purpose of which is to construct and improve the National Highway System, urban and rural roads, and bridges.
federally-listed species	Any species of fish, wildlife, or plant that has been determined by the U.S. Fish and Wildlife Service or National Marine Fisheries Service to be endangered or threatened under Section 4 of the Endangered Species Act.
floodplain	Any land area susceptible to being inundated by flood waters from any source. This is typically the flat or nearly flat land on the bottom of a stream valley or tidal area that is covered by water during floods, including the flood fringe and floodway.
foreground	In a visual analysis, this distance zone is where the viewer has impressions of immediate details and intensity of color is at a maximum. This area can be designated with clarity and simplicity not possible for the middleground and background because the observer is a direct participant (0 to 0.25 mile).
forested land cover	Vegetated areas where trees with an average height greater than 20 feet are the predominant vegetation. See also: "shrubs/grasses land cover" and "maintained vegetation land cover".

Word or Term	Meaning
forested wetland	A wetland characterized by woody vegetation that is 20 feet tall or taller.
general-purpose lane	A freeway or arterial lane available for use by all traffic.
geographic information system (GIS)	A digital computer mapping system that can overlay a wide variety of data such as land use, utilities, and vegetative cover, and provide a spatial analysis.
groundwater	That portion of the water below the ground surface that is free flowing within the soil particles. Groundwater typically moves slowly, generally at a downward angle because of gravity, and eventually enters into streams, lakes, and oceans.
habitat	The environment or specific surroundings where a plant or animal grows or lives.
high-occupancy vehicle (HOV)	High-occupancy vehicle is a special designation for a bus, carpool, or vanpool provided as an encouragement to increase ride-sharing. Specially designated HOV lanes and parking are among the incentives for persons to pool trips, use fewer vehicles, and make the transportation system more efficient. HOV lanes are generally inside (left-side) lanes, and are identified by signs and a diamond on the pavement. Currently, two or more (2+) occupants are required to use the I-405 HOV lanes. Motorcycles are allowed to use freeway HOV lanes as well.
historic property	A cultural resource that is on or eligible for listing on the National Register of Historic Places.
hydrology	Within the context of a wetland, permanent or periodic inundation or prolonged soil saturation sufficient to create anaerobic conditions in the soil.
impervious surface	Pavement, roofs, and other compacted or hardened areas that do not allow the passage of rainfall or runoff into the ground.
indirect effect	An effect that occurs later in time or is removed in distance from the proposed action, but is still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems.
intactness	The visual integrity of the natural and human-built landscape and its freedom from encroaching elements. High intactness means that the landscape is free of eyesores and is not broken up by features that are out of place.
large woody debris (LWD)	Logs, limbs, or root wads that are waterward of the ordinary high water line. To qualify as large woody debris, it must be of sufficient size to be resistant to erosion, provide bank

Word or Term	Meaning
	stability, or help maintain or create habitat features important to fish life.
level of service (LOS)	A measure of how well a freeway or local signalized intersection operates. For freeways, LOS is a measure of traffic congestion typically based on volume-to-capacity ratios. For local intersections, LOS is based on how long it takes a typical vehicle to clear the intersection. Other criteria also may be used to gauge the operating performance of transit, non-motorized, and other transportation modes.
listed species	Any species of fish, wildlife, or plant that has been determined to be endangered or threatened. See also: "federally-listed species" and "state-listed species".
low-income	A household income that is at or below the federally designated poverty level for a given household size.
maintained vegetation land cover	Areas of roadside vegetation, including roadway medians and shoulders that are regularly maintained, and landscaped areas consisting primarily of plants grown for ornamental value for residential, commercial, and industrial developments. Maintained vegetation typically provides little to no value as wildlife habitat. See also: "forested land cover" and "shrubs/grasses land cover".
Metro Transit	The King County public transit agency.
Metropolitan Transportation Plan (MTP)	The detailed long-range plan for future investments in the central Puget Sound region's regional transportation system. For planning purposes, the MTP also is recognized as the central Puget Sound region's Regional Transportation Plan.
minority	Individuals listed in the Census as Black (a person having origins in any of the black racial groups of Africa); Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race); Asian American (a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands); American Indian/Alaskan Native (a person having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition); or some other race.
mitigation	An effort to: (1) avoid the impact altogether by not taking a certain action or parts of an action; (2) minimize the impact by limiting the magnitude of the action and its implementation, by using technology or by taking affirmative steps; (3) rectify the impact by repairing, rehabilitating, or restoring the affected environment; (4) reduce or eliminate the impact over time by preservation and maintenance operations; (5) compensate for the impact by replacing, enhancing or providing substitute

Word or Term	Meaning
	resources or environments; and/or (6) monitor the impact and take appropriate corrective measures.
modeling	Use of statistics and mathematical equations to simulate and predict real events and processes.
National Ambient Air Quality Standards	Standards established by the Environmental Protection Agency under the Clean Air Act for pollutant concentrations in outside air throughout the country.
National Environmental Policy Act	Federal legislation adopted in 1969 that established a national environmental policy intentionally focused on federal activities and the desire for a sustainable environment balanced with other essential needs of present and future generations. NEPA also established federal agency responsibility and created the basic framework for integrating environmental considerations into federal decision-making. The fundamentals of the NEPA decision-making process include: an interdisciplinary approach in planning and decision-making for actions that affect the human environment, interagency coordination, consideration of alternatives, examination of potential environmental consequences and mitigation, documentation of the analysis, and making the information available to the public for comment prior to implementation.
National Historic Preservation Act	Federal legislation adopted in 1966 that requires federal agencies to consider the effects of their undertakings on historic properties and provide the Advisory Council on Historic Preservation with an opportunity to comment on such undertakings.
National Register of Historic Places	Authorized under the National Historic Preservation Act of 1966, this is the Nation's official list of properties and other cultural resources that are recognized as deserving preservation. The National Register is administered by the National Park Service as part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archaeological resources. Properties listed in the register include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and culture.
noise abatement criteria	The FHWA noise abatement criteria specify exterior and interior noise levels for various land activity categories such as residential and commercial. WSDOT considers a noise impact to occur if predicted equivalent hourly noise levels (Leq (h)) approach within 1 dBA of the noise abatement criteria.

Word or Term	Meaning
noise level	The sound pressure level, measured using a meter with an "A" frequency weighting and reported as dBA.
noise wall	A designed wall that provides a noise buffer between a noise source and adjacent residences or other sensitive noise receptors.
off-peak	In relation to transportation, public services and utilities, off-peak means those times when fewer persons use the facility, service, or utility.
ordinary high water mark (OHWM)	The elevation marking the highest water level that is so common and maintained for a sufficient time in all ordinary years that it leaves evidence upon the landscape, such as a clear and natural line impressed on the bank, changes in soil character, destruction of or change in vegetation, or the presence of litter and debris. Generally, it is the point where the natural vegetation changes from predominately aquatic to upland species. Where the ordinary high water mark cannot be found, it is the line of mean annual flood—the highest the water gets in an average year—but not the highest it gets during extreme flooding.
park-and-ride	A facility where individuals can park their vehicle for the day and access public transportation or rideshare for the major portion of their trip.
peak	The maximum sound level during a given time interval when the normal frequency and time weighting is not used.
peak flow	The maximum instantaneous rate of flow during a storm, usually in reference to a specific design storm event.
peak hour	The hour in the morning or in the afternoon when the maximum demand occurs on a given transportation facility or corridor.
peak period	The period of the day during which the maximum amount of travel occurs. It may be specified as the morning (AM) or afternoon or evening (PM) peak.
pollutant	Any substance introduced into the environment that contaminates or otherwise adversely affects the usefulness of a resource.
publicly owned	Property that is owned and/or operated by a public entity. If a governmental body has a proprietary interest in the land (such as fee ownership, drainage easements or wetland easements), it can be considered publicly owned. Land subject to a public easement in perpetuity can also be considered to be publicly owned land for the purpose for which the easement exists.

Word or Term	Meaning
Puget Sound Regional Council (PSRC)	The Metropolitan Planning Organization (MPO) and Regional Transportation Planning Organization (RTPO) for the central Puget Sound region, which is comprised of Snohomish, King, Pierce, and Kitsap counties. The MPO and RTPO is the legally-mandated forum for cooperative decision-making about regional growth policies and transportation issues in the metropolitan planning area.
race	A characteristic of population. In the 2000 Census, race included White and Non-White (Persons of Color). Non-White includes Black or African-American alone, American Indian or Alaskan Native alone, Asian alone, Native Hawaiian or other Pacific Islander alone, some other race alone, or a mixture of two or more races. Non-White can include persons of Hispanic/Latino heritage; some Hispanic/Latinos, however, are White.
Record of Decision (ROD)	A document prepared by the federal lead agency that presents the basis for the decision reached after completion of the Final EIS. The ROD summarizes any mitigation measures that will be incorporated into the project, and documents any required Section 4(f) or other approvals.
resident fish	Fish that do not migrate out to the ocean, but remain in fresh water.
retaining wall	A structure used to hold earth in place where the natural grade cannot be maintained.
right-of-way	Land purchased prior to the construction of transportation improvements along with land for sound walls, retaining walls, stormwater facilities, and other project features. This also includes permanent or temporary easements for construction and maintenance. Vacant land may also be set aside for future highway expansion under certain circumstances.
riparian	Pertaining to anything connected with or immediately adjacent to the banks of a stream, river, or other water body.
riparian area	The land and habitat adjacent to streams, lakes, estuaries, or other waterways, comprising the transition area between the aquatic ecosystem and the nearby upland terrestrial ecosystem. Riparian corridors, or zones, identified by soil characteristics or plant communities, include the wet areas in and near streams, ponds, lakes, springs, and other surface waters.
salmonid	Any member of the family Salmonidae, which includes all species of salmon, trout, and char (including bull trout).
scrub-shrub wetland	Wetland dominated by woody vegetation less than 20 feet tall. The vegetation may include shrubs, young trees, and trees or shrubs that may be stunted because of

Word or Term	Meaning
	environmental conditions. Scrub-shrub wetlands are flooded for extended periods during the growing season.
Section 106 of the National Historic Preservation Act	Under Section 106 of the Act, federal agencies must identify and evaluate cultural resources and consider how their undertakings affect historic properties eligible for inclusion in the National Register of Historic Places. See also: "National Historic Preservation Act".
Section 4(f) of the U.S. Department of Transportation Act	Section 4(f) of the U.S. Department of Transportation Act of 1966 (49 USC 303) declares as a national policy that a special effort be made to preserve the natural beauty of the countryside, including public park and recreation lands, wildlife and waterfowl refuges, and historic sites.
sector	Within the context of an economic analysis, a high-level grouping of specific industries with common characteristics based on the standard industrial classification system.
shrubs/grasses land cover	Vegetated areas where woody plants (distinguished from a tree by their multiple stems and lower height) less than 20 feet tall, grasses and grass-like plants, or a combination of these are the predominant vegetation. See also: "forested land cover" and "maintained vegetation land cover".
social resources	Elements of the community or social environment, including population, housing, community facilities, religious institutions, social and employment services, cultural and social institutions, and government institutions.
Spill Prevention Control and Countermeasures (SPCC) Plan	A plan for minimizing effects to soil, surface water, and groundwater in the event of a spill of contaminated soil, petroleum products, contaminated water, or other hazardous substances. The SPCC plan addresses construction procedures, equipment, and materials.
State Environmental Policy Act (SEPA)	Washington State legislation adopted in 1974, that establishes an environmental review process for all development proposals and major planning studies prior to taking any action. SEPA includes early coordination to identify and mitigate any substantial issues or significant effects that may result from a project or study.
stormwater	The portion of precipitation that does not naturally percolate into the ground or evaporate, but flows overland, in channels, or in pipes into a defined surface water channel or a constructed stormwater facility.
stormwater detention	The process of storing stormwater in manmade facilities such as ponds or vaults and releasing the stormwater at a controlled rate. This helps control the volume and rate at which stormwater enters streams and rivers. Controlling the flow of stormwater helps maintain or improve conditions in the

Word or Term	Meaning
	streams and minimizes erosion of stream banks.
transponder	A small electronic device required in all toll-paying vehicles that is designed to communicate with electronic readers along the route that automatically deduct the toll amount from the vehicle operator's prepaid account balance. This technology enables in-motion, electronic toll collection without the need to stop at a toll plaza.
Unanticipated Discovery Plan	A set of procedures identifying how the project will respond to archaeological finds or human remains found unexpectedly during project construction.
unity	The visual coherence and compositional harmony of the landscape when considered as a whole. High unity frequently reflects the careful design of individual human components and their relationship in the landscape.
use	Within the context of a Section 4(f) analysis, use generally occurs when (1) land from a Section 4(f) site is acquired for a transportation project, (2) there is an occupancy of land that is adverse in terms of the statute's preservationist purposes, or (3) the proximity effect of the transportation project on the Section 4(f) site, without acquisition of land, is so great that the functions of the Section 4(f) site are substantially impaired.
vehicle	Any car, truck, van, motorcycle, or bus designed to carry passengers or goods. Bicycles and other pedestrian-oriented vehicles are not included in this definition.
view	That which can be seen either from or toward the transportation facility.
viewpoint	The position or location of the viewer.
visual effect	The degree of change in visual resources and the viewer response to those changes caused by facility development and operations.
visual quality	A subjective measure of the character of the visual resource. The many factors that contribute to a landscape's visual quality are grouped under intactness, unity, and vividness.
visual resources	The collection of all features and things that can be seen in an area.
vividness	Describes how the landscape elements combine to form a colorful, striking, or otherwise memorable composition.
Water Resource Inventory Area (WRIA)	An administrative and planning area designated by the Washington State Department of Ecology for addressing water and aquatic resource management issues. Sixty-two WRIAs have been designated, corresponding to the state's major watershed basins. The terms WRIA and watershed are

Word or Term	Meaning
	frequently used interchangeably, although a WRIA may include more than one watershed.
watershed	The region of land that drains into a specific body of water such as a river, lake, sea, or ocean. Rain that falls anywhere within a given body of water's watershed will eventually drain into that body of water.
wetland	Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.
wetland hydrology	The condition where water is present during a portion (between 5 and 12.5 percent) of the annual growing season.

CHAPTER 9 REFERENCES

GIS Sources

Exhibit 1-1

WSDOT (Washington State Department of Transportation).

2006 – 2007 I-405 Staff; project limits.

Exhibit 2-2

WSDOT.

2006 – 2007 I-405 Staff; project limits.

Exhibit 4-2 – Sheets 1 through 6

WSDOT.

2006 – 2007 I-405 Staff; project limits, existing right-of-way, proposed right-of way, relocated noise wall, proposed retaining wall, proposed stormwater features, proposed new pavement.

Exhibit 5.1-1

WSDOT.

2006 – 2007 I-405 Staff; intersection level of service.

Exhibit 5.2-3

Parsons Brinckerhoff.

2006 – 2007 Parsons Brinckerhoff Staff; Evaluated Noise Barriers.

Exhibit 5.3-1

Bellevue.

2006 Subareas, Neighborhoods.

US Census Bureau.

2002 Census 2000 Summary File 3, Washington State Census of Population and Housing. 2007. Census Tracts and Block Groups. http://www.census.gov. Washington, D.C.

Exhibit 5.3-1 – Sheets 1 through 3

King County.

2006 Standard GIS Data Disk, extract June 2007: Parcels.

WSDOT.

2006 – 2007 I-405 Staff; Existing and Proposed Right-of-Way, Proposed Impact, Proposed Property Acquisition.

Exhibit 5.5-1

City of Bellevue.

2002 Drainage Basin Maps. http://www.bellevuewa.gov/drain_basin_map.htm. Accessed February 2007.

WSDOT.

2006 – 2007 I-405 Staff; drainage basin boundaries.

Exhibit 5.6-2 – Sheets 1 through 6

USGS.

2002 Color Aerial Photography. June 2002. http://edc.usgs.2398 gov/products/aerial/hiresortho.html

WSDOT.

2006 – 2007 I-405 Staff; Project Limits, Wetlands

Base Data

Bellevue.

2006 Lakes, Parks, Streams.

GDT (Geographic Data Technology, Inc.).

2005 GDT – Dynamap Transportation. April 2005.

King County.

2006 Standard GIS Data Disk, extract June 2006:

2005 Trails in King County. Data updated by I-405 staff to match fieldwork, 2002 LiDAR and orthorectified aerial photography.

USGS (United States Geological Survey).

2002 Color Aerial Photography. June 2002. http://edc.usgs. gov/products/aerial/hiresortho.html

WSDOT (Washington State Department of Transportation).

2001 Aerial photography program. March 2001.

2006 Spatial Data Catalog, 2006, City Limits.

1997 Spatial Data Catalog, 1997, Railroads.

2006 – 2007 I-405 Staff; Tenth Mile Posts, NE 10th St Bridge, Project Area.

Text References and Verbal Communications

FHWA.

1981 Visual Impact Assessment for Highway Projects. Technical Advisory Bulletin FHWA-HI-88-054.

LaCombe, N., City of Bellevue.

2007 Personal Communication. February 15, 2007.

Transportation Research Board.

2000 Highway Capacity Manual.

United States Census.

2000 Available at: http://www.census.gov/main/www/cen2000.html.

Washington State Department of Ecology.

2006a 2004 Statewide Water Quality Assessment 303(d) List.

2005 Stormwater Management Manual for Western Washington.

WSDOT (Washington State Department of Transportation).

2007a I-405, NE 8th Street to SR 520 Braided Crossing Project Scoping Report. Olympia, Washington.

2007b I-405, NE 8th Street to SR 520 Braided Crossing Project Biological Assessment. Olympia, Washington.

2007c Environmental Procedures Manual. M31-11. April 2007.

2007d 2007-2026 Highway System Plan, High Benefit Low Cost. Olympia, Washington. Available at:

http://www.wsdot.wa.gov/planning/HSP.htm. Working Draft, September 2007.

2006a Highway Runoff Manual (HRM). M31-16. Olympia, Washington.

2006b Hydraulics Manual. M23-03. Olympia, Washington.

2005 Geotechnical Design Manual. Olympia, Washington.

2002a I-405 Corridor Program NEPA/SEPA Final Environmental Impact Statement and Final Preliminary Section 4(f) Evaluation. Olympia, Washington. June 2002.

2002b I-405 Corridor Program NEPA/SEPA Final Environmental Impact Statement Record of Decision. Olympia, Washington.