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APPENDICES

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1.0 INTRODUCTION

Northwest Ecological Services, LLC (NES) was retained by the City of Bellingham to prepare a shoreline characterization for all regulated shorelines within the city limits and the Urban Growth Area (UGA). The following text provides a summary of data compiled by NES on the attributes for distinct shoreline reaches; as well as providing proposed shoreline designations, preservation, and enhancement opportunities within each reach.

2.0 METHODS

The project is the result of compiling the available existing data and assessing it for its application to shoreline function. The documents and data reviewed are listed in a master project bibliography and provided as a Word document. Documents and data reviewed were assessed for their accuracy and application for shoreline function. In reviewing material, some data sources were not included for this analysis if the authorship could not be determined, or if there was question as to accuracy, or application to shoreline function. Some field confirmation was performed, but field work was extremely limited and not a primary task in the scope of this project. GIS layers of most the included attributes reviewed have been submitted to the City of Bellingham.

Each Shoreline Management Area (SMA) is divided into reaches, as depicted in the GIS material submitted. A summary sheet for each watershed is also provided. The watershed analysis summarizes key elements within a given SMA and its greater watershed. Each reach has a corresponding data sheet that includes a list of attributes used to analyze the general land use, potential presence of wildlife and fish species, general physical environment, specific attributes for either lacustrine, riparian or marine function, and a review of historic and cultural data. Each reach data sheet concludes with an analysis of ecological function. The function analysis reviews the hydrologic, shoreline vegetation and general habitat functions within a given reach. The function analysis identifies limiting factors that may impede function and assesses the likelihood that given functions are sustainable over time. The final portion of the reach analysis reviewed priority actions identified to improve function within a particular reach; identifies any current or proposed enhancement actions; and finishes with a list of less vital opportunities for preservation and/or enhancement actions in the SMA. References are provided in parenthesis for each attribute reviewed. The references are footnoted and refer back to the master literature list for the project (Appendix A). A glossary has been provided to define the terms used in this analysis (Appendix B). Proposed shoreline designations are included in Appendix D.

3.0 REACH DESIGNATIONS

The following tables describe individual reaches; and include information on the reach name, reference number, segment, and rationale for how the reach extent was decided. Figures depicting the extent of each reach are included in Appendix C of this report.

| Reach | Reach Limits | Segment | Rationale |
|-------------|---|---------|--|
| Chuckanut 1 | Interface with Chuckanut Bay upstream to stream gradient change on WDFW maps. | A | Reach located within limits of tidal influence and light residential use. Upper limit defined by change of gradient in stream bed. |
| Chuckanut 2 | Upper limit of Reach 1 at downstream extent and change in stream gradient at upstream limit | B | Reach located in area of moderate gradient change and low density land use. |
| Chuckanut 3 | Upper limit of Reach 2 at downstream extent and change in stream gradient at upstream limit | B | Reach located in area of low gradient change and low density land use. |
| Chuckanut 4 | Upper limit of Reach 2 at downstream extent and change in stream gradient at upstream limit | A | Reach located in area of moderate gradient change and moderate density land use. |

| Reach | Reach Limits | Segment | Rationale |
|---------------|---|----------------|---|
| Lake Padden 1 | West edge of west parking area in park east to eastern extent of lawn in swim area. | A | Reach located in moderately developed portion of park that includes structures and lawn. |
| Lake Padden 2 | East edge of lawn in swim area east to west edge of lawn in eastern lawn area of park. | B | Reach located in area of low development or modification and dominated by forested cover. |
| Lake Padden 3 | West edge of lawn in eastern lawn area of park to north side on inlet stream on east side of lake | A | Reach located in moderately developed portion of park that includes structures and lawn. |
| Lake Padden 4 | North side on inlet stream on east side of lake around south side of lake to west edge of west parking area on north side of Lake | B | Reach located in area of low development or modification and dominated by forested cover. |

| Reach | Reach Limits | Segment | Rationale |
|----------------|---|----------------|---|
| Padden Creek 1 | South of Harris Ave and upstream to McKenzie Ave | A | Extent of Tidal influence. |
| Padden Creek 2 | Upstream of McKenzie Ave to south side of Fairhaven Parkway | B | Non-Tidal, moderate density development and low stream channel gradient |

| Reach | Reach Limits | Segment | Rationale |
|----------------|---|----------------|---|
| Lake Whatcom 1 | UGA limit on Northshore Drive west to the north edge of Bloedel-Donovan Park. | A | Dense residential use along shoreline and modified shoreline |
| Lake Whatcom 2 | Defined by Bloedel-Donovan Park limits | B | Public space, public park |
| Lake Whatcom 3 | South of Bloedel-Donovan Park to southern extent of inlet near northern extent of Lakeside Ave. | C | Moderate density development, natural vegetation present, mouth of creek. |
| Lake Whatcom 4 | Northern extent of Lakeside Ave. to eastern edge of Euclid Park boundary. | A | Dense residential development and public open space. |
| Lake Whatcom 5 | South and east of eastern Euclid Park boundary to UGA Limits along Lake Whatcom Blvd. | A | Dense residential use along shoreline and modified shoreline |

| Reach | Reach Limits | Segment | Rationale |
|-----------------|--|----------------|---|
| Whatcom Creek 1 | Mouth of Creek east of Holly Street upstream to west side of Dupont Street | A | Mouth of Whatcom Creek area of salt water influence below falls, public access area. |
| Whatcom Creek 2 | West side of Dupont upstream to west side of Cornwall Ave. crossing. | B | Urban density, confined channel, limited riparian vegetation |
| Whatcom Creek 3 | West side of Cornwall crossing upstream to sewer line crossing east of I-5. | B | Urban density, confined channel, riparian vegetation corridor slightly more developed |
| Whatcom Creek 4 | Upstream of sewer line crossing east of I-5 ending at Toledo Street easement | C | Commercial zoning, riparian buffer wider, unconfined channel. |
| Whatcom Creek 5 | Toledo Street easement upstream to east side of Woburn Street crossing | C | Naturally vegetated riparian zone that is associated with wetlands and Cemetery Creek confluence |
| Whatcom Creek 6 | East of Woburn Street crossing upstream to gas pipeline crossing. | D | Natural confinement, increased channel gradient and low density development and fire influence, in Park. |
| Whatcom Creek 7 | Upstream of pipeline crossing to dam at downstream end of fishing pond in Whatcom Falls park | D | Natural confinement, increased channel gradient and low density development and no fire influence, in Park. |
| Whatcom Creek 8 | Upstream of dam at west end of fish pond in Whatcom Falls park to next dam | D | Unconfined channel, low gradient, some disturbance to riparian vegetation, in Park. |
| Whatcom Creek 9 | West of Electric Ave Bridge Crossing to dam. | D | Lagoon area, moderate residential use on east shore, park property on west shore. |

| Reach | Reach Limits | Segment | Rationale |
|--------------------|---|----------------|---|
| Squalicum Creek 1 | From western most rail crossing upstream to east side of Elderidge Road crossing | A | Tidal influence, confined channel, Industrial uses. |
| Squalicum Creek 2 | Upstream of Elderidge crossing to confluence with Baker Creek | B | Stream channel moderately confined, moderate riparian vegetation present, moderate density residential use. |
| Squalicum Creek 3 | Confluence of Baker Creek upstream to east side of Guide Meridian crossing | B | Stream channel unconfined, moderate residential land use and public property. |
| Squalicum Creek 4 | Upstream of Guide Meridian Crossing to the eastern edge of Cornwall Park | C | Forested riparian corridor through public park, moderately confined channel |
| Squalicum Creek 5 | Upstream of Cornwall Park to west edge of Squalicum Parkway culvert, includes floodplain. | D | Herbaceous and shrub riparian, old farms, private/public ownership. |
| Squalicum Creek 6 | Upstream of Squalicum Parkway road crossing to east end of Sunset Pond | E | Naturalized riparian corridor, man made ponds and ditched stream channels. |
| Squalicum Creek 7 | Upstream of east end of Sunset Pond to west side of Hannegan Road | F | Unconfined channel, naturalized riparian vegetation, lacks ponds. |
| Squalicum Creek 8 | Upstream of Hannegan Road crossing across DNR owned land. | F | Unconfined channel, public land holding, restoration potential. |
| Squalicum Creek 9 | Upstream from DNR northern boundary to northern edge of Wilder property. | G | Confined, industrial use, limited riparian vegetation |
| Squalicum Creek 10 | Upstream of northern property boundary of Wilder property to south side of Bakerview Road | G | Partially confined mixed use area. |
| Squalicum Creek 11 | Upstream of Bakerview Road crossing to UGA Boundary | G | Partially confined, low density residential use. |

| Reach | Reach Limits | Segment | Rationale |
|-----------|---|---------|--|
| Marine 1 | From northern UGA boundary southeast to southeast side of cement plant. | A | Lightly developed shoreline dominated by residential use. |
| Marine 2 | Extends from southeast side of cement plant southeast to west side of Mt. Baker Plywood site | A | Public access area (Squalicum Beach) |
| Marine 3 | West edge of Mt. Baker Plywood site southeast to southwest corner of Bellingham Cold Storage jetty. | B | Squalicum Creek Estuary, industrial use. |
| Marine 4 | Southwest corner of B'ham Cold Storage jetty east to center of the I/J Waterway | B | Dominated by Squalicum Marine, high intensity use. |
| Marine 5 | Center of I/J Waterway east to Center of Whatcom Waterway. | B | High intensity industrial use. |
| Marine 6 | Center of I/J Waterway south to toe of Cornwall Ave. | B | Dominated by GP Mill. |
| Marine 7 | Toe of Cornwall Ave. south to south end of Cornwall Fill. | B | Abandoned industrial area. |
| Marine 8 | South end of Cornwall Fill to north end of Boulevard Park | C | Residential shoreline with riparian vegetation. |
| Marine 9 | North end of Boulevard Park south to Taylor Street Dock | C | Dominated by Public access areas, mixed with residential and commercial use. |
| Marine 10 | South of Taylor Street dock to north end of Fairhaven Marine yard | D | Lightly developed area with mixed use zoning |
| Marine 11 | South of Fairhaven Marine yards northern edge south to north boundary of Marine Park, excludes Padden Lagoon. | E | High Intensity, water dependent industrial and commercial uses. |
| Marine 12 | Padden Lagoon from Railroad trestle to west side of Harris Ave. | F | Padden Lagoon, mixed use. |

| | | | |
|-----------|--|---|---|
| Marine 13 | North Marine Park boundary south to south end of Post Point. | G | Dominated by public access areas. |
| Marine 14 | South of Post Point to north end of north lagoon | H | Shoreline residential use area. |
| Marine 15 | South end of north lagoon south to south end of lagoon | I | Lagoon in shoreline residential use area. |
| Marine 16 | South of north lagoon south to north end of southern lagoon | H | Shoreline residential use area. |
| Marine 17 | North end of southern lagoon to north end of Clark's Point | I | Lagoon in shoreline residential use area. |
| Marine 18 | Northwest end of Clark's Point to northeast side | J | Lightly developed natural area- Clark's Point |
| Marine 19 | Northeast side of Clarks Point at trestle through Chuckanut Bay to south side of Bay at trestle. | K | Chuckanut bay, residential shoreline use and public access. |
| Marine 20 | Trestle at south end of Chuckanut Bay south to UGA limit. | J | Natural shoreline with Public access in development. |

4.0 CHUCKANUT CREEK SMA

Summary: The Chuckanut Creek SMA is 91.8 acres in size and has very low density development, but has the potential for significant infill. Infrastructure is limited within the SMA and a lack of sanitary sewer service to most the area currently limits growth. This SMA currently is functioning at high levels for most ecological parameters. Fecal coliform and dissolved oxygen levels have exceeded Washington State water quality parameters and their management should be a high priority for this SMA. Habitat quality is excellent throughout most this drainage and conservation is recommended. Data sheets for Chuckanut Creek are located in Appendix E.

4.1 Watershed Analysis

4.1.1 Landscape Setting

The drainage is located at the northern toe of Chuckanut Mountain and approximately half the drainage occurs within the City limits. The Chuckanut Watershed is heavily forested and part of a large forested corridor that extends south to Blanchard Mountain. It is also of the only remaining forested corridor in Washington State that extends from the Cascade Mountains to the marine system.

Chuckanut Creek flows within an incised ravine cut into continental sedimentary material and bedrock. The channel is naturally confined within the narrow ravine. The narrow nature of the ravine bottom is not conducive to channel migration to any significant extent. Squalicum-Chuckanut-Nati soils are the dominant soils types in this drainage. The soils can be generally described as moderately deep to very deep, moderately well drained, gently sloping to very steep soils, on foothills, plateaus and landslides. The side slopes of the ravine along most this SMA area range between 20% to 100%. Soils within this reach have a slight to moderate risk of erosion. The ravine widens and slopes decrease in Reach 1.

4.1.2 Land Use

Land Use: The upper reaches and headwaters of Chuckanut Creek are within unincorporated Whatcom County and it flows through low density single family zoned parcels on acreage. The drainage has sustained low to moderate impact outside the City limits, mostly associated with past timber harvest on Chuckanut Mountain and the construction of Interstate 5. Zoning within the greater watershed, outside the City limits, includes rural and commercial forestry and recreational open space with small areas of rural residential with a density of one unit per 5 acres.

Land use within the Chuckanut Creek SMA includes single family residential and public area designations. Existing platted lots and overlaying zoning indicate residentially zone property east and west of Arroyo Park are currently under-developed. Development of these areas is currently limited by the lack of sanitary sewer service. If the area is provided with sanitary sewer service an increase in density would be expected. The

central portion of the drainage is dominated by Arroyo Park, a City of Bellingham Park. The existing Shoreline Management Plan for the City of Bellingham lists Chuckanut Creek shoreline designations as Rural, Natural and Conservancy II.

Transportation and Utilities: Major roads within the Chuckanut Creek SMA include Chuckanut Drive (State Road 11) and Old Samish Road. Chuckanut Drive crosses the SMA near the intersection of Chuckanut Drive and Old Samish Road. Old Samish Road parallels and intermittently touches the northern edge of the SMA along its length from Chuckanut Drive east to the City limits. Smaller residential roads access the Chuckanut Village community, west of Chuckanut Drive.

Public Access: Public access is provided in two locations within Chuckanut Creek SMA: Chuckanut Bay; and Arroyo Park. Public access is provided via Arroyo Park which dominates Reaches Segment B. Arroyo Park is a City of Bellingham Park and includes foot trails and limited parking. Arroyo Park is maintained in a natural condition, but includes user trails and a foot bridge crossing Chuckanut Creek. The Arroyo Park trail system connects a City and County Interurban trail system that extends from Fairhaven Parkway to Larrabee State Park near the Whatcom/Skagit county line. Connecting trails to the Interurban system provide access to a well developed trail system that connects many areas on the Chuckanut/Blanchard Mountain complex.

Shoreline Modifications: Very few modifications were identified along Chuckanut Creek within the City limits. No data was located that provided information on shoreline modifications outside the City limits, but modifications appear minimal. No bulkheads or shoreline armoring were identified by NES in field review within the SMA area. Road crossings and supporting infrastructure are present at Okanogan Street in Chuckanut Village and at the Chuckanut Drive crossing. Chuckanut Creek passes under Old Samish Road via a culver near the southern City Limits. Wooden foot bridges are located within Arroyo Park, two within Chuckanut Village and one near the City limits. The average pervious surface break down for the Chuckanut Creek SMA are 9% pervious surfaces, 16% semi-pervious surface, 75% pervious surface and 7% water. Reach 1 had the greatest percent impervious and semi-pervious area of the reaches. Reaches 2-4 were nearly identical in their break down of surface condition.

4.1.3 Critical Areas

Wetlands/ Regulated Streams: Wetlands are present, but most are small and located on slopes adjacent to Chuckanut Creek or at the mouth of the creek. Scattered small (0.1 to 1.0 acre) palustrine forested and scrub-shrub wetlands are located along the length of Chuckanut Creek. Wetlands increase in size and frequency near the mouth. A variety of palustrine emergent, scrub-shrub and forested wetlands are interspersed within the SMA in Reach 1. A saltwater marsh is located at the mouth of Chuckanut Creek as it enters Chuckanut Bay.

City of Bellingham code considers Chuckanut Creek as regulated stream as defined in the City of Bellingham Wetland and Stream Regulatory Chapter. A number of tributary streams feed into Chuckanut Creek of which three are considered City of Bellingham regulatory streams (as indicated in Exhibit B of the Wetland and Stream Ordinance): #35, #38, and #39.

FEMA: A small area at the mouth of Chuckanut Creek is located within the FEMA floodplain, but not located within the floodway. All other portions of the review portions of the drainage are not indicated on the FEMA floodplain and floodway maps.

Slopes: Chuckanut Creek is located in a ravine with steep slopes along most the SMA length. Side slopes within the majority of the ravine range are at 20% to 100% slopes. Slopes along most of the Chuckanut Creek drainage are area mapped on the Whatcom County Geohazard Maps as "Landslide Hazard Areas".

Potential PHS/TSE Species: The Chuckanut SMA includes potential habitat for federally listed bull trout and federal candidate species Puget Sound coho salmon. The SMA is adjacent and flows into to hardshell shellfish beds and winter bird concentrations in Chuckanut Bay. A bald eagle nesting territory is indicated to be near, but not include the Chuckanut SMA. State Priority Habitats identified for the Chuckanut Creek include riparian habitat and wetlands.

4.1.4 Ecological Functions

Overall Chuckanut Creek is providing most ecological functions at a high level. Several limitations to ecological function have been identified for the Chuckanut SMA. Water quality standards are being met for most parameters within Chuckanut Creek, with the exception of Fecal coliform and dissolved oxygen. Chuckanut Creek has been listed by the WA Dept. of Ecology as: a Category 5 "Polluted Water" for Fecal coliform and dissolved oxygen; a Category 4 "Impaired Water" for low flow; and a Category 2 a "Water of Concern" for pH and temperature. Studies in 2002 by Plotnikoff and Wiseman found no biological degradation of aquatic life based on the *River Invertebrate and Prediction Classification System* at sample stations within the SMA (DOE Water Quality Website 2004). Instream structure is complex and provides high quality fish habitat along the entire Chuckanut SMA.

Riparian vegetation with the SMA is dominated by a second growth mixed coniferous/deciduous forest in most segments. Segments 1 and 3 also include residential lawn and ornamental gardens. The vegetation community is dominated by a diverse number of native plant species. Noxious and invasive plant species such as knotweed, teasel, ivy and herb Robert, are present but at low frequencies and are not well established.

The Chuckanut SMA provides high quality habitat to a wide variety of wildlife and fish species. It provides a wide range of habitat features, a complex structure and is well connected to other large tracts of high quality habitat. Anadromous trout and salmon use Chuckanut Creek for spawning, migration and rearing. Wildlife species associated with mixed coniferous forests are well represented. No priority species have been specifically identified for this SMA, but could be present.

4.2 Reach Analysis: Segment A (Reach Chuckanut 1)

4.2.1 Landscape Setting

This segment extends from Chuckanut Bay upstream approximately 700 feet with a total size of 11.5 acres. This portion of the drainage is located in alluvium deposits. Soils are upland soils in Drainage Class B or C, which have moderate to slow infiltration rates and have a moderate to slow rate of water transmission. The risk of erosion within the reach soils ranges from slight to moderate. Chuckanut Creek flows within an unconfined channel with an average channel gradient of 1% to 2% in this segment.

4.2.2 Land Use

Land Use: The overlaying zoning for this segment includes 10.8 acres of residential and 0.8 acres public area. Current land use includes low density single family residential and undeveloped forested property. There are a number of undeveloped "paper plats" of small lot within and around the reach. Most of this area is not served by City sewer and the houses are on private septic systems. Twenty-seven buildings are mapped for this segment. Current zoning and platted lots indicate the potential for greater density in this segment.

Transportation: Only small secondary residential roads are located in this segment.

Public Access: No public access is provided within this reach.

Shoreline Modifications: No shoreline modifications have been identified for this reach. Two foot bridges cross Chuckanut Creek and Okanogan Street crosses the stream with a bridge. Impervious surface is calculated at 18% of the segment, 28% groundcover is semi-pervious, 54% is pervious and 10% is water.

4.2.3 Critical Areas

Wetlands/ Regulated Streams: An estuarine wetland is mapped at the mouth of Chuckanut Creek as it enters Chuckanut Bay. A palustrine forested and emergent wetland is mapped in the City Wetland inventory for this reach near the mouth (6.5 acres). Regulated stream #39 is enters the segment from the south.

FEMA: A small area (1.2 acres) is mapped within the FEMA Floodplain. This area appears to be located in the salt marsh area.

Slopes: Ravine sides along the entire segment have slopes ranging from 20% to 100%. Slopes in this area mapped on the Whatcom County Geohazard Maps as “Landslide Hazard Areas”.

Potential PHS/TSE Species: This segment includes potential habitat for federally listed bull trout and federal candidate species Puget Sound coho salmon. Segment A is adjacent, and flows into, hardshell shellfish beds and winter bird concentrations in Chuckanut Bay. A bald eagle nesting territory is indicated to be in the vicinity of this segment. Bald eagle nesting territory is not documented to include the Chuckanut SMA, but use is possible. State Priority Habitats identified for this segment include instream, riparian habitat, estuary and wetlands.

4.2.4 Ecological Functions

Water Quality: This segment has been listed by the WA Dept. of Ecology as a Category 5 “Polluted Water” for Fecal coliform and dissolved oxygen, Category 4 “Impaired Water” for low flows affecting fish passage and Category 2 “Water of Concern” for pH and temperature (limited excursions from water quality standards).

Vegetation: An estimated average fifty foot forested buffer exists on both side of the channel through this reach. The remaining pervious surface is lawns and ornamental gardens.

Wildlife: Adjacent to important marine wildlife habitat including: hardshell clam and Dungeness crab habitat, dabbling bird concentrations in Chuckanut mud flats. Anadromous fish utilizing Chuckanut Creek include: coho and chum salmon, sea-run cutthroat and steelhead. Bull trout presence is presumed but not documented.

Habitat: Forested riparian area is well connected to quality habitats outside the SMA designation. Important connections include: undeveloped forested habitat connecting to the Chuckanut Mountain complex to the southeast; northeast to undeveloped forested habitat and along the shoreline of Chuckanut Bay.

4.2.5 Opportunities

Preservation

- Protect existing native forested and shrub vegetation within SMA area.

Enhancement or Restoration Opportunities

- The repair of septic systems and extension of city sewer to this area may assist in decreasing Fecal coliform levels.
- Retaining native forest and shrub cover will assist in maintaining instream water temperatures, decrease sediment that can transport Fecal coliform and protect the existing hydrological and habitat functions within this segment.

4.3 Reach Analysis: Segment B (Reaches Chuckanut 2 and 3)

4.3.1 Landscape Setting

This segment extends upstream to just east of Arroyo Park and has a total size of 34.9 acres. This segment is located in continental sedimentary deposits and bedrock. The majority of the soils are upland soils that are in Drainage Class A, B or C. The erosion risk for soils in this reach is moderate with a small area rated as slight. The channel is naturally confined within a ravine throughout these reaches with an average channel gradient of 2% to 4%.

4.3.2 Land Use

Land Use: The current zoning overlaying this reach includes 6.5 acres of residential and 28.4 acres public. Current land use is predominately forested parkland with single family residential at the east and west ends of the segment. One building is mapped for this reach. Current zoning and platted lots indicate the potential for greater density in the residentially zoned portions of the reach.

Transportation: Chuckanut Drive crosses this segment near its western edge. Old Samish Road is the only other road within the SMP designation. Old Samish Road parallels the western side edge of this segment.

Public access: Public access is provided via Arroyo Park and associated user trails. New trails are proposed for this area by the City of Bellingham Parks Department.

Shoreline modification: A box culvert with baffles for fish passage passes under Chuckanut Drive.

4.3.3 Critical Areas

Wetlands/ Regulated Streams: Small palustrine forested and scrub-scrub wetlands are located along the length of this segment the average sizes are estimated to be approximately 0.2 acres. City of Bellingham regulated streams #35 and #38 enter Chuckanut Creek in this segment. Stream 35 enters from the north, immediately northeast of the Chuckanut Road crossing. #38 enters from the south immediately southeast of the Chuckanut Road crossing.

FEMA: No areas within this segment are identified on FEMA maps.

Slopes: Ravine sides along the entire segment have slopes ranging from 20% to 100%. Slopes in this reach are mapped on the Whatcom County Geohazard Maps as "Landslide Hazard Areas".

Potential PHS/TSE Species: Bull trout presence is presumed based on suitable habitat and prey. Bull trout are Federally listed as a threatened species. Puget Sound coho may

occur within this drainage. Puget Sound coho salmon are a candidate species for Federal listing.

4.3.4 Ecological Functions

Water Quality: This segment has been listed by the WA Dept. of Ecology as a Category 5 “Polluted Water” for Fecal coliform and dissolved oxygen, Category 4 “Impaired Water” for low flows affecting fish passage and Category 2 “Water of Concern” for pH and temperature (limited excursions from water quality standards).

Vegetation: The existing forested buffer exceeds 200 feet on both side of the channel through this reach and is a second growth mixed coniferous/deciduous forest. Noxious weeds have been identified within this segment: teasel and knotweed are located adjacent to Old Samish Road in Reach 3. Ivy and herb Robert are present within Arroyo Park. Herb Robert is well established, but ivy is infrequent.

Wildlife: Anadromous fish utilizing Chuckanut Creek include: coho and chum salmon, sea-run cutthroat and steelhead. Bull trout presence is presumed but not documented. Pacific giant salamander larvae have been recorded inhabiting the segment (Jackson, unpublished data). Historical accounts of tailed-frogs from tributary stream adjacent to Chuckanut Drive. Red-legged frogs and northwestern salamanders have breeding populations in a wetland on northwest portion of Reach 2 (Jackson, unpublished data).

Habitat: Forested riparian area is well connected to quality habitats outside the SMA designation. Important connections include: undeveloped forested habitat connecting to the Chuckanut Mountain complex to the south; northeast to undeveloped forested habitat. Habitat is of high quality and includes many important habitat features. A sample analysis of stream substrate and aquatic invertebrates was conducted by DOE in this segment. The substrate is as follows: 6% sand, 17% fine gravel, 33% coarse gravel, 36% cobble, 8% boulder. The aquatic macroinvertebrate inventory indicated high diversity. These data are from one sample plot taken in Chuckanut Creek, but the analysis appears to be representative of most areas in drainage. A more comprehensive study is recommended.

4.3.5 Opportunities

Preservation

- Maintain canopy cover and forested buffer.
- Place a high priority on best management practices that control erosion and protect native soils.

Enhancement or Restoration Opportunities

- Repair none functioning septic fields in this segment.
- Work on trail design within Arroyo Park to discourage trampling of riparian vegetation.

- Control noxious weeds within reach with a high priority given to knotweed control.

4.4 Reach Analysis: Segment B (Reach Chuckanut 4)

4.4.1 Landscape Setting

This segment extends from just east of Arroyo Park to the City limits and is 45.4 acres in size. This SMA is located in continental sedimentary deposits and bedrock. The soils are upland soils that are in Drainage Class B or C. The erosion risk for soils in this reach is slight to moderate. The channel is naturally confined within a ravine throughout this segment with an average channel gradient of 2% to 4%. No channel migration areas were identified due to nature of the natural topography. Ravine slopes are mapped at 20% or greater. Impervious surface is calculated to be at 5% of reach and 13% of the reach groundcover is semi-pervious and 83% is pervious and 5% is water.

4.4.2 Land Use

Land Use: The current zoning overlaying this reach includes 43.0 acres of residential and 2.0 acres public. Current land use is predominately forested tracts with single family residential. Public holdings are limited to an area in the southeast corner of the reach. At total of 12 buildings are mapped for this reach. Current zoning and platted lots indicate the potential for greater density in the residentially zoned portions of the segment, but the majority of the segment is retained as City Park property.

Transportation: Old Samish Road is the only road within the SMP designation. Old Samish Road parallels the western side edge of this reach and crosses towards its southern extent.

Public access: No public access is provided to properties within this reach. A publicly held parcel is owned Whatcom County and no access has been developed.

Shoreline modification: No shoreline modifications have been identified for this reach, but should be field confirmed. Impervious surface is calculated to be at 7% of reach and 12% of the reach groundcover is semi-pervious and 82% is pervious and 6% is water (channel).

4.4.3 Critical Areas

Wetlands/ Regulated Streams: Small palustrine forested and scrub-scrub wetlands are located along the length of this reach. Wetlands range from 0.1 to 1.0 acres in size, with a mean of 0.4 acres. No other City of Bellingham regulated streams occur in this segment.

FEMA: No areas within this segment are identified on FEMA maps.

Slopes: Ravine sides along the entire segment have slopes ranging from 20% to 100%. Slopes in this reach are mapped on the Whatcom County Geohazard Maps as “Landslide Hazard Areas”.

Potential PHS/TSE Species: Bull trout presence is presumed based on suitable habitat and prey. Bull trout are federally listed as a threatened species. Puget Sound Coho may occur within this drainage. Puget Sound Coho salmon are a candidate species for Federal listing.

4.4.4 Ecological Functions

Water Quality: This segment has been listed by the WA Dept. of Ecology as a Category 5 “Polluted Water” for Fecal coliform.

Vegetation: An estimated average 200 foot forested buffer exists on both side of the channel through the majority of this reach. The buffer has been decreased to less than 50 feet at the southern extent of the reach as it passes through residential yards.

Wildlife: Anadromous fish utilizing Chuckanut Creek include: coho and chum salmon, sea-run cutthroat and steelhead. Bull trout presence is presumed but not documented.

Habitat: Forested riparian area is well connected to quality habitats outside the SMP designation. Important connections include: undeveloped forested habitat connecting to the Chuckanut Mountain complex to the south. Interstate 5 presents a barrier to many wildlife species movement and isolates this site from habitats to the east.

4.4.5 Opportunities

Preservation

- Maintain canopy cover and forested buffer.
- Place a high priority on best management practices that control erosion and protect native soils.

Enhancement or Restoration Opportunities

- Repair none functioning septic fields in this segment.
- Control noxious weeds within reach with a high priority given to knotweed control.

5.0 LAKE PADDEN SMA

Summary: The Lake Padden SMA is 111.3 acres in size. It has low density development and land use is dominated by a public park. This SMA currently is functioning at high levels for most ecological parameters. Habitat quality is excellent throughout most this drainage and conservation is recommended. Data sheets for Lake Padden are located in Appendix F.

5.1 Watershed Analysis

5.1.1 Landscape Setting

The Lake Padden SMA is a total size of 111.3 acres. The drainage is mainly located in continental glacial drift, with 27.8 acres of continental sedimentary deposits. Upland soils range from Drainage Class A to D. Infiltration rates for soils in the SMA are as follows: 7.8 acres of high infiltration rates; 10.3 acres moderate; 25.4 acres slow; 18.7 very slow. Steep slopes of 20 to 34% dominate the southern portion of the lake, and the north side has slopes 0 to 5%. The potential for soil erosion ranges from slight to moderate risk.

5.1.2 Land Use

Land Use: Land use within the Lake Padden SMA includes single family residential and public area designations. The majority of the reaches are located in Lake Padden Park, a City of Bellingham park. Land use in Reaches 2 and 4 is best described as natural, and it is dominated by a coniferous forest with public trails. Land use in Reaches 1 and 3 is dominated by lawn, picnic areas, parking, with small forested areas. Some residential development exists in the outer fringe of Reach 1.

The overlaying zoning for this SMA includes 58.4 acres of public area, 3.1 acres of residential. Water comprises 50 acres of this SMA. The majority of the SMA is a public park, and current land use is moderate. Five buildings are mapped for the SMA, which are city park structures. Only Reach 1 is served by City sewer, and no storm drains are located in the SMA.

Transportation and Utilities: Major roads within the Lake Padden SMA include Samish Way, Wilkin Street, and Lakeshore Road. Smaller park roads provide access throughout Lake Padden Park. No roads are located in Reach 4. Roads cover 0.8 miles and 1.4 acres throughout the SMA.

Public Access: Nearly the entire SMA is located in a public park. Public access is provided to Lake Padden Park in two locations. The entire area is accessible, including up to the shoreline, via a well developed system of trails which circles the lake. Approximately half of the SMA is maintained in a natural condition, and the remainder is maintained lawns, picnicking, and parking areas.

Shoreline Modifications: Very few shoreline modifications were identified in the lake. Modifications indicated include concrete bulkheads along the parking area near the tennis courts in Reach 1, two docks, and one dam at the outlet (Padden Creek). Impervious surface for the SMA is very low; land is covered by approximately 67% pervious, 25% is semi-pervious and 9% impervious surfaces.

5.1.3 Critical Areas

Wetlands/ Regulated Streams: Four streams are mapped in the Lake Padden SMA. Two tributaries (#28 and #29) are located in Reach 1, one tributary (#31) in Reach 2, and Padden Creek (#30) in Reach 4. All streams are regulated under COB Wetland and Stream Ordinances. Padden Creek is also regulated under the COB Shoreline Master Program, but only at the lower reaches of the creek, which does not extend into this SMA.

Lake Fringe wetlands are indicated at the shorelines in Reaches 1, 3 and 4. Ten small depressional wetlands indicated in depressions between slopes in Reach 4; and the edge of a larger wetland complex in indicated at the southeastern extent of the reach. No wetlands are indicated in Reach 2.

FEMA: Within the SMA, 50.8 acres are mapped within the FEMA 100 year floodplain, and none are mapped in the floodway. All other portions of the SMA are not indicated on the FEMA floodplain and floodway maps.

Slopes: The majority of the northern half of the lake has slopes ranging from 0% to 10%, with small areas of slope class 20 to 34% present. While the majority of the southern half of the lake is dominated by 20-34% slopes. Slopes in the southern half of the lake are mapped as potential "Landslide Hazard Areas" on the Whatcom County Geohazard Maps.

Potential PHS/TSE Species: Priority species identified for this SMA, include bald eagle, which is a federally threatened species. A bald eagle nesting territory is indicated overlaying the entire SMA. Resident cutthroat trout, a federal species of concern is indicated in the lake. No additional species of concern are listed for this SMA. Habitat for breeding/ nesting/ wintering use by multiple PHS or SC is documented throughout the SMA. Connectivity of habitats is excellent for Reaches 2 and 4; and the reaches provide a wide range of habitat features, a complex structure, and are well connected to other large tracts of high quality habitat.

5.1.4 Ecological Functions

Overall Lake Padden is providing most ecological functions at a high level. Water quality standards are being met for most parameters, with the exception that the lake has been listed by the WA Department of Ecology as a Category 5 "Polluted Water" for

pentachlorophenol, and Category 2 “Water of Concern” for pH and temperature (one excursions of each in 2001).

Terrestrial vegetation with the SMA is dominated by a second growth mixed coniferous/deciduous forest in most segments. Reaches 1 and 3 also include a large area of maintained lawn and picnic areas. Areas of mature native forest with a high quality native plant community are present throughout the drainage. Noxious, invasive plant species such as Himalayan blackberry and reed canarygrass are present but at low frequencies and are not well established.

The Lake Padden drainage provides high quality habitat to a wide variety of wildlife and fish species. Wildlife species associated with mixed coniferous forests are well represented. Resident cutthroat trout and Kokanee use the lake and Padden Creek for spawning and rearing. Nearly 100% of this SMA is indicated as having habitat for garter snakes and lizards including denning habitat, a variety of non-urban mammals and birds including habitat specific species, and a variety of native amphibians.

5.2 Reach Analysis: Segment A (Reach Padden 1 and 3)

5.2.1 Landscape Setting

This segment is located in the northwest and southeast sections of the lake, with a total size of 40.2 acres. This portion of the drainage is located in continental glacial drift. Upland soils are in Drainage Class A, B or D, and the soils that cover the most acreage have moderate or very slow infiltration rates. The risk of erosion within the reach soils ranges from slight to moderate.

5.2.2 Land Use

Land Use: The overlaying zoning for this segment includes 20.2 acres of public area, 2.2 acres of residential. Water comprises 17.8 acres of this segment. The majority of the segment is a public park, and current land use is moderate. Five park buildings are mapped within this segment. Only Reach 1 is served by City sewer, and no storm drains are located in this segment.

Transportation and Utilities: Samish Way is the only major road in this segment. Additional secondary roads include Wilkin Street, Lakeshore Road, and small access roads within the park. Roads cover 0.7 miles or 1.1 acres throughout the segment.

Public Access: Public access is provided throughout the segment. A parking area for Lake Padden Park is located in each reach of the segment. The entire area is accessible, including up to the shoreline, via a well developed system of trails which circles the lake.

Shoreline Modifications: Shoreline modifications include concrete bulkheads along the parking area near the tennis courts in Reach 1. No additional shoreline modifications have been identified for this segment. Impervious surface is calculated at 15% of the segment, 31% is semi-pervious, and 54% is pervious.

5.2.3 Critical Areas

Wetlands/ Regulated Streams: Tributaries #28 and #29 are located in Reach 1 and are both regulated under COB Wetland and Stream Ordinance. Lake Fringe wetlands are indicated at the shoreline in Reaches 1 and 3. No additional wetlands are documented within this segment.

FEMA: 18.0 acres within this segment are mapped within the FEMA Floodplain.

Slopes: The majority of the segment has slopes ranging from 0% to 10%. Small areas of slope class 20 to 34% are also present. None of the slopes in this segment are mapped on the Whatcom County Geohazard Maps as "Landslide Hazard Areas".

Potential PHS/TSE Species: Priority species identified for this segment include bald eagle, which is a federally threatened species. A bald eagle nesting territory is indicated overlaying the entire SMA. Resident cutthroat trout, a federal species of concern is indicated in the lake. No additional species of concern are listed for this segment. Habitat for breeding/ nesting/ wintering use by multiple PHS or SC is documented throughout this segment.

5.2.4 Ecological Functions

Water Quality: This segment has been listed by the WA Dept. of Ecology as a Category 5 "Polluted Water" for pentachlorophenol, and Category 2 "Water of Concern" for pH and temperature (one excursions of each in 2001).

Vegetation: Vegetation cover is low, and approximately 55% of this segment is a maintained lawn. Areas of mature native forest with emergent, trees, and high quality native plant community are also present interspersed throughout the segment.

Aquatic vegetation documented in the lake includes common elodea, big-leaf pondweed, curly leaf pondweed, tapegrass (non-native), spatterdock, and Chara (Whatcom County Noxious Weed Board, 2004). Additional emergent species documented in the lake include cattail, small fruited bulrush, slough sedge, jointed rush, and soft-stem bulrush. Non-native, invasive Himalayan blackberry and reed canarygrass have also been documented in this segment.

Wildlife: This segment has good quality habitat to a wide variety of wildlife and fish species. Resident cutthroat trout are documented in the lake. Kokanee are indicated in the tributary streams. Nearly 100% of this segment is documented with an abundance of

garter snakes, and lizards present including denning habitat, a variety of non-urban mammals and birds including habitat specific species, and a variety of native amphibians present.

Habitat: Habitat for breeding/ nesting/ wintering use by multiple PHS or SC is documented throughout this segment. Connectivity of habitats is moderate, and the forested portions of the segment provide a wide variety of habitat features, and a complex structure.

5.2.5 Opportunities

Preservation

- Protect existing native forested and shrub vegetation within SMA area.

Enhancement or Restoration Opportunities

- Enhancement of shoreline vegetation in areas with low recreational use.
- Relocation of park trails away from the shoreline.
- Control of invasive, non-native plants.

5.3 Reach Analysis: Segment B (Reach Padden 2 and 4)

5.3.1 Landscape Setting

This segment is located in the northwest and south sections of the lake, with a total size of 71.1 acres. This portion of the drainage is located in continental glacial drift, with 27.8 acres of continental sedimentary deposits. Soils in Reach 2 are in equally split in Drainage Class A and D, which have very slow or very high infiltration rates. Soils in Reach 4 are in Drainage Class C and D, which have slow to very slow to very high infiltration rates, and high runoff potential. The risk of erosion in this segment ranges from slight to moderate.

5.3.2 Land Use

Land Use: The overlaying zoning for this segment includes 38.2 acres public area, 0.9 acres of residential, and water covers 32.2 acres of this segment. Current land use is low and the majority of the segment is public property. No buildings are mapped for this segment. Sanitary sewer is only present in Reach 2, and no storm drains are located in this segment.

Transportation and Utilities: The primary road in this segment is Samish Way. Secondary roads include Lakeshore Road; and additional small access roads within the park in Reach 2. No roads are located in Reach 4. Roads cover 0.1 miles or 0.3 acres in this segment.

Public Access: Public access is provided throughout this segment, including up to the shoreline, via a well developed system of trails which circle the lake.

Shoreline Modifications: Two docks and one dam at the outlet (Padden Creek) are located in this segment. No additional shoreline modifications have been identified for this segment. Impervious surface is calculated at 3% of the segment, 18% is semi-pervious, and 79% is pervious.

5.3.3 Critical Areas

Wetlands/ Regulated Streams: Two streams are located in this segment. One inflowing stream (#31) which is located at the southeastern edge of Reach 2; and Padden Creek (#30) which enters the lake at the eastern edge of Reach 4 and exits the lake at the western edge. Both streams are regulated under COB Wetland and Stream Ordinances.

Lake Fringe wetlands are indicated at the shoreline in the northern extent of Reach 4. Ten small wetlands in depressions in-between slopes are located throughout Reach 4; and the edge of a larger wetland complex is indicated at the southeastern extent of the reach. No wetlands are indicated in Reach 2.

FEMA: 32.8 acres within this segment are mapped within the FEMA Floodplain. None of this segment lies within a floodway.

Slopes: The majority of Reach 2 has slopes ranging from 0% to 10%, which are not mapped on the Whatcom County Geohazard Maps as "Landslide Hazard Areas". The majority of Reach 4 has slopes ranging from 20% to 35% or greater, and they are mapped on the Whatcom County Geohazard Maps as "Landslide Hazard Areas".

Potential PHS/TSE Species: Priority species identified for this segment include bald eagle, which is a federally threatened species. A bald eagle nesting territory is indicated overlaying the entire SMA. Resident cutthroat trout, a federal species of concern is indicated in the lake. No additional species of concern are listed for this segment. Habitat for breeding/ nesting/ wintering use by multiple PHS or SC is documented throughout this segment.

5.3.4 Ecological Functions

Water Quality: This segment has been listed by the WA Dept. of Ecology as a Category 5 "Polluted Water" for pentachlorophenol, and Category 2 "Water of Concern" for pH and temperature (one excursions of each in 2001).

Vegetation: Vegetation cover is high in this segment. Nearly 100% of this segment is a diverse multi-structured, mature native forest with emergent trees, and a high quality native plant community.

Aquatic vegetation documented in the lake includes common elodea, big-leaf pondweed, curly leaf pondweed, tapegrass (non-native), spatterdock, and Chara. Additional emergent species documented in the lake include cattail, small fruited

bulrush, slough sedge, jointed rush, and soft-stem bulrush. Non-native, invasive Himalayan blackberry and reed canarygrass have been documented in this segment.

Wildlife: This segment has excellent quality habitat to a wide variety of wildlife and fish species. Wildlife species associated with mixed coniferous forests are well represented. Resident cutthroat trout and Kokanee use the lake and Padden Creek for spawning and rearing. Nearly 100% of this segment is documented with an abundance of garter snakes, and lizards present including denning habitat, a variety of non-urban mammals and birds including habitat specific species, and a variety of native amphibians present. Movement is possible for all sizes of animals, including amphibians throughout the segment.

Habitat: Habitat for breeding/ nesting/ wintering use by multiple PHS or SC is documented throughout this segment. Connectivity of habitats is high, the segment provides a wide variety of habitat features, a complex structure, and is well connected to other large tracts of high quality habitat.

5.3.5 Opportunities

Preservation

- Protect existing native forested and shrub vegetation within SMA area.

Enhancement or Restoration Opportunities

- Enhancement of shoreline vegetation in areas with low recreational use.
- Relocation of park trails away from the shoreline.
- Control of invasive, non-native plants.

6.0 PADDEN CREEK SMA

Summary: The Padden Creek SMA has urban density development. Most areas are built out to near capacity, but some growth may be seen in the commercially zoned areas near the mouth. A variety of roads and utility service are present with the SMA, however stormwater retention and treatment is lacking. This SMA currently is functioning at moderate levels for most ecological parameters. Fecal coliform, temperature and dissolved oxygen levels have exceeded Washington State water quality parameters and their management should be a high priority for this SMA. An extended culvert under Fairhaven Parkway is a significant fish passage barrier replacement should be a high priority. Data sheets for Padden Creek are located in Appendix G.

6.1 Watershed Analysis

6.1.1 Landscape Setting

The Padden Creek drainage lies entirely within the City of Bellingham limits. Padden Creek originates in Padden Lake. A control feature is located at the outlet of the lake.

From Lake Padden, Padden Creek flows through a deep ravine, passes under Interstate 5 and flows through Happy Valley, south of Fairhaven Parkway. A long section of the creek has been placed in a culvert that extends from Fairhaven Parkway to 19th Street. Only the southern portion of Padden Creek actually occurs within the SMA, however for the purposes of this study the review area was extended to the culvert under Fairhaven Parkway.

Padden Creek flows within an incised ravine cut into sedimentary material. Within the SMA the channel is naturally confined within a narrow ravine with steep slopes. Ravine side range from 20% to 100% slopes and erosion is evident in a number of areas. The narrow nature of the ravine bottom is not conducive to significant channel migration. Squalicum-Chuckanut-Nati soils are the dominant soils types in this drainage, with areas of Whatcom-Labounty soils. The soils can be generally described as moderately deep to very deep, moderately well drained (poorly drained in Labounty soils), gently sloping to very steep soils, on foothills, plateaus and landslides. Whatcom-Labounty soils occur on glaciomarine drift and are mapped in portions of Reach 1. The side slopes of the ravine along most this SMA area range between 20% to 100%. The ravine ends north and east of Fairhaven Parkway and at the mouth of Padden Creek in Reach 1.

6.1.2 Land Use

Land Use: Within the review area Padden Creek flows through areas with a wide range of zoning including residential, commercial, industrial and public zoning. Zoning upstream of the SMA is predominately residential single family mixed with pockets of residential multifamily, commercial and public zoning. The drainage has sustained moderate to high levels of impact, including extensive culverting, rerouting the channel and alteration within collector basins. A large portion of the Padden Creek SMA is publicly accessible through Greenways trails and Fairhaven Park.

Existing land use in the areas outside of publicly zone property is densely developed in most areas, although the area at the north end of Reach 1 appears underdeveloped. Existing platted lots and overlaying zoning indicate residentially zone property is mostly developed. Undeveloped plated parcels are mostly located on steep slopes of Padden Creek ravine. Fairhaven Park and associated Greenways trails dominate Reach 3 of this drainage. A well developed Greenways trail system parallels Padden Creek for the entire SMA.

Transportation and Utilities: Major roads within the Padden Creek SMA include Harris Street, 12th Street and Fairhaven Parkway. Harris Street crosses Padden Creek at the interface between Padden Lagoon and Padden Creek. Twelfth Street crosses over Padden Creek via a tall bridge in Reach 2. Fairhaven Parkway is the eastern extent of this review. Padden Creek passes under Fairhaven Parkway via an extended culvert that does not daylight until 19th Street. Smaller residential roads access the surrounding neighborhoods and business districts. Sewer mains are located under the Greenways trails for the entire length of the creek. Untreated, un-detained stormwater enters the creek from a number of outflows along the entire length of the creek.

Public Access: Public access is provided along most the SMA via a well developed series of Greenways trails maintained by the City of Bellingham. The trail system parallels the stream and is located on top of a city sewer main. The trail system connects to other Greenway trails and to adjacent neighborhoods and business districts. Fairhaven Park provides the other primary access to the Padden Creek SMA and connects to the Greenways trails.

Shoreline Modifications: Very few modifications were identified along Padden Creek within the SMA. Padden Creek flows within a naturally confined channel within the ravine. No bulkheads or shoreline armoring are identified within the SMA area, except where associated with culvert or bridge crossing. Three fish passage structures are located within the SMA. A footbridge crosses the creek in Fairhaven Park.

6.1.3 Critical Areas

Wetlands/ Regulated Streams: Wetlands are present adjacent to Padden Creek at the ravine bottom and on side slopes draining into Padden Creek. Identified wetlands include palustrine forested, scrub-shrub and emergent wetlands. Three tributary streams are mapped as flowing into Padden Creek.

FEMA: Portions of the Padden Creek SMA are indicated on the FEMA floodplain and floodway maps.

Slopes: Padden Creek is located in a ravine with steep slopes along most its length within the SMA. Side slopes within the majority of the ravine range from 20% to 100% slope. These areas are not depicted as geological hazards on the Whatcom County maps.

Potential PHS/TSE Species: The Padden Creek SMA includes potential habitat for federally listed bull trout and federal candidate species Puget Sound Coho salmon. State Priority Habitats identified for the Chuckanut Creek include riparian habitat and wetlands.

6.1.4 Ecological Functions

Padden Creek provides ecological functions at a range of levels. Several limitations to ecological function have been identified for the Padden Creek SMA. Water quality standards are not being met for a variety of parameters and may affect the SMA reaches. Upstream reaches of the drainage also are not meeting standards for some parameters. Padden Creek has been listed by the WA Dept. of Ecology as: a Category 5 "Polluted Water" for fecal coliform, temperature and dissolved oxygen; a Category 4 "Impaired Water" for bio-assessment and fish passage. Studies in 2002 by Plotnikoff and Wiseman found biological degradation of aquatic life based on the *River Invertebrate and Prediction Classification System* at sample stations within the SMA (DOE Water Quality Website

2004). Instream habitat function ranges from moderate to high throughout the drainage. Upstream land use and stream condition have had deleterious effects on the SMA area.

Riparian vegetation with the SMA is dominated by a mixed deciduous forest in a narrow range of age classes averaging about 30 to 40 years of age. The understory generally lacks complexity and is dominated by native and non-native shrub species. Invasive plants have become well established throughout this SMA and have decreased the structure and species diversity. The natural topography and public land holdings have resulted in a broad forested corridor extending from the marine system, connecting the SMA riparian corridor with other terrestrial and wetland habitats.

The Padden Creek SMA provides moderate quality habitat to a variety of wildlife and fish species. None native, invasive eastern grey squirrels are well established in this corridor. Terrestrial habitat features such as snags and downed woody debris, are present, but not common. When present they represent a narrow range of age classes, species and decay levels. Anadromous trout and salmon use Padden Creek for spawning, migration and rearing. The drainage has a particularly healthy population of chum salmon. Wildlife species associated with mixed deciduous forests are well represented. No priority wildlife species have been specifically identified for this SMA, but could be present.

6.2 Reach Analysis: Segment A (Reach Padden Creek 1)

6.2.1 Landscape Setting

This segment extends from Padden Lagoon upstream approximately 500 feet. This portion of the drainage is located in alluvium deposits in glaciomarine drift. Soils are upland soils in Drainage Class B or D. Soils in drainage Class B have moderate infiltration rates when wet and moderate water transmission and Class D soils have very slow infiltration and have a very slow rate of water transmission. The risk of erosion within the reach soils ranges from slight to severe. Most of the soils have a slight risk of erosion, but a small area has a severe risk. Padden Creek flows within an unconfined to moderately confined channel with an average channel gradient of 1% to 4% in Reach 1.

6.2.2 Land Use

Land Use: The overlaying zoning for this 13.4 acre reach includes 3.5 acres of residential, 3.5 acres of commercial, 1.4 acres of industrial and 0.8 acres public area. Current land use includes high density single family residential and lightly utilized commercial and industrial properties. There are a number of undeveloped "paper plats" of small lot within and around the reach, but most of these are located on the steep side slopes of the ravine.

Current zoning and platted lots indicate the potential for greater density in the commercial and industrial portions of this reach, but little change is anticipated in the residential areas.

Transportation/Utilities: Harris Avenue is the largest road in this reach. Harris Ave crosses Padden Creek at the interface of Padden Lagoon and the Creek via concrete culverts. Utilities in the reach include storm and sewer mains. A sanitary sewer main parallels the Creek and the access road provides the base for the Greenway Trail. A sewer line is suspended above Padden Creek channel near the McKenzie Street easement.

Public Access: Public access is provided along this entire segment via the Greenway trails.

Shoreline Modification: No shoreline modifications have been identified for this reach except those associated with stream crossings. Padden Creek flows through three culverts. All of which appear to be fish passable. Impervious surface is calculated at 27% of reach and 36% of the reach groundcover is semi-pervious and 37% is pervious and 11% is water.

6.2.3 Critical Areas

Wetlands/ Regulated Streams: A palustrine scrub-shrub and emergent wetland (approximately 1.0 acre) is indicated on the 1992 City Wetland Inventory. This wetland is located where the ravine bottom widens out and a small drainage enters from the west. The unnamed drainage appears to be a surface water collector ditch that is fed by runoff from the surrounding industrial and residential properties. This ditch could be a source of contaminants.

FEMA: Portions of this segment are indicated on the FEMA floodplain and floodway maps. Mapping indicates 4.7 acres occurs within the 100 year floodplain and 1.2 acres are in the floodway. These areas are located in the ravine bottoms.

Slopes: Ravine sides along most of the segment have slopes ranging from 20% to 100%. Slopes are not mapped on the Whatcom County Geohazard Maps as "Landslide Hazard Areas".

Potential PHS/TSE Species: This segment includes potential habitat for federally listed bull trout and federal candidate species Puget Sound Coho salmon. Segment A is adjacent, and flows into the estuary in Padden Lagoon. State Priority Habitats identified for this segment include instream, riparian habitat, estuary and wetlands.

6.2.4 Ecological Functions

Water Quality: This segment has been listed by the WA Dept. of Ecology as a Category 2 "Water of Concern" for pH, temperature and dissolved oxygen (limited excursions from water quality standards).

Vegetation: An estimated average 75 foot forested buffer exists on both sides of the channel through this segment. The forested riparian buffer is well developed in the upper portion of the segment. The lower one-third of the segment passes through an industrially zoned area that currently is a gravel pad supporting weedy herbaceous species. The Tennis Club building covers a significant area of this segment. English ivy, holly and bindweed are invasive plants that are well established within this reach. Control is recommended.

Wildlife: Little data is available on specific wildlife use within this segment outside of anadromous fish. Anadromous fish species utilizing this segment include: Coho, Chinook and Chum salmon, sea-run Cutthroat and Steelhead. Bull trout presence is presumed but not documented.

Habitat: This segment flows into Padden Lagoon estuary and provides important passage functions for anadromous fish species transitioning into and out of the marine environment. Most of this segment is tidally influenced and salt water enters the system. Data on instream habitat features and substrate is lacking for this segment. NES field review observed little large woody debris within the channel, a silty substrate in the lower reaches with mixed gravels behind the tennis club. Surrounding riparian vegetation is a young mixed deciduous forest dominated by red alder. The understory ranges from sparse to well developed with willow and salmonberry. The Greenways trail is located close to the stream bank and vegetation is trampled in a number of areas. The channel braids at the bend behind the tennis club and the ravine bottom is vegetated. Garbage is present in this area. The forested riparian area provides a travel corridor from the marine environment and upstream terrestrial habitat as well as refuge for wildlife in this urban area.

6.2.5 Opportunities

Preservation

- Protect existing forested and shrub vegetation within the ravine of this segment area.

Enhancement or Restoration Opportunities

- Retaining and enhancing native forest and shrub cover will assist in maintaining instream water temperatures, proper oxygen levels.
- The addition of large woody debris in this segment would increase the functional aspects of this segment for fisheries.
- Educational signage may assist in retaining riparian vegetation adjacent to the trail.
- Improved stormwater treatment and retention.
- The removal of invasive and noxious weeds (particularly bindweed) is highly recommended to maintain species and structural integrity and maintain

supporting functions such as instream water quality, temperature control and general biotic support.

6.3 Reach Analysis: Segment B (reaches Padden 2 and 3)

6.3.1 Landscape Setting

This segment is located in continental sedimentary deposits and bedrock. The majority of the soils are upland soils that are in Drainage Class D with small areas of B. The erosion risk for soils in this reach is slight with a small area rated as severe. The channel is indicated to be confined within a ravine throughout these reaches with an average channel gradient of 1% to 2%. Channel migration is limited by the steep banks for the ravine and the sewer main/trail bed.

6.3.2 Land Use

Land Use: The current zoning overlaying this reach includes 20.2 acres of public, 12.3 acres residential and 3.0 acres commercial. Fairhaven Park dominates this segment. Multi-family complexes are located at the top of bank in the northwest corner of the segment. Areas within the ravine are predominately a mixed deciduous forest. Current zoning and platted lots indicate little change within this segment.

Transportation/Utilities: Fairhaven Parkway, Chuckanut Drive and 12th Street are the major roads that intersect the reach. Chuckanut Drive touches the segment on the south side near Fairhaven Park, Fairhaven Parkway defines the upstream end of the SMA, and 12th Street crosses Padden Creek via a tall bridge that spans the ravine. Footings from the 12th Street bridge are located within the ravine, but are not located in the active channel bed. Small neighborhood roads are located in the SMA in the southwest corner of the segment. There are utilities present, and a lack of storm water retention or treatment.

Public access: Public access is provided along this entire segment via the Greenway trails and Fairhaven Park.

Shoreline Modification: Few shoreline modifications were identified for this reach. Bank modification has been made of concrete and riprap around culvert crossing. Three culvert crossings were identified for this segment; three where the sewer main/greenways trails cross the stream and one where Donovan and 10th Streets. None of the culverts are indicated as fish passage impairments. Three instream fish passage structures are located in this reach: two concrete fish ladders and one wooden weir system. Impervious surface coverage calculated to be at 24% of reach and 29% of the reach groundcover is semi-pervious and 47% is pervious and 10% is water (channel).

6.3.3 Critical Areas

Wetlands/ Regulated Streams: The 1992 City of Bellingham Wetland inventory indicates the ravine bottom contains has extensive palustrine scrub-shrub and forested

wetland. Small slope wetlands also are present throughout this segment. A large palustrine scrub-shrub wetland enters drains into Padden Creek at the northern extent of the segment. This wetland appears to have important base flow and water quality contributions to Padden Creek. Although several small drainages enter this segment, none are regulated by the 1991 City Wetland and Stream Regulatory Chapter. This drainage appears to originate from surface runoff and untreated storm runoff.

FEMA: Portions of this segment are indicated on the FEMA floodplain and floodway maps. Mapping indicates 6.4 acres occurs within the 100 year floodplain and 2.9 acres are in the floodway. These areas are located in the ravine bottoms.

Slopes: Ravine sides along most of the segment have slopes ranging from 20% to 100%. Slopes are not mapped on the Whatcom County Geohazard Maps as "Landslide Hazard Areas".

Potential PHS/TSE Species: This segment includes potential habitat for federally listed bull trout and federal candidate species Puget Sound Coho salmon. This segment includes the following PHS habitat: instream, riparian, wetland, urban natural open space.

6.3.4 Ecological Functions

Water Quality: This segment has been listed by the WA Dept. of Ecology as a Category 5 "Polluted Water" for Fecal coliform, Category 4 "Impaired Water" for a fish passage impairment (Fairhaven Parkway culvert) and Category 2 "Water of Concern" for Diazinon and Chlorothalonil (limited excursions from water quality standards in 2001).

Vegetation: The existing forested buffer averages about 150 feet on both side of the channel through this reach and is restricted primarily to the side slopes and bottom of the ravine. Noxious weeds have been identified within this segment: English ivy, bindweed, holly, and Himalayan blackberry. Himalayan blackberry is the dominant vegetation cover in several places, particularly immediately east of the Donovan/10th Street crossing. Purple loosestrife is located upstream, outside the SMA, in the vicinity of Happy Valley Park and 24th Street. This invasive species could spread downstream, particularly in disturbed wet habitats.

Wildlife: Little data is available on specific wildlife use within this segment outside of anadromous fish. Anadromous fish documented to utilize Padden Creek include: coho, chinook and chum salmon, sea-run cutthroat and steelhead. Bull trout presence is presumed but not documented. Grey squirrels are well established in this corridor. This species is not native and is invasive.

Habitat: NES field review observed little large woody debris within the channel, a silty substrate in the lower reaches with mixed gravels behind the tennis club. Surrounding riparian vegetation is a young mixed deciduous forest dominated by red alder. The

understory ranges from sparse to well developed with willow and salmonberry. The Greenways trail is located close to the stream bank and vegetation is trampled in a number of areas. The channel braids at the bend behind the tennis club and the ravine bottom is vegetated. The forested riparian area provides a travel corridor for wildlife species connecting the marine system with other terrestrial habitats.

In stream habitat provides moderate to high function. No data on large woody debris was located, but NES field review noted moderate levels on instream woody debris. Future contributions from the terrestrial areas appear to be moderately good, however most the trees are of narrow range of age classes and species and may not provide a good long term supply of material to the stream. This segment has a large amount of undercutting on the ravine banks, resulting in undercut banks for fish refuge. A sample analysis of stream substrate and aquatic invertebrates was conducted by DOE in this segment. The substrate is as follows: 4% sand, 7% fine gravel, 26% coarse gravel, 62% cobble, 2% boulder. The aquatic macroinvertebrate inventory indicated moderate diversity. This analysis appears to be representative of most areas in drainage, except at the mouth where silt levels appear high.

6.3.5 Opportunities

Preservation

- Protect existing forested and shrub vegetation within the ravine of this segment area.

Enhancement or Restoration Opportunities

- Retaining and enhancing native forest and shrub cover will assist in maintaining instream water temperatures, proper oxygen levels.
- Educational signage may assist in retaining riparian vegetation adjacent to the trail.
- The removal of invasive and noxious weeds (particularly ivy and Himalayan blackberry) is highly recommended to maintain species and structural integrity and maintain supporting functions such as instream water quality, temperature control and general biotic support.
- Removal culvert under Fairhaven Parkway and vicinity or changed channel route to provide more day-lighted areas to improve fish passage.

7.0 LAKE WHATCOM SMA

Summary: The northern most portion of Lake Whatcom, Basin One and parts of Basin Two, are located within the City and the Urban Growth Boundary. SMA jurisdiction within this segment is approximately 309 acres. Land use is dominated by high density urban residential development. The only public access is Bloedel-Donovan Park. Many areas within Basin One are considered polluted for dissolved oxygen and/or mercury. Habitat loss is extensive. Only two significant native habitat areas remain in Lake Whatcom Reaches 3 and 4. Data sheets for Lake Whatcom are located in Appendix H.

7.1 Watershed Analysis

7.1.1 Landscape Setting

Lake Whatcom is a large body of water that was created by glaciation. The lake consists of three basins separated by distinct glacial sills. Basin 1 and a portion of Basin 2 are located within the City of Bellingham or the Urban Growth Area. Basins 1 and 2 are relatively shallow (20 to 25 m maximum depth). The lake is fed by several creek systems around the lake. Surface water exits the lake from the north (Basin 1) via Whatcom Creek. The hydroperiod of the lake has been reversed and controlled for recreation and erosion control purposes. Lake levels are maintained at higher levels during the summer and lowered during the winter. This change in water level and discharge also affects the hydroperiod of Whatcom Creek.

The lake is situated in a valley formation dominated by sedimentary deposits and rocks. The soils in the vicinity of the lake reflect the sedimentary nature of the geology. The soils in Reaches 1-4 and the northern half of Reach 5 are Group B hydrologic soils and have moderate filtration rates and runoff potential. The soils in the southern half of Reach 5 are Group A hydrologic soils and have high filtration and low runoff potential. Approximately 50% of the soils in the Lake Whatcom SMA jurisdiction are susceptible to severe sheet flow and rill erosion; the remaining soils are a slight risk for erosion. Lake substrate in Basin 1 tends to have a higher content of sand and gravel. Basin 2 tends to have less sand and gravel due to the increased presence of mud and bedrock.

7.1.2 Land Use

Land Use: Urban level residential density is extensive in the shoreline jurisdiction of Lake Whatcom. Single family residential development is high in Basin 1 and moderate to high in Basin 2. The exception to this is Reach 2 which is dominated by Bloedel-Donovan Park, a public city park. Future development in the Lake Whatcom watershed is uncertain. Zoning ranges from rural residential to commercial forestry. Potential residential densities could be substantial and would have an increasing impact on overall ecological functions.

Transportation and Utilities: A major arterial and associated collector streets dominate the transportation system. Northshore Road, Electric Avenue and Lake Whatcom Boulevard are the main access roads and are often just within or adjacent to SMA jurisdiction. Portions of Northshore Road and Electric Avenue are public transportation routes for bus service.

Public Access: Bloedel-Donovan Park dominates Reach 2. This park is the only existing public access to lake recreation in the City of Bellingham. Two small neighborhood association parks are located along the lake shore in Reach 1, but access is limited and not open to the general public. One privately owned parcel of open space is also located in Reach 1; again, there is no access to the general public. Euclid County Park Reserve is located at the southern most portion of Reach 4. The property abuts the lake and is undeveloped, dedicated public open space and does not currently offer public access to the lake.

Shoreline Modifications: Shoreline and associated upland modification is extensive along the Lake Whatcom shoreline. In Basin 1, dock density averages 3 docks per 100 meters and bulkhead density averages 30%. In Reaches 1 and 5 where development is highest, impervious surface averages 45% with pervious surfaces averaging 12.5%. Semi-impervious surface dominates Reaches 2 and 3 averaging 60%. Surfaces in Reach 4 are balanced with fairly equal percentages of impervious (28%), semi-pervious (39%) and pervious (33%) surfaces.

7.1.3 Critical Areas

Wetlands/ Regulated Streams: Wetlands and streams are the only critical areas of note in the Lake Whatcom shoreline study area. Only three wetland areas remain: a large shrub/forested wetland complex is located at the southern extent of Reach 3 and is associated with an un-named creek that flows into Lake Whatcom; a forested wetland area is located within the Euclid County Park Reserve at the southern most extent of Reach 4 and is associated with an un-named creek that flows into Lake Whatcom; and, a small shrub wetland is located at the southern end of Bloedel-Donovan Park and is associated with Lake Whatcom. All three wetlands appear on the 1992 City wetland inventory and/or on the National Wetland Inventory maps. Five City regulated streams are located in the Lake Whatcom shoreline: four streams flow into the lake (Streams 10, 11, 12 and 14) and one flows out of the lake (Stream 13 – Whatcom Creek).

FEMA: The FEMA floodway and 100 year floodplain in Lake Whatcom does not extend beyond the maximum controlled lake level.

Slopes: The topography ranges from gentle to moderate slopes, with occasional areas of steep slopes adjacent to the lake. The majority of the upland adjacent to the lakeshore in SMA jurisdiction is flat and shallow giving rise to moderate slopes. The exception to this is Reach 2 and the northern portion of Reach 3. These areas are relatively flat.

Potential PHS/TSE Species: No current documentation on priority habitat species was found. However, historically, bald eagles, a Federal and State threatened species, have used Scudder Pond as nesting territory. This territory is adjacent to, and partially included, in Reaches 1 and 2. Bald eagles also use the cottonwood trees in Bloedel-Donovan Park for daytime perching.

7.1.4 Ecological Functions

Ecological functions of the lake shore and adjacent buffers have been greatly reduced by high density development and land use. Development has resulted in a loss of habitat and native vegetation. These losses have reduced the use of the area by wildlife: mammals, birds and amphibians. Naturally occurring aquatic shoreline vegetation has also been significantly reduced or lost which has caused habitat loss for fish. Water quality has also been affected. Many areas in Basin 1 have been listed by the Washington Department of Ecology as Category 5 “Polluted Water” for dissolved oxygen and/or mercury. Testing results for mercury in the southern half of Basin 1 and Basin 2 (in the UGA) have meet current standards.

7.2 Reach Analysis: Segment A (Reaches 1, 4, 5)

7.2.1 Landscape Setting

These three reaches constitute approximately 255 acres. Lake Whatcom is located in a sedimentary rock valley that has been glaciated. Sedimentary deposits and rock dominate the land forms around the shoreline. Sands and gravel dominate the lake substrate in Reaches 1 and 4. Bedrock becomes evident in Reach 5. The soils are Group B hydrologic soils and are moderate to high for filtration and tend to have lower potentials for runoff. Approximately 50% of the soils in the segment are susceptible to severe sheet flow and rill erosion; the remaining soils are a slight risk for erosion. Slopes adjacent to the shoreline are gradual in the northern portion of the lake (Reach 1). Areas throughout Reaches 1, 4 and 5 have steeper slopes, particularly in Reach 4 where slopes can range from 20-70%.

7.2.2 Land Use

Land Use: Residential zoning dominates the segment. Residential development is high in Reaches 1 and 4, and moderate to high in Reach 5.

Transportation and Utilities: Northshore, Electric Avenue, and Lake Whatcom Boulevard are major arterials that access this segment. Secondary roads are also present throughout. Utilities, stormwater treatment and detention are present. Information for stormwater facilities and culverts in the UGA is limited.

Public Access: Public access is limited in this segment. In Reach 1, there are a few neighborhood parks or parcels owned by neighborhood associations. A large parcel (Euclid Park) at the southern end of Reach 4 is owned by the city.

Shoreline Modifications: Reach 1 has 102 dock structures, Reach 4 has 34 dock structures and Reach 5 has 110 structures. Bulkhead density is approximately 30% in Basin One and 25% in Basin Two. Total impervious and semi-pervious surfaces are high in Reaches 1 and 5 at greater than 85%. Reach 4 is moderately high with 67%.

7.2.3 Critical Areas

Wetlands/ Regulated Streams: No wetlands were identified in this segment. Four City regulated streams are located in this segment: four streams flow into the lake, Streams 10, 11, 12 in Reach 1 and Stream 14 in Reach 5.

FEMA: The FEMA floodway and 100 year floodplain in Lake Whatcom does not extend beyond the maximum controlled lake level.

Slopes: A narrow band of steep slopes occurs in the southern portion of Reach 5 on the uphill side of Lake Whatcom Boulevard. Generally, the slopes are located adjacent to the road.

Potential PHS/TSE Species: No current documentation on priority habitat species was found. However, historically, bald eagles, a Federal and State threatened specie, have used Scudder Pond as nesting territory. This territory is adjacent to, and partially included, in the southwest extent of Reach 1.

7.2.4 Ecological Functions

Water Quality: High density use and relatively shallow water conditions in Basin 1 have lead to decreasing water quality. Many areas in the northern portion of Basin 1 have been listed by the WA Dept. of Ecology as a Category 5 "Polluted Water" for dissolved oxygen and/or mercury.

Vegetation: Vegetation in this segment is dominated by residential lawns and ornamental landscaping. Naturally vegetated shoreline is virtually non-existent. Very small isolated pockets of native shrubs and deciduous trees persist in a few areas. Data was not available regarding aquatic vegetation. However, based on personal observation, some homeowners have allowed shallow water hydrophytic vegetation to remain in the nearshore area of the lake shore, but these areas seem to be few and do not provide extensive habitat opportunities due to small size and isolation. Knotweed, a noxious weed, is present on some private properties along the lake shore.

Wildlife: Kokanne and resident cutthroat trout are indigenous to Lake Whatcom. Many non-native fish species have been introduced into the lake and persist today, including,

rainbow trout, lake trout, large and small mouth bass, yellow perch, brown bullhead and pumpkinseed. Documented use of the shoreline by specific priority habitat species was not found. Presence of native and non-urban animals, reptiles, birds and amphibians is unknown. Animal movement is not possible without high risk.

Habitat: Buffer width along the lake shore varies. Generally a lawn/landscape buffer width of at least 25-50 feet buffer exists along the shoreline. Virtually no native shoreline habitat remains in this segment. Small pockets of native vegetation exist in scattered locations in the shallow nearshore and occasionally near the shoreline. These habitats have no connectivity. The only habitat adjacent to the shoreline of any significant size is the reserve park property at the southern end of Reach 4. The vegetation in this area is native, of high quality and structural diversity. The area still provides habitat for native amphibians, non-urban mammal and birds, and provides the possibility of movement of animals to other habitat areas.

Fish passage into and out of Lake Whatcom is limited by naturally occurring water falls in Whatcom Creek. In addition, two dams have been constructed in the headwaters of Whatcom Creek, up stream of the water fall blockage.

7.2.5 Opportunities

Preservation

- Maintain protection and preservation of Euclid County Reserve Park. Use of this property as public recreational access to the lake is not recommended due to its value as habitat.

Enhancement or Restoration Opportunities

- When the opportunity presents itself, native vegetation enhancement along the lake shore should be encouraged.
- Erosion control practices and land disturbance should be required in areas of the lake shore where highly erosive soils exist. Such practices are important for minimizing sediment load into surface water bodies thus reducing water quality degradation.

7.3 Reach Analysis: Segment B (Reach 2)

7.3.1 Landscape Setting

This reach is approximately 17 acres in size. Lake Whatcom is located in a sedimentary rock valley that has been glaciated. Sedimentary deposits and rock dominate the land forms around the shoreline. Sands and gravel dominate the lake substrate in this segment. The soils are Group B hydrologic soils and are moderate for filtration and runoff potential. Approximately 60% of the soils in Reach 2 are susceptible to severe sheet flow and rill erosion; the remaining soils are a slight risk for erosion. Reach 2 is relative flat, 2-5% slopes, and is located at the outlet for the lake.

7.3.2 Land Use

Land Use: This Segment is zoned for public use and is currently developed as a city park with swimming and boating access available.

Transportation and Utilities: A major arterial is located along the northern boundary of this segment and is located at the outflow of Lake Whatcom.

Public Access: Public access is extensive in this reach; this segment is currently developed as a city park with swimming and boating access available.

Shoreline Modifications: Seven in-water structures were identified in this reach. In addition, a concrete bulkhead is located at the ordinary high water mark along the majority of the shoreline in the park. A portion of three buildings are located within the SMA jurisdiction. Impervious surfaces constitute 32% of reach, semi-pervious surfaces 58% and pervious surfaces 9%. Five detention facilities are located in the reach totaling 0.05 acres.

7.3.3 Critical Areas

Wetlands/ Regulated Streams: The only remaining wetland in this segment is a small wetland at the southern extent of the reach. The wetland is located at the south end of the park. Surrounding uses include a boat launch to the north and undeveloped open space to the south.

FEMA: The FEMA floodway and 100 year floodplain in Lake Whatcom does not extend beyond the maximum controlled lake level.

Slopes: There are no steep slopes in Reach 2.

Potential PHS/TSE Species: No current documentation on priority habitat species was found. However, historically, bald eagles, a Federal and State threatened specie, have used Scudder Pond as nesting territory. This territory is adjacent to, and partially included, in this reach. Bald eagles also use the cottonwood trees in Bloedel-Donovan Park for daytime perching.

7.3.4 Ecological Functions

Water Quality: High density use and relatively shallow water conditions in Basin 1 have lead to decreasing water quality. Many areas in the northern portion of Basin 1 have been listed by the WA Dept. of Ecology as Category 5 "Polluted Water" for dissolved oxygen and/or mercury.

Vegetation: The use of this area as a public park dictates that large grassy areas are available for recreation. The majority of the vegetation in this segment is dominated by

mowed grass; however, several large deciduous trees remain throughout the park. Data was not available regarding aquatic vegetation. Knotweed, a noxious weed, is present to some degree in Bloedel-Donovan Park.

Wildlife: Kokanee and resident cutthroat trout are indigenous to Lake Whatcom. Many non-native fish species have been introduced into the lake and persist today, including, rainbow trout, lake trout, large and small mouth bass, yellow perch, brown bullhead and pumpkinseed. Documented use of the shoreline by specific priority habitat species was not found. However, bald eagles do use the cottonwood trees in the park for perching. This area is also within the historic bald eagle nesting territory at Scudder Pond. In some areas of the segment, there is some presence of garter snakes and lizards. Both urban and non-urban animals and birds also use portions of the segment. Native amphibian use is possible.

Habitat: Buffer width in the northern portion of the segment is only several feet wide and often is dominated by Electric Avenue, a major arterial. Buffer width within the park is generally several tens of feet wide and varies between mowed grass and mature deciduous trees. The buffer in the southern portion of the reach is paved to the shoreline and is used as a boat launch. The only native habitat that remains in this segment is a shrub wetland just south of the boat launch. A narrow strip of undeveloped land along the southern park property boundary provides some amount of connectivity, for some animals, between this shoreline habitat and upland habitat to the south and west (the wetland complex in Reach 3 and Whatcom Falls Park). The vegetation in the wetland area is both native and naturalized non-native plants. The native plant community is of medium quality.

Fish passage into and out of Lake Whatcom is limited by naturally occurring water falls in Whatcom Creek. In addition, two dams have been constructed in the headwaters of Whatcom Creek, up stream of the water fall blockage.

7.3.5 Opportunities

Preservation

- Because so little shoreline associated wetlands remain around the northern portion of the lake, the remaining shoreline wetland in the southern portion of the park, even though it is small and nearly isolated from other habitats, should be protected from development.

Enhancement or Restoration Opportunities

- The area of the shoreline and associated wetlands could also benefit from enhancement by planting and diversifying the native plant community.
- Enhance vegetation diversity along park boundary to improve habitat corridor.
- When practicable, noxious weeds should be eliminated and monitored.

7.4 Reach Analysis: Segment C (Reach 3)

7.4.1 Landscape Setting

This reach is approximately 37 acres in size. Lake Whatcom is located in a sedimentary rock valley that has been glaciated. Sedimentary deposits and rock dominate the land forms around the shoreline. Sands and gravel dominate the lake substrate in this segment. The soils are Group B hydrologic soils and are moderate for filtration and runoff potential. Approximately 40% of the soils in Reach 3 are susceptible to severe sheet flow and rill erosion; the remaining soils are a slight risk for erosion. The slopes along the shoreline transition from flat, to gently sloping to moderately steep at the southern extent of the segment. An un-named creek enters the lake from the south. The creek and geological land forms have resulted in the formation of a wetland complex at the mouth of the creek and narrow outlet to the lake forming a land peninsula.

7.4.2 Land Use

Land Use: Residential zoning, particularly multi-family housing, dominates this segment. Development has occurred in the northern portion of the segment, but the wetland complex and land peninsula remain undeveloped. Sixteen buildings are located within the SMA jurisdiction. The existing housing units have been located off the lake shoreline leaving open space adjacent to the lake.

Transportation and Utilities: Only one minor collector road is located in this segment. The road crosses the wetland complex in the southern portion of the reach.

Public Access: No public access is indicated in this segment.

Shoreline Modifications: Only five dock structures are located with this segment. Impervious surfaces constitute 14% of reach, semi-pervious surfaces 61% and pervious surfaces 24%.

7.4.3 Critical Areas

Wetlands/ Regulated Streams: A large wetland complex is located in the southern portion of this segment. The wetlands is located at the mouth of an un-named creek and is directly associated with the lake.

FEMA: The FEMA floodway and 100 year floodplain in Lake Whatcom does not extend beyond the maximum controlled lake level.

Slopes: Steep slopes are present along the lake shore in the southern most portion of the segment.

Potential PHS/TSE Species: No current documentation on priority habitat species was found.

7.4.4 Ecological Functions

Water Quality: High density use and relatively shallow water conditions in Basin 1 have lead to decreasing water quality. Many areas in the northern portion of Basin 1 have been listed by the WA Dept. of Ecology as a Category 5 “Polluted Water” for dissolved oxygen and/or mercury. The un-named creek which flows into Lake Whatcom in this reach is also listed as polluted for mercury.

Vegetation: The built environment, which is a little less than half of the segment, is dominated by residential lawn and landscaping. The rest of the segment is wetland or undeveloped upland. The wetland is a medium quality native shrub and tree plant community. The wetland buffer is dominated by native deciduous trees. The undeveloped peninsula is predominately a shrub/herbaceous plant community with scattered trees. Patches of homogeneous non-native grasses are scattered throughout this area, decreasing the overall quality of the vegetation. Data was not available regarding aquatic vegetation.

Wildlife: Kokanne and resident cutthroat trout are indigenous to Lake Whatcom. Many non-native fish species have been introduced into the lake and persist today, including, rainbow trout, lake trout, large and small mouth bass, yellow perch, brown bullhead and pumpkinseed. Documented use of the shoreline by specific priority habitat species was not found. In some areas of the segment, there is some presence of garter snakes and lizards. Both urban and non-urban animals and birds also use portions of the segment. Native amphibian use is possible.

Habitat: Lakeshore and wetland buffers in this segment are at least 50 feet and as much as 200 feet in most of the reach. The exception to this is in the vicinity of the roadway through the wetland and some housing structures in this area well. A relatively large wetland/upland complex with medium quality native vegetation remains in this segment. The wetland has direct association with the lake and good connectivity with upland habitat. In addition, connectivity to Whatcom Falls Park and Whatcom Creek is available for some species – those that can pass across Electric Avenue. The size and quality of the native habitat in this wetland/creek/lake/upland complex all contribute to making this area valuable, rare habitat in an area of dense residential development.

The un-named creek in this segment provides spawning and rearing habitat for resident cutthroat trout. Fish passage into and out of Lake Whatcom is limited by naturally occurring water falls in Whatcom Creek. In addition, two dams have been constructed in the headwaters of Whatcom Creek, up stream of the water fall blockage.

7.4.5 Opportunities

Preservation

- The existing wetland/upland complex in Reach 3, associated with a natural drainage, should be protected. Protection should include the entire area east of

Electric Avenue in order to preserve the habitat corridor between Lake Whatcom and Whatcom Creek.

- The upland peninsula at the southern end of the reach should also be protected.

Enhancement or Restoration Opportunities

- The area encompassing the upland peninsula has the potential to provide greater habitat value based on its proximity to the lake and the creek/wetland complex by enhancing the vegetation structure (removing invasive species and diversifying the shrub and trees species, particularly coniferous trees).

8.0 WHATCOM CREEK SMA

Summary: The entire length of Whatcom Creek is located within the City of Bellingham. SMA jurisdiction associated with this creek is approximately 300 acres. Land use is dominated by high density urban residential development, commercial, industrial development and public park. Public access is available via Whatcom Falls Park (Reaches 6 through 9) and numerous walking trails along the majority of the creek length. The entire creek length is considered polluted for dissolved oxygen, temperature and fecal coliform. A TMDL is in place for fecal coliform. Habitat loss is extensive in the lower reaches which are dominated by residential and commercial development (generally below Interstate-5). Good quality habitat exists in portions of the Iowa Street corridor. This corridor also has the greatest potential for preservation and habitat improvement. The area is of particular importance due to the connectivity with existing habitat in the Cemetery Creek watershed. Habitat quality is high in the upper reaches (Whatcom Falls Park). Data sheets for Whatcom Creek are located in Appendix I.

8.1 Watershed Analysis

8.1.1 Landscape Setting

Whatcom Creek is the only natural surface water outlet of Lake Whatcom. Whatcom Creek is 4.3 miles long with a drainage basin of approximately 5,790 acres. Both Whatcom Creek and Lake Whatcom were created by glaciation. The predominant hydrology source for Whatcom Creek is Lake Whatcom. Other surface water sources include: Hanna, Cemetery, Fever and Lincoln Creeks. A control dam is located at the upper extent of Whatcom Creek. The dam is used for downstream flooding control, utility storage for water quantity, for water quality considerations and to maintain lake levels. The hydroperiod of Lake Whatcom has been reversed and is controlled for recreation and erosion control purposes. Lake levels are maintained at higher levels during the summer and lowered during the winter. This manipulation of water level and discharge affects the hydroperiod of Whatcom Creek.

The upper portion of the creek flows through continental sedimentary rock, resulting in a narrow incised channel with steep slopes and bedrock substrate and outcrops. Soils in

this area are Group B hydrologic soils and tend to allow moderate infiltration and have moderate runoff potential. The lower portion of the creek flows through glaciomarine drift in narrow, incised channels that are surrounded by relatively flat terrain. Soils in glacial marine drift material tend to be very impermeable with little to no infiltration. The hydrologic soil group for these soils is Group D (slow filtration). The mouth of Whatcom Creek is dominated by artificial fill and industrial uses.

8.1.2 Land Use

Land Use: Whatcom Creek flows through the heart of the City of Bellingham, flowing into Bellingham Bay in the middle of dense industrial development. Commercial, industrial and residential uses dominate the land use adjacent to or in close proximity of the creek in the lower portion of Whatcom Creek. Although land use is dense through these reaches, much of the property immediately adjacent to the creek is in public ownership. Often these properties are only several feet or tens of feet wide on one or both sides of the creek. The Iowa Street corridor between Interstate-5 and Whatcom Falls Park is the only remaining length of the creek where there is development potential. The undeveloped properties along this length are zoned industrial or multi-family residential. Current zoning could allow industrial development that would have severe impacts on existing ecology or the potential for ecological improvement. The upper portion of the creek is dominated by public ownership. Whatcom Falls Park is located at the upper extent of the creek and Marine Park is located at the mouth of the creek.

Transportation and Utilities: In conjunction with dense land use development, transportation corridors and utilities have a major impact on the lower portion of Whatcom Creek. Several major arterials and Interstate-5 cross Whatcom Creek in the stream corridor between Whatcom Falls Creek and Bellingham Bay.

Public Access: Due to the acquisition of public property along the entire length of Whatcom Creek, public access via parks and trails is available over a significant portion of the stream length from Lake Whatcom to Bellingham Bay. Maritime Heritage Park and surrounding public land (approximately three acres) offers direct access to the mouth of Whatcom Creek. Whatcom Falls Park offers many recreational opportunities, including creek access and many miles of trails. Walking trails have also been built along the creek in the central business district and just south of Whatcom Falls Park in the Iowa Street industrial area.

Shoreline Modifications: Data is not available regarding in-stream and shoreline modifications, such as bulkheads and rip-rap, along Whatcom Creek. However, with the aid of aerial photographs, general conclusions about modifications within the SMA jurisdiction can be made. Generally speaking, the SMA jurisdiction below Whatcom Falls Park has been densely developed with structures and impervious surfaces to within several feet of the creek, averaging 25-50 feet in most areas except in the Iowa Street corridor where some buffers are greater than 100 feet. In contrast, very few

modifications the creek and its buffer exist in the upper extent of the creek where it flows through Whatcom Falls Park. The major modifications in the upper reaches of the creek are the control two dams in Reaches 8 and 9.

8.1.3 Critical Areas

Wetlands/ Regulated Streams: Significant wetlands still remain in the upper drainage basin, many of which are associated with Whatcom Creek. Several wetlands exist at the headwater of the creek. In addition, forested and shrub wetlands exist in the upland forest in Whatcom Falls Park. A large wetland complex remains at the confluence of Whatcom and Cemetery Creeks. In this area of the city where development is fairly significant, the wetland complex and associated undeveloped uplands provide a good habitat corridor to the Cemetery Creek drainage despite development barriers such as roads. Four City regulated stream systems flow into Whatcom Creek: Hanna, Cemetery, Fever and Lincoln Creeks.

FEMA: The only area along the length of Whatcom Creek that has a significant FEMA 100 year floodplain associated with the creek beyond the ordinary channel is in Reaches 3, 4 and 5, between Interstate-5 and Whatcom Falls Park.

Slopes: Steep slopes are present in Whatcom Falls Park. The Whatcom County Planning Department has mapped the geographical area around the lower extent of Whatcom Creek, Reaches 2 through 5, as seismic hazard area based upon geologic units.

Potential PHS/TSE Species: Tidal influence at the mouth of Whatcom Creek does provide some estuary type habitat. Documented fish use in Whatcom Creek below Whatcom Fall Park includes: bull trout, and sea-run cutthroat, Chinook, coho, chum, pink, sockeye and steelhead salmon. Chinook salmon and bull trout are listed as Federal threatened species and by the State as species of concern. Sea-run cutthroat and coho salmon are listed as a Federal species of concern and have no State status. Documented fish usage in Whatcom Creek above the natural fish barrier includes: resident cutthroat and kokanee. Pacific lamprey, a Federal species of concern, is also documented in Whatcom Creek.

Wildlife habitat is severely limited in the heavily urbanized areas, generally downstream from Interstate-5. The Iowa Street corridor offers more habitat for wildlife since the area has not yet been fully developed. Creek buffers in this area tend to be wider and more native vegetation is present, including areas with canopy cover.

The best wildlife habitat along the entire length of the creek is in Whatcom Falls Park where large areas of native mature habitat have been preserved. Wildlife usage tends to be more diverse and include non-urban and larger animals. Documented use by species of interest includes: bald eagle, merlin, common loon, pileated woodpecker and possibly pacific Townsend's big-eared bat.

8.1.4 Ecological Functions

Ecological functions of the creek and adjacent buffers have been greatly reduced in the lower reaches of the creek, down stream from Interstate-5. Development has resulted in the loss of habitat and native vegetation in a majority of the buffer. Moderate functions remain in the Iowa Street corridor. Buffer widths are greater and native vegetation still remains in some areas. Additionally, a large wetland complex with high quality native vegetation remains at the confluence with Cemetery Creek in Reach 5. The Whatcom Falls Park area provides high quality creek and buffer functions. Buffer widths are greater than 200 feet in most areas and the vegetation is native and high in quality. However, the creek and buffer in lower Whatcom Falls Park and Iowa Street corridor were severely burned during a petroleum fire in the creek during an oil spill in 1999. Extensive restoration has taken place in the effected area. The ecology of the area is still recovering.

The entire length of Whatcom Creek has been listed by the Washington Department of Ecology as Category 5 "Polluted Water" for dissolved oxygen, fecal coliform and temperature. A TMDL is in place for fecal coliform.

8.2 Reach Analysis: Segment A (Reach 1)

8.2.1 Landscape Setting

This reach is approximately 12 acres in size. Glaciomarine drift dominates the geology. Soils in glacial marine drift material tend to be very impermeable with little to no infiltration. The hydrologic soil group for these soils is Group D (slow filtration). All of the soils in Reach 1 are susceptible to severe sheet flow and rill erosion. Steep slopes are present to the southeast and northwest of the creek channel. The water in the upper extent of the reach flows through a natural water fall formed in sedimentary rock. Creek substrate data is unavailable for this reach, however, sedimentary rock dominates the upper reach and marine tides influence the substrate in the lower half of the reach.

8.2.2 Land Use

Land Use: Commercial and public zoning dominates this segment. Commercial and light industrial uses and a public park dominate the uses in this reach. Nine buildings are located within the SMA jurisdiction covering approximately 1.5 acres. Maritime Heritage Park is located along the bank of Whatcom Creek and constitutes approximately 1.3 acres.

Transportation and Utilities: Two major arterials cross the creek at the upper and lower extents of the segment, Holly and Dupont Streets.

Public Access: Public access is extensive in this segment. Two and a half acres of open space and park are present, including Maritime Heritage Park, 1.3 acres of community parks, and 1.3 acres of neighborhood parks.

Shoreline Modifications: Cement bulkheads have been constructed along portions of the creek shoreline. Restrictive in-water structures are associated with the Holly Street crossing. A foot bridge crosses the creek near the water falls. On average, impervious surfaces constitute 45% of the reach, semi-pervious surfaces 27% and pervious surfaces 28%.

8.2.3 Critical Areas

Wetlands/ Regulated Streams: Some estuarine vegetation is present in the tidally flooded area of this reach. There are no associated streams.

FEMA: The mouth of Whatcom Creek is tidally flooded twice a day up to the natural falls at the upper extent of the reach. Besides tidal flooding within the ordinary channel of the creek, no additional FEMA 100 year floodplain is associated with the creek.

Slopes: Steep slopes are present along the south eastern shoreline and buffer. Steep slopes are also present in the north western boundary of the reach along Dupont Street. Whatcom County Planning Department has identified this reach as being a seismic hazard area based on geologic units.

Potential PHS/TSE Species: Documented PHS usage includes: Chinook, coho, bull trout and sea-run cutthroat salmonid. Chinook salmon and bull trout are listed as a Federal threatened species and by the State as a candidate species. Sea-run cutthroat and coho salmon are listed as a Federal species of concern and have no State status. Pacific lamprey, a Federal species of concern, is also documented in Whatcom Creek. Multiple PHS and species of concern use a portion of the reach for breeding, rearing and wintering.

8.2.4 Ecological Functions

Water Quality: The entire length of Whatcom Creek has been listed by the Washington Department of Ecology as Category 5 "Polluted Water" for dissolved oxygen, fecal coliform and temperature. A TMDL is in place for fecal coliform. There are six stormwater discharges in Reach 1 that flow into Whatcom Creek. One known toxic site is documented in SMA jurisdiction. The site is listed as the Holly Street Landfill. Sediment and/or ground water contamination includes: metals, petroleum, aromatic hydrocarbons, EPA priority pollutants, base neutral acid organics.

Vegetation: Built environment (impervious surfaces), mowed grass and native and naturalized non-native shrubs and trees dominate the vegetation and ground cover in this reach. The buffer along the south side of the creek has been maintained as naturalized vegetation. Vegetation enhancement has also occurred in this buffer area. The buffer on the north side of the creek is mainly lawn and concrete, except for the upper most extent of the reach. The overstory is non-existent in the lower half of the

reach and sparse in the upper portion. Overall, the naturalized vegetation in the northern portion of the reach is of medium quality.

Wildlife: Documented fish use includes: bull trout, and sea-run cutthroat, Chinook, coho, chum, pink, sockeye and steelhead salmon. Some garter snakes, lizards and native amphibians are present in approximately half the reach. Urban and non-urban birds also use portions of the reach. Animal movement opportunities are poor for the entire segment.

Habitat: The creek buffer in this reach ranges from none to 75 feet. Most of the buffer is developed or only a few feet wide. The buffer along the south side of the creek is of better quality, ranging between 25 to 75 feet of native or naturalized vegetation. Although some native habitat exists in this reach, the size of the habitat is small and isolated from other habitats by dense urban development. Some effort has been made to enhance the habitat along Whatcom Creek through the central business district. These improvements do allow for more movement along the stream corridor for some animals.

Tidal influence at the mouth of Whatcom Creek does provide some estuary type habitat. Two small mixed algae beds are present in the tidal zone. The tidal zone of the creek is breeding, rearing and wintering habitat for salmonid species. The falls at the upper extent of the reach may present passage problems for some fish species.

8.2.5 Opportunities

Preservation

- None indicated.

Enhancement or Restoration Opportunities

- Public areas within 50 feet of the creek could be enhanced with additional native plants.
- Canopy cover for the creek could be improved greatly by planting coniferous and deciduous trees along the shoreline.
- Aquatic estuarine vegetation enhancement may be possible in the tidal zone.

8.3 Reach Analysis: Segment B (Reaches 2 & 3)

8.3.1 Landscape Setting

This reach is approximately 78 acres in size. Glaciomarine drift dominates the geology. Soils in glacial marine drift material tend to be very impermeable with little to no infiltration. The hydrologic soil group for these soils is Group D (slow filtration). All of the soils in Reach 2 and about half in Reach 3 are susceptible to severe sheet flow and rill erosion. The risk of water erosion for the remainder of the soils in Reach 3 is slight. The creek flows through an incised channel that has moderately steep slopes. Overall

topography beyond the creek channel is relatively flat, with slopes of 2-5%. Creek substrate data is unavailable for this reach.

8.3.2 Land Use

Land Use: Commercial and industrial zoning dominates this segment with scattered areas of residential and public use. The segment is densely developed. One hundred two (102) buildings are located within the SMA jurisdiction.

Transportation and Utilities: Several major arterials pass over the creek in this segment, including Interstate-5.

Public Access: Public land use is concentrated along the creek channel. Multiple restoration projects are located along the right and left bank of the creek through Reach 2, many of which include public walking trails.

Shoreline Modifications: Data on the extent of in-water structures and bulkheads is not available. On average, impervious surfaces constitute 70% of the segment, semi-pervious surfaces 25% and pervious surfaces 5%.

8.3.3 Critical Areas

Wetlands/ Regulated Streams: The only wetlands associated with Whatcom Creek in this segment are located up stream of Interstate-5 on the south side of the creek. There are no streams associated with this segment of Whatcom Creek.

FEMA: The only significant FEMA 100 year floodplain associated with the creek is in Reach 3 above Interstate-5. Floodplain extends beyond the SMA jurisdiction east of the interstate. Flooding in this area is attributed to Whatcom and Fever Creeks. Some floodplain exists downstream of the interstate, but these areas are generally small and confined to the incised channel through with the creek flows.

Slopes: The creek flows through an incised channel that has moderately steep slopes. The slopes become less steep and the channel narrower in the upper half of Reach 3. Overall topography beyond the creek channel is relatively flat, with slopes of 2-5%. Whatcom County Planning Department has identified this reach as being a seismic hazard area based on geologic units.

Potential PHS/TSE Species: Documented PHS usage includes: Chinook, coho, bull trout and sea-run cutthroat salmonids. Chinook salmon and bull trout are listed as a Federal threatened species and by the State as a candidate species. Sea-run cutthroat and coho salmon are listed as a Federal species of concern and have no State status. Pacific lamprey, a Federal species of concern, is also documented in Whatcom Creek. Multiple PHS and species of concern use a portion of this segment for breeding, rearing and wintering.

8.3.4 Ecological Functions

Water Quality: The entire length of Whatcom Creek has been listed by the Washington Department of Ecology as Category 5 “Polluted Water” for dissolved oxygen, fecal coliform and temperature. A TMDL is in place for fecal coliform. There are 16 stormwater discharges in Reach 2 and 25 in Reach 3 in SMA jurisdiction.

Vegetation: Built environment (impervious surfaces) dominate this segment. Generally, native and naturalized non-native shrubs and trees dominate the vegetation adjacent to the creek. Non-native invasive species dominate the creek side vegetation in areas along this segment, particularly in the northern portion of Reach 3. Some vegetation enhancement has occurred in the creek buffer in Reach 2. The overstory is either non-existent or sparse. Overall, the naturalized vegetation in the northern portion of the reach is of medium quality.

Wildlife: Documented fish use includes: bull trout, and sea-run cutthroat, Chinook, coho, chum, pink, sockeye and steelhead salmon. Some garter snakes, lizards and native amphibians are present in approximately 20 percent of the reach. Urban and non-urban birds also use portions of the reach. Animal movement opportunities are poor for the entire segment except for the area east of Interstate-5.

Habitat: Average creek buffer width in this segment is between 25 and 50 feet. The buffer is less than 25 feet in scattered areas throughout the segment. The width of the buffer increases east of Interstate-5 to between 50 to 75 feet. Nearly all of the SMA jurisdiction area outside of the immediate creek buffer is developed with impervious surfaces. Generally, the habitat immediately adjacent to the creek is isolated from other habitats by development. Some effort has been made to enhance the habitat along Whatcom Creek in Reach 2. These improvements do allow for more movement along the stream corridor for some animals.

Fish habitat is degraded by low water quality, and the lack of in-stream structures and consistent canopy cover.

8.3.5 Opportunities

Preservation

- The undeveloped buffer area east of Interstate-5 should be preserved and enhanced.

Enhancement or Restoration Opportunities

- Non-native species should be removed and native shrubs and trees planted in order to restore creek side habitat and canopy, particularly in the undeveloped buffer east of I-5. Enhancing this area would benefit habitat and ecological functions due to connectivity with moderate to high quality habitat up stream at the confluence of Cemetery Creek.

- Where practicable, invasive species control and elimination measures should be implemented along the creek channel. The channel should then be planted with native shrubs and trees in order to restore native creek side canopy.

8.4 Reach Analysis: Segment C (Reaches 4 & 5)

8.4.1 Landscape Setting

This reach is approximately 88 acres in size. Glaciomarine drift dominates the geology. Soils in glacial marine drift material tend to be very impermeable with little to no infiltration. The hydrologic soil group for these soils is Group D (slow filtration). All of the soils in Reaches 4 and 5 have a slight risk for water erosion. The creek flows through relatively flat topography, slopes of 2-5%, in this segment. Creek substrate data is unavailable for this reach.

8.4.2 Land Use

Land Use: Industrial, residential multi-family, and public zoning dominates this segment. Current land use is dominated by light industrial businesses. Development is denser on the northern side of the creek along Iowa Street. The southern side of the creek is a mix of light industry, residential housing and undeveloped publicly owned property. In general, undeveloped buffers in this segment are considerably wider than the buffers down stream. The public property has not been developed into park but a walking trail has been constructed along the north side of the creek through Reach 5. Thirty-nine (39) buildings are located within the SMA jurisdiction.

Transportation and Utilities: One collector road and one major arterial pass over the creek in northern most extent of Reach 5.

Public Access: No public access is indicated. However, the city owns a large track of land south of and adjacent to the creek in Reach 4, and there is 17.8 acres of open space in Reach 5.

Shoreline Modifications: Data on the extent of in-water structures and bulkheads is not available. Ground surfaces in Reach 4 are approximately 50% impervious, 41% semi-pervious and 9% pervious. Ground surfaces in Reach 5 are 23% impervious, 25% semi-pervious and 51% pervious. Pervious surfaces are considerably higher in Reach 5 due to undeveloped public land and a wetland complex associated with Cemetery Creek.

8.4.3 Critical Areas

Wetlands/ Regulated Streams: Stream side wetlands were identified by the 1992 City inventory along the southern bank of the creek in Reach 4 between Interstate-5 and the confluence of Lincoln Creek. Stream side wetlands were also identified on both sides of the creek between Lincoln Creek and Racine Street. A large wetland complex is located in the southern portion of Reach 5 and is associated with the Cemetery Creek system.

Three creeks enter Whatcom Creek in this segment: Lincoln and Fever Creeks at the lower end of Reach 4 and Cemetery Creek at the lower extent of Reach 5. These creeks are not SMA jurisdictional waters but are regulated by the City.

FEMA: The entire SMA jurisdiction of Reach 4 is located within a FEMA 100 year floodplain. Flooding in this area is attributed to Whatcom and Fever Creeks. FEMA 100 year floodplain is also associated with Cemetery Creek in the vicinity of Whatcom Creek. This area coincides with wetlands associated with Cemetery Creek. The only other floodplain is a small area located at the upper most extent of Reach 5.

Slopes: There are no steep slopes in this segment. Whatcom County Planning Department has identified this reach as being a seismic hazard area based on geologic units.

Potential PHS/TSE Species: Documented PHS usage includes: Chinook, coho, bull trout and sea-run cutthroat salmonids. Chinook salmon and bull trout are listed as a Federal threatened species and by the State as a candidate species. Sea-run cutthroat and coho salmon are listed as a Federal species of concern and have no State status. Pacific lamprey, a Federal species of concern, is also documented in Whatcom Creek. Fifty to seventy-five percent of the segment is used by multiple PHS and species of concern breeding, rearing and wintering.

8.4.4 Ecological Functions

Water Quality: The entire length of Whatcom Creek has been listed by the Washington Department of Ecology as Category 5 “Polluted Water” for dissolved oxygen, fecal coliform and temperature. A TMDL is in place for fecal coliform. There are five stormwater discharges in Reach 4, and four in Reach 5 that flow into Whatcom Creek. Several more stormwater discharges are present in Reach 5 south of the creek.

Vegetation: Large portions of this segment remain undeveloped. While industrial businesses and housing is a dominant use, large areas along Whatcom and Cemetery Creeks are vegetated with native and naturalized non-native plant communities, as well as undeveloped areas that have been disturbed and are therefore dominated by invasive species. Approximately 70% of the segment is predominantly native vegetation of high quality, with some mature forest and emerging young trees. The majority of the higher quality vegetation occurs in Reach 5. Non-native naturalized and invasive species are dominant in areas along the creek that have been disturbed, particularly in the southern extent of Reach 4 and northern extent of Reach 5. Canopy cover along the creek is sparse over the length of the entire segment. The creek and adjacent vegetation in this segment was burned during the pipeline fire of 1999.

Wildlife: Documented fish use includes: bull trout, and sea-run cutthroat, Chinook, coho, chum, pink, sockeye and steelhead salmon. Some garter snakes, lizards and native

amphibians are present in approximately 70% of the segment. Urban and non-urban mammals are present, and a variety of predominantly non-urban birds and native only amphibians use approximately 70% of the segment. Due to larger areas of undeveloped property and better habitat connectivity between this property and the creek, movement is possible for medium to large sized animals.

Habitat: Creek buffer widths increase substantially from those down stream. Buffer widths range from 25 to 200 feet. Buffer widths are generally wider overall, greater than 50 feet. In addition to wider habitat buffers along the creek in this segment, the habitat is connected to both wetland and upland habitats of good quality, particularly in the Cemetery Creek drainage. Connectivity to habitat in Whatcom Falls Park is available for some animals. Movement through this area is limited by the quality of the vegetation, size of the buffer and human development, including a major arterial.

Fish habitat is degraded by low water quality and lack of consistent canopy cover. All three streams that flow into Whatcom Creek in this segment support fish usage.

8.4.5 Opportunities

Preservation

- Existing undeveloped buffer width should be protected and enhanced with native vegetation.
- Undeveloped upland and wetland habitat associated with Cemetery Creek should be protected, including wetlands throughout the Cemetery Creek watershed.

Enhancement or Restoration Opportunities

- The publicly owned property south of the creek in Reach 4 should be restored to a native riparian forested vegetation community.
- Creek canopy cover in both reaches is negligible. Enhancement of the canopy by planting coniferous and deciduous species should be encouraged. Increased canopy with diversify habitat and increase water quality by moderating creek temperature.

8.5 Reach Analysis: Segment D (Reaches 6, 7, 8, 9)

8.5.1 Landscape Setting

This reach is approximately 123 acres in size. This segment of Whatcom Creek flows through continental sedimentary rock, resulting in a narrow incised channel with steep slopes and bedrock substrate and outcrops. Soils in this area are Group B hydrologic soils and tend to allow moderate infiltration and have moderate runoff potential. The soils in Reaches 6, 7 and 8 have moderate to slight risk for water erosion. Approximately half the soils in Reach 9 are susceptible to severe sheet flow and rill erosion; the remaining soils are a slight risk for water erosion. Slopes in this segment are moderate to

steep in Reaches 6, 7 and 8, ranging from 20 to 100 percent. Slopes are relatively flat in Reach 9 (2-5%). Creek substrate data is unavailable for the majority of the reach, except for a sampling point taken just down stream from the falls in Reach 6. The reported substrate content was: 14% fine gravel, 18% coarse gravel, 53% cobble and 16% boulder.

8.5.2 Land Use

Land Use: Public zoning dominates this segment. Whatcom Falls Park and other publicly held property dominates the segment. Residential development and zoning fringe the park and SMA jurisdiction throughout the segment, but is more prevalent in the upper reaches. Four buildings are located in Reaches 6 and 7, 21 in Reach 8 and 15 in Reach 9.

Transportation and Utilities: Park roads and Electric Avenue are located in SMA jurisdiction in the northern part of the segment where residential and urban development abuts park property.

Public Access: Public access is extensive, and Whatcom Falls Park and other publicly held property dominate this segment.

Shoreline Modifications: Data on the extent of in-water structures and bulkheads is not available, except for the two control dams that are located at the southern extent of Reaches 8 and 9. Internal park roads are located in the southern portion of the segment. Ground surfaces in Reaches 6, 7 and 8 average 5% impervious, 32% semi-pervious and 63% pervious. Ground surfaces in Reach 9 are 17% impervious, 38% semi-pervious and 46% pervious. Pervious surfaces are higher in Reach 9 due to residential development.

8.5.3 Critical Areas

Wetlands/ Regulated Streams: Significant wetlands still remain in this segment, many of which are associated with Whatcom Creek. Several wetlands exist at the headwater of the creek. In addition, forested and shrub wetlands exist in the upland forest throughout Whatcom Falls Park. One creek enters Whatcom Creek in this segment: Hanna Creek. The creek is not a SMA jurisdictional water but is regulated by the City.

FEMA: Flooding is limited in this segment due to the nature of the geology. The creek flows through a channel cut through sedimentary rock. The floodplain is limited to the width of the channel and its natural confinement between steep slopes. The flood area is predictable and does not pose an immediate hazard due to the use of this region as a public park. In addition, flooding is controlled through this area with two dams.

Slopes: Steep slopes are present throughout Reaches 6, 7 and 8, and in the southern most channel of the creek in Reach 9 – just before the dam.

Potential PHS/TSE Species: Documented PHS usage includes: Chinook, coho, bull trout and sea-run cutthroat salmonids down stream of the natural fish blockage in Reach 6. Chinook salmon and bull trout are listed as a Federal threatened species and by the State as a candidate species. Sea-run cutthroat and coho salmon are listed as a Federal species of concern and have no State status. Pacific lamprey, a Federal species of concern, is also documented in Whatcom Creek. Approximately 90% the segment is used by multiple PHS and species of concern breeding, rearing and wintering.

8.5.4 Ecological Functions

Water Quality: The entire length of Whatcom Creek has been listed by the Washington Department of Ecology as Category 5 “Polluted Water” for dissolved oxygen, fecal coliform and temperature. A TMDL is in place for fecal coliform. One known toxic site is documented just outside of SMA jurisdiction. The site is listed as Olympic Pipeline located at 3201 Arbor Court. The site is listed for petroleum products.

Vegetation: Large portions of this segment remain undeveloped primarily due to public ownership and designation as a public park. The majority of the segment is vegetated with native coniferous and deciduous forest. Some portions of the park are maintained as mowed grass. Some portions of Reaches 8 and 9 are developed with residential structures and landscaping/lawn, but these areas are generally on the fringe of the SMA and do not dominate the reach. The creek and adjacent vegetation in Reaches 6 and 7 was burned during the pipeline fire of 1999. Some affected areas have been replanted with native plant species. Creek canopy cover in these areas has been greatly reduced.

Reaches 6, 7 and 8 are predominately mature native mixed forest communities with a mature overstory. Habitat is diverse and multi-structured and of high quality. Reach 9 is a mix of vegetation communities: mixed coniferous/deciduous forest, shrub wetland, emergent wetland, open water and residential landscaping. Some mature canopy exists in this reach. Non-native invasive species are also present and are concentrated in the ponded area of the reach. Known species include: Eurasian water milfoil, yellow flag iris, knotweed, reed canary grass, hairy willow-herb, bittersweet nightshade and traveler’s joy.

Wildlife: Documented fish use in Reach 6 includes: sea-run and resident cutthroat, Chinook, chum, pink and steelhead salmon. Reach 6 also has a presumed potential or historic usage by bull trout and coho. Resident cutthroat is present throughout the segment and kokanee is present in Reaches 8 and 9. Many of the species introduced to Lake Whatcom may also be present in Reach 9, including: rainbow trout, lake trout, large and small mouth bass, yellow perch, brown bullhead and pumpkinseed. Documented use of the shoreline by specific priority habitat species was not found. However, bald eagles have used the black cottonwood trees in Reach 9 for nesting. For 100% of Reaches 6 and 7, and 80% of Reaches 8 and 9 there is an abundance of garter snakes and lizards with denning habitat; a variety of native amphibians; a variety of

non-urban mammals and birds including habitat specific species. Due to larger areas of undeveloped property and good habitat connectivity within the segment, movement is possible for all animals and amphibians.

Habitat: Buffer widths in this segment are 200 feet or greater in the majority of the segment. Some exceptions to this are in Whatcom Falls Park (park facilities and utility roads) and in Reaches 8 and 9 in residential areas. The majority of the buffer is native mature forest and of very high quality. A relatively large wetland/upland complex with medium to high quality native vegetation dominates Reach 9. The wetland is directly associated with the lake and has good connectivity with upland habitat. In addition, many shrub and forested wetlands exist throughout Whatcom Falls Park, both directly associated with Whatcom Creek and in the forested uplands. Connectivity between these wetlands and other habitat types is high. Overall, the size and quality of the native habitat in this segment is very high, making this area very valuable.

Hanna Creek flows into Whatcom Creek in lower portion of this segment. There is no documented fish usage for this creek. A natural fish barrier exists in Reach 6 (falls). Two dams are also located in Reaches 8 and 9.

8.5.5 Opportunities

Preservation

- None indicated

Enhancement or Restoration Opportunities

- Where practicable, invasive species control and elimination measures should be implemented. Shoreline upland vegetation could be diversified by planting native coniferous species. Diversification would increase habitat and canopy cover.

9.0 SQUALICUM CREEK SMA

Summary: The Squalicum Creek basin is approximately 15,800 acres. The majority of the creek is within the City of Bellingham. The upper extent of the creek and headwaters are in Whatcom County. SMA jurisdiction associated with this creek is approximately 423 acres. Land use is dominated by urban residential and industrial development as well as large segments of undeveloped parcels. Public access is available via Cornwall Park (Reach 4) and Sunset Pond (Reach 6). All reaches, except the segment between James Street and Hannegan Road, indicated some level of pollution for dissolved oxygen, temperature, fecal coliform, zinc and/or pentachlorophenol. Habitat is generally impaired throughout creek. Due to the amount of undeveloped property in the creek valley and floodplain, good habitat, or habitat potential through restoration, remains along most of the creek. The potential for habitat connectivity along the entire length of the creek still exists to a high degree despite transportation corridor barriers. Undeveloped floodplain also provides opportunities to improve stream habitat (meanders and in-stream structures). Data sheets for Squalicum Creek are located in Appendix J.

9.1 Watershed Analysis

9.1.1 Landscape Setting

Squalicum Creek is a glacially formed stream that flows through a shallow valley with widths of less than one-quarter mile in most places. The valley walls in the lower reaches rise approximately 60 feet from the valley floor with the south wall being much steeper than the north wall. The basin is approximately 15,800 acres. The creek valley is dominated by glacial outwash in the upper reaches and glacial drift in the lower reaches. The uplands surrounding the stream valley are also characterized by unstratified glacial drift. The headwaters of the creek are located in a broad area characterized by rural residential development and agriculture. There is not one identifiable source of water for the creek, rather, precipitation, natural springs and wetlands and small lakes feed the creek and minor tributaries in the upper watershed. Squalicum Lake, Toad Lake and Baker Creek all drain into Squalicum Creek.

The creek flows through glacial drift and outwash. Soils in the watershed are dominated by Group D hydrologic soils which tend to have very slow infiltration rates and high runoff potential. Group B and C soils are also mapped in the valley (portions of Reaches 2, 3, 4 & 5). These soils tend to have moderate to slow infiltration and moderate runoff potential. The mouth of Squalicum Creek is confined by artificial fill and industrial uses.

9.1.2 Land Use

Land Use: Squalicum Creek flows through many land uses before flowing into Bellingham Bay in an area dominated by industrial development. Residential

development and industrial zoning are prevalent through the entire length of the creek, with scattered pockets of commercial, service and industrial uses. Although land use is fairly dense in Reaches 1 through 6, significant vegetated buffers still remain along nearly the entire stream length despite the urban character of the landscape. Buffer widths are generally 50 feet or greater. A large percentage of Reaches 6 through 11 is undeveloped land. Most of the undeveloped properties in this area are zoned industrial and hospital. Several large parcels are also in public ownership. Current zoning could allow industrial development that would have severe impacts on existing ecology or the potential for ecological improvement. Publicly owned parcels are scattered throughout the lower reaches of the creek. Cornwall Park is located in Reach 4 and a large portion of industrial property in Reach 2 has recently been acquired and will be developed as a public park, however, the vast majority of this property is outside the SMA.

Transportation and Utilities: Transportation corridors and utilities parallel the creek in the lower reaches of the segment (Reaches 1, 2, 3 & 5). Several major arterials and Interstate-5 cross Squalicum Creek, however, crossings and arterials within the SMA decreases measurably in the upper portion of the segment.

Public Access: Although large tracts of land are publicly owned along the entire length of the creek, public access is relatively limited. Cornwall Park is located in Reach 4. A park has also been established at Sunset Pond in Reach 6. Cornwall Park offers many recreational opportunities. Sunset Pond is geared toward more passive recreation, such as walking and fishing. A large park is going to be developed in Reach 2 on old industrial property, but the majority of the property is located just outside the SMA.

Shoreline Modifications: Data is not available regarding in-stream and shoreline modifications, such as bulkheads and rip-rap, along Squalicum Creek. However, with the aid of aerial photographs, general conclusions about modifications within the SMA jurisdiction can be made. Generally speaking, in-water structures and dense development directly adjacent to the shoreline is relatively sparse over the entire length of the creek. Major structural modifications include the artificial fill and industrial development at the mouth of the creek, creek channel modification (including berms and culverts) due to Interstate-5 construction, and two long channel culverts in Reach 2.. Outside of these exceptions, the creek meanders through the valley in a relatively undisturbed channel with buffers averaging 50 feet or greater. Impervious surfaces and structures are generally set back from the creek shoreline, except for Squalicum Parkway in Reaches 1, 2 and 3.

9.1.3 Critical Areas

Wetlands/ Regulated Streams: A significant wetland/upland complex still remains in Reaches 5 through 9. Nearly all of this system is directly associated with Squalicum Creek. Scattered riparian wetlands are also located along the creek in Reaches 1, 2 and 3. The wetland complex in the upper reaches is significant based on the large size of the

system and connectivity within the system despite surrounding urban development and transportation corridors. The system provides good, diverse habitat and good connectivity to upland habitat in the upper reaches of the watershed. One City regulated stream system flows into Squalicum Creek: Baker Creek.

FEMA: Significant FEMA 100 year floodplain is associated with the creek in Reaches 5 through 11. The floodplain in these reaches is generally mapped for the entire valley floor, from valley wall to valley wall. Floodplain is also mapped in Reaches 1 through 3, but the area of flooding is more immediate to the creek channel and not to the entire valley.

Slopes: Steep slopes are present on both the north and south valley walls in Reaches 1 through 3; the south valley wall of Reaches 6 through 8; and, the north valley wall in Reach 11. The Whatcom County Planning Department has mapped the upper portion of Reach 2, Reach 3, and the extreme southern extent of Reaches 5 through 8 as seismic hazard areas based upon geologic units. Reach 1 is mapped as a seismic hazard area based on artificial fill. The majority of Reach 2 is mapped as a mine hazard area.

Potential PHS/TSE Species: Tidal influence at the mouth of Squalicum Creek does provide some estuary/marsh type habitat, but the area is very small and the tidal influence is greatly inhibited due to an in-water structure. This structure is a barrier at low tide. Documented fish use in Squalicum Creek includes: sea-run cutthroat, Chinook, coho and steelhead salmon. Bull trout are documented up to the first long culvert in Reach 2 and presumed to be present in the remainder of the reaches. Chum are documented in Reaches 1 through 5 and presumed in the remainder of the reaches. Chinook salmon and bull trout are listed as Federal threatened species and by the State as a species of concern. Sea-run cutthroat and coho salmon are listed as a Federal species of concern and have no State status.

Areas of diverse wildlife habitat are available in Reaches 6 through 9 due to large tracts of undeveloped land, wider buffers and diverse native vegetation that provide canopy and structure. Habitat corridors are present in the lower reaches of the creek but are more limited due to the closer proximity of development. Development has reduced upland and wetland habitats in the lower reaches causing an increase in urban wildlife. Even though habitat is greatly reduced, the buffers that remain tend to be of higher quality and include native vegetation and canopy cover. Moderate industrial development and agricultural use in Reaches 10 and 11 has affected the quality of available habitat.

The best wildlife habitat along the entire length of the creek is between James Street (Reach 6) and Reach 9. Connectivity between habitats over this length of creek is very high and large areas of native vegetation are present. Wildlife usage tends to be more diverse and abundant, including a variety of non-urban animals and birds. Habitat

specific species are present for mammals and birds. Movement is easy for medium to large animals.

9.1.4 Ecological Functions

Ecological functions of the creek and adjacent buffers are reduced down stream from Interstate-5. Development has resulted in the loss of habitat and reduced buffers. Moderate to high functions remain up stream of Interstate-5. Buffer widths are greater and native vegetation still remains in many areas. A large wetland complex with a wide range of quality native vegetation remains in Reaches 6 through 9. The quality of ecological function in this area is reduced by transportation barriers that bisect the reaches and by degradation of native vegetation which has allowed non-native and invasive species to populate portions of these reaches. Buffer widths tend to be 50 feet or greater along the entire creek and 200 feet or great in several areas.

Portions of the entire length of Squalicum Creek have been listed by the Washington Department of Ecology as Category 5 "Polluted Water" for dissolved oxygen, fecal coliform, temperature, zinc and/or pentachlorophenol, except for the stream length between James Street and Hannegan Road (Reaches 6 & 7). Many of these same Reaches are waters of concern for pH and/or temperature. The upper portion of Reach 3 is impaired for degradation of aquatic life.

9.2 Reach Analysis: Segment A (Reach 1)

9.2.1 Landscape Setting

This reach is approximately nine acres in size. Artificial fill and glacial outwash dominates the geology. Soils in this segment are Group D hydrologic soils and tend to be very slow infiltration rates and high runoff potential. Approximately half of the soils are susceptible to severe sheet flow and rill erosion. The remaining soils have a slight erosion risk. Steep slopes are present on both side of the valley through which the creek flows, except for the area of artificial fill located at the mouth of the creek. Creek substrate data is unavailable for this reach. Marine tides influence the substrate and vegetation at the mouth of the creek.

9.2.2 Land Use

Land Use: Industrial use and zoning dominates this segment. Residential zoning is also present in a small amount, with only one house currently located within the SMA. Ten buildings are located within the SMA jurisdiction covering approximately 0.26 acres (this data may not be correct). Mount Baker Plywood and Bellingham Cold Storage are located along the marine waterfront at the mouth of Squalicum Creek.

Transportation and Utilities: Two major arterials cross the segment, Roeder Avenue and Eldridge Drive; and an active railway line bisects the segment. The railway and Eldridge Drive are elevated above the creek on bridges. Cement culverts and

road/railway bridges have been built over the creek. Some or all of these structures are located within the creek.

Public Access: None indicated.

Shoreline Modifications: Some rip-rap armoring has occurred along the creek shoreline in this reach. On average, impervious surfaces constitute 57% of the reach, semi-pervious surfaces 22% and pervious surfaces 21%.

9.2.3 Critical Areas

Wetlands/ Regulated Streams: Some estuarine vegetation is present in the tidally flooded area of this reach. There are no associated streams or wetlands.

FEMA: Some tidal flooding occurs at the mouth of the creek twice a day, the extent of which is limited by a narrow cement culvert. FEMA 100 year floodplain is mapped for the entire segment except for a small elevated portion in the northeast corner of the segment.

Slopes: Steep slopes are present along the northern and southern valley walls in the upper half of the segment. Whatcom County Planning Department has identified the lower half of the segment as being a seismic hazard area due to artificial fill.

Potential PHS/TSE Species: Documented PHS usage includes: Chinook, coho, chum, bull trout and sea-run cutthroat salmonids. Chinook salmon and bull trout are listed as a Federal threatened species and by the State as a candidate species. Sea-run cutthroat and coho salmon are listed as a Federal species of concern and have no State status.

9.2.4 Ecological Functions

Water Quality: This segment has been listed by the Washington Department of Ecology as Category 5 "Polluted Water" for dissolved oxygen, fecal coliform and temperature. The segment is also listed as impaired water for in-stream flow and fish habitat (at the lower most extent of the segment). Fish limiting factors include: floodplain conditions, gravel quality, channel stability, large woody debris and riparian condition. Low in-stream flows limit salmonid use. The water is also listed as a concern for pH. There are no stormwater discharges in this segment. Mt. Baker Plywood is the only documented toxic site in SMA jurisdiction. Ground water pollutants include: EPA priority pollutants and metals. Soil pollutants include: EPA priority pollutants, halogenated organic compounds, metals, petroleum products and PAH.

Vegetation: Built environment (impervious surfaces) dominates the lower half of the segment. The upper half of the segment is dominated by vegetation that includes deciduous trees, and shrub and herbaceous cover. Vegetation is a mix of native and naturalized non-native plants. Some areas in the upper segment are characterized by a

medium quality native plant community. The buffer along the creek up-stream of the railroad grade is a mix of native and non-native shrub and tree species. Canopy cover in the lower half of the segment is non-existent.

Wildlife: Documented fish use includes: bull trout, sea-run cutthroat, Chinook, coho, chum and steelhead salmon. The majority of the reach provides no viable habitat. Approximately 13% of the reach supports some non-urban mammals and birds, as well as garter snakes and native amphibians, and offers easy movement for birds, fish and medium to large animals.

Habitat: The creek buffer in this reach is ranges from none to 100 feet. Most of the buffer is developed or only a few feet wide below the railroad grade. The buffer north of the railroad grade is substantially wider and of better quality, ranging between 25 to 100 feet of native or naturalized vegetation. Some native habitat exists in this segment and continues into the adjacent reaches providing connectivity to up-stream wetland and upland habitats. This connectivity of habitat allows for animal and bird movement along the stream corridor. PHS and SC species use approximately 13% of the reach as habitat for breeding and/or rearing.

Tidal influence at the mouth of Squalicum Creek does provide some marsh type habitat. One small area of marsh vegetation is present in the tidal zone. The tidal zone offers some opportunity for breeding and rearing for some fish populations. The cement culvert at the mouth of the creek is a barrier to fish passage at low tide.

9.2.5 Opportunities

Preservation

- Expansion and enhancement of the existing marsh habitat.
- Squalicum Creek delta restoration was studied by Anchor Environmental in September 2001. See draft report for alternatives.

Enhancement and Restoration Opportunities

- At a minimum, replacement of the blocking structures at the mouth of the creek should be considered. Improving these structures will increase natural tidal flow and fish passage.
- Canopy cover for the creek could be improved greatly by planting coniferous and deciduous trees along the shoreline.
- Where practicable, invasive species control and elimination measures should be implemented along the creek channel and in the buffer. Native shrubs and trees should be planted where possible.

9.3 Reach Analysis: Segment B (Reaches 2 & 3)

9.3.1 Landscape Setting

This reach is approximately 91 acres in size. Glacial drift and outwash dominate the geology. Soil groups represented in this segment vary. Group D soils are generally associated with the creek channel and the lower half of the segment. An area of Group B soils dominates Reach 3 and is also located outside the creek channel in the upper half of Reach 2. A small area of Group A soils is mapped in Reach 2. Group D hydrologic soils and tend to be very slow infiltration rates and high runoff potential. Group B soils have moderate infiltration rates and Group A soils have high infiltration rates. Only seven acres in the segment have soils that are at high risk for erosion, with the remainder of the segment only at slight risk. Steep slopes are present on both side of the valley through which the creek flows. The valley is relatively narrow through this segment, averaging one-quarter mile wide, except for the middle portion of Reach 2. Creek substrate data is unavailable for this reach.

9.3.2 Land Use

Land Use: Residential uses and zoning dominates this segment. Commercial zoning is located in the Northwest Drive/Birchwood area. Industrial zoning in Reach 2 has been acquired by the city and will be re-developed into a public park. One hundred two (102) buildings are located within the SMA jurisdiction in Reach 2 covering approximately 3.12 acres, and 21 buildings in reach 3 covering approximately 0.54 acres.

Transportation and Utilities: Squalicum Parkway, an arterial between Interstate-5 and the Bellingham Bay waterfront, parallels the creek through the entire segment. Northwest Drive crosses the creek via a high bridge.

Public Access: Scattered parcels throughout the segment are publicly owned but have not been developed to provide access.

Shoreline Modifications: The creek flows through two long culverts in Reach 2, one under Squalicum Parkway and one at Northwest Drive. On average, impervious surfaces constitute 33% of segment, semi-pervious surfaces 25% and pervious surfaces 42%.

9.3.3 Critical Areas

Wetlands/ Regulated Streams: Only one wetland in mapped in the segment at the southern most extent of Reach 2 on the north side of Squalicum Parkway. The wetland does not appear to have a surface water connection to the creek. There may be some riparian wetlands associated with the creek, but this has not been confirmed. Baker Creek, a city regulated stream, flows into this segment at the confluence of Reaches 2 and 3.

FEMA: FEMA 100 year floodplain is mapped between the steep valley walls of Reach 2, which constitutes approximately 45% of the Reach. There appears to be no structural development in the floodplain. The creek channel in Reach 3 is confined by natural topography and Squalicum Parkway thus limiting the FEMA floodplain to the existing creek channel.

Slopes: Steep slopes are present along both sides of the creek valley throughout the entire segment. Whatcom County Planning Department has identified Reach 2 as being a mine hazard area and the upper most extent of Reach 2 and all of Reach 3 on the south side of Squalicum Parkway as a seismic hazard area due to geologic units.

Potential PHS/TSE Species: Documented PHS usage includes: Chinook, coho, chum, bull trout and sea-run cutthroat salmonids. Presence of bull trout is presumed above the long culvert under Squalicum Parkway in Reach 2. Chinook salmon and bull trout are listed as a Federal threatened species and by the State as a candidate species. Sea-run cutthroat and coho salmon are listed as a Federal species of concern and have no State status.

9.3.4 Ecological Functions

Water Quality: The segment below the long culvert under Squalicum Parkway in Reach 2 has been listed by the Washington Department of Ecology as Category 5 “Polluted Water” for dissolved oxygen, fecal coliform and temperature. The water is also listed as a concern for pH. There are no stormwater discharges indicated, however, based on the location of storm drain lines and topography; it appears that there are six possible discharges in SMA jurisdiction. A sewer main is located in the Squalicum Parkway. There are no documented toxic sites in this segment.

Vegetation: A mix of native and non-native vegetation dominates this segment. The vegetation in Reach 2 tends to be more native in composition and characterized by a mature canopy. Built environment includes Squalicum Parkway and residential homes in the outer limits of the buffer on the south side of the creek. In the areas where the native canopy has been removed, invasive species tend to dominate, particularly Himalayan blackberry and old man’s beard. Non-native and invasive species tend to be problematic along Squalicum Parkway through the entire segment. In the upper portions of Reach 2 and through Reach 3, the quality of the vegetation community decreases due to pressures from commercial and residential development. Vegetation areas are narrower and tend to be dominated by deciduous trees and shrubs, as well as non-native and invasive species that thrive in disturbed areas. Approximately 40% of the segment is an equal mix of native and naturalized non-native plants with a medium quality native plant community with a young forest overstory. Approximately 25% of the segment is ranges from predominately non-native to no native plants with sparse overstory.

Wildlife: Documented fish use includes: bull trout, sea-run cutthroat, chinook, coho, chum and steelhead salmon. The segment offers a mix of habitat that supports mainly urban mammals. Half of Reach 2 supports no mammals. Fifty percent of Reach 3 and 10% of Reach 2 supports both urban and non-urban mammals. Approximately 40% of the segment supports an equal mix of urban and non-urban birds. Approximately half of the segment supports native amphibians with as much as 70% of the segment supporting garter snakes. Large to medium sized animal movement is possible in 40% of the segment. Fish and bird movement is easy in 20% of the segment.

Habitat: The creek buffer in this reach ranges from 25 to 200 feet. Most of the immediate buffer is vegetated (20 to 50 feet). Most impervious surfaces are set back from the creek, except for Squalicum Parkway, which parallels the creek through this entire segment. The buffer in Reach 2 tends to be native or naturalized and dominated by a forest canopy, except near the built environment where the canopy has been removed allowing non-native and invasive species to populate. The buffer in the upper portion of Reach 2 and through Reach 3 is a mix of deciduous trees, shrubs and invasive species. Some native plant habitat exists in this segment but it is generally isolated from other habitats by development. Residential development that dominates the southern creek buffer also has a negative impact on habitat and animal use. The overall quality of habitat is reduced due to these two factors. Isolation of habitat limits usage to those species that can take advantage of narrow habitat corridors. Habitat use is also limited to those species that can adapt to habitat disturbance from adjacent development uses. PHS and SC species use approximately 35% of Reach 2 has habitat for breeding and/or rearing and an additional 15% of the reach has habitat that is used regularly for foraging or other non-breeding activity. PHS and SC species use approximately 37% of the habitat in Reach 3 for foraging and non-breeding, and 18% of the reach is used sporadically by PHS and SC.

The two long culverts (under Squalicum Parkway and Northwest Drive) in this segment may limit use of the upper watershed by some fish species.

9.3.5 Opportunities

Preservation

- Possible preservation and habitat connection with development of the new park in Reach 2.

Enhancement or Restoration Opportunities

- Canopy cover for the creek could be improved greatly by planting coniferous and deciduous trees along the shoreline.
- Where practicable, invasive species control and elimination measures should be implemented along the creek channel and in the buffer. Native shrubs and trees should be planted where possible.
- Improvement or replacement of the culvert under Squalicum parkway.

9.4 Reach Analysis: Segment C (Reach 4)

9.4.1 Landscape Setting

This reach is approximately 16 acres in size. Glacial outwash dominates the geology. A small area of continental sedimentary rock is also present in the southeastern portion of the reach. Hydrologic soil group B is located in the glacial outwash areas. Group C soils area mapped in the sedimentary rock area. Group B soils have moderate infiltration rates and Group C soils have a slow infiltration rate. All soils in the reach have only a slight risk of erosion. Steep slopes in the reach are minimal and only located immediately adjacent the creek in the lower portion of the reach. The valley through which the creek flows broadens considerably through this reach. The valley walls are well outside SMA jurisdiction. Creek substrate data is generally unavailable for this reach. However, data for one sampling point was available. The sample was taken in Cornwall Park: 3% sand, 10% fine gravel, 20% coarse gravel and 68% cobble.

9.4.2 Land Use

Land Use: Public uses and zoning dominates this segment. The majority of this segment is located within a city park. One building is located within the SMA jurisdiction covering approximately 0.07 acres.

Transportation and Utilities: Guide Meridian Street, a major arterial, crosses the creek at the lower extent of the reach. Birchwood Ave is located just north of the creek, the majority of which is located outside of the SMA.

Public Access: All but 0.2 acres of the SMA is located within a city park. Cornwall Park offers active and passive recreational opportunities.

Shoreline Modifications: The extent of shoreline modifications is unknown, however, one foot path, bridge is located within the park and there are no culverts in this reach. On average, impervious surfaces constitute 7% of segment, semi-pervious surfaces 40% and pervious surfaces 53%.

9.4.3 Critical Areas

Wetlands/ Regulated Streams: There are no wetlands or tributary streams mapped in this reach.

FEMA: FEMA 100 year floodplain is associated with the creek through the entire reach. Approximately half of the reach is located with the floodplain.

Slopes: Steep slopes in the reach are minimal and only located immediately adjacent the creek in the lower portion of the reach. These minimal slopes pose no real geohazard. The valley through which the creek flows broadens considerably through this reach. There are no other identified geohazards in the reach.

Potential PHS/TSE Species: Documented PHS usage includes: Chinook, coho, chum, bull trout and sea-run cutthroat salmonids. Presence of bull trout is presumed in this reach. Chinook salmon and bull trout are listed as a Federal threatened species and by the State as a candidate species. Sea-run cutthroat and coho salmon are listed as a Federal species of concern and have no State status.

9.4.4 Ecological Functions

Water Quality: The reach has been listed by the Washington Department of Ecology as Category 5 "Polluted Water" for dissolved oxygen, fecal coliform, temperature, zinc and pentachlorophenol. The water is also listed as a concern for pH and temperature. There are no stormwater discharges indicated, however, based on the location of storm drain lines and topography, it appears that there is one possible discharge in SMA jurisdiction. Sewer mains are located along Guide Meridian and Birchwood Ave. There are no documented toxic sites in this segment.

Vegetation: A large portion of this reach is undeveloped due to public park designation. The portions of the reach that are not developed with park buildings and open space (grass lawn) remain vegetated with mature coniferous forest. In the grass areas of the park a narrow band of shrubs and deciduous trees remain along side of the creek. A small portion of the upper reach is dominated by weedy grasses and herbaceous species. Creek canopy cover is moderate to good in most of the park, except for the northern most extent of the reach where herbaceous species are dominant.

Wildlife: Documented fish use includes: sea-run cutthroat, Chinook, coho, chum and steelhead salmon. All of the reach supports garter snakes and lizards, urban and some non-urban mammals, an equal mix of urban and non-urban birds and native amphibians. Large to medium sized animal movement is easy in this reach. Wildlife use is generally higher in this area due to the quality of native vegetation and connectivity to large areas of undeveloped upland habitat in other areas of Cornwall Park.

Habitat: Average creek buffer in this reach is nearly 200 feet. Trees or shrubs constitute the immediate creek buffer through all but the northern most portion of the reach. In the lower extent of the reach the majority of the buffer is mowed grass. The buffer in the upper half of the reach is dominated by coniferous forest. Some park services (parking) are located in buffer as well. Outside of the grass areas and park services, the vegetation is predominately native forest with emergent trees and is of medium quality. The native forest habitat extends well beyond the SMA into the remainder of Cornwall Park. Habitat quality is moderate to high for an urban setting due to connectivity to other habitat areas and the quality of the native vegetation. PHS and SC species use approximately 100% of the reach as habitat for breeding and/or rearing. There are no known fish barriers in this reach.

9.4.5 Opportunities

Preservation

- None indicated.

Enhancement or Restoration Opportunities

- Canopy cover for the creek could be improved by planting coniferous trees in the adjacent buffer in the lower portion of the reach.
- Habitat and canopy cover in the northern most portion of the reach could be improved by replacing the herbaceous plant community with a native shrub and tree community.

9.5 Reach Analysis: Segment D (Reach 5)

9.5.1 Landscape Setting

This reach is approximately 22 acres in size. Glacial outwash dominates the geology. Hydrologic soil group B is mapped in the lower half of the reach; the upper half of the reach is mapped as Group D soils. Group B soils have moderate infiltration rates and Group D soils have very slow infiltration rates and high erosion potential. There are no soils in this reach with high risk of erosion. There are no steep slopes in the reach except for a very small area in the south eastern most corner of the reach. The valley through which the creek flows broadens considerably through this reach. The valley walls are well outside SMA jurisdiction. An old creek channel is located in the south eastern portion of the reach. The hydrology of Squalicum Creek was changed dramatically with the construction of Interstate-5. The stream location was changed and segments were channelized and/or culverted. Gravel was removed from the valley floor substrate to mix concrete for the road bed. Additionally, a berm roadbed was constructed across the valley for the interstate, which acts as a barrier or dam for water flow except for the elevated bridge over the railway and culverts. All these activities amounted to dramatic changes in the hydrology of the valley upstream of Reach 5, thus affecting stream flow and stream location in the reach. Creek substrate data is unavailable for this reach.

9.5.2 Land Use

Land Use: Residential multi-family/institutional zoning dominates this reach. A small portion of the reach is zoned industrial (4 acres). Current uses include pasture, and animal and plant agriculture. Zoning potential in this reach poses significant risk potential to the creek and habitat potential of the area. Sixteen buildings are located within the SMA jurisdiction covering approximately 1.17 acres.

Transportation and Utilities: One arterial, Birchwood Ave/Squalicum Way, is located in the reach. The road parallels the creek through the valley and then crosses the creek at the upper extent of the reach.

Public Access: None indicated.

Shoreline Modifications: The extent of in-water shoreline modifications is unknown. The creek passes under the roadway at the corner of Birchwood Ave and Squalicum Way via three culverts. On average, impervious surfaces constitute 22% of segment, semi-pervious surfaces 60% and pervious surfaces 18%.

9.5.3 Critical Areas

Wetlands/ Regulated Streams: The upper most extent of the reach is mapped as wetland. This wetland complex is directed associated with Squalicum Creek and the old creek channel in the south eastern portion of the reach. There are two creek/drainage channels in this reach in addition to the mainstem of Squalicum Creek. The middle channel appears to be a remnant channel of Squalicum Creek and possibly was the mainstem before construction of Interstate-5. The southern most feature appears to be a drainage channel and it corresponds to a city mapped storm drain line. The source of hydrology for this drainage is a 12 inch pipe on the south side of the valley and appears to be conveying surface and groundwater from the south valley wall.

FEMA: FEMA 100 year floodplain is associated with the creek through the entire reach. Nearly the entire reach is located with the floodplain.

Slopes: There are no steep slopes in the reach. The valley through which the creek flows broadens considerably through this reach. The only identified geohazard in the area is the valley walls, which have been mapped by Whatcom County Planning as seismic hazard areas based on geologic units. The valley wall is located at the outer extent of the SMA jurisdiction on the south side of the creek.

Potential PHS/TSE Species: Documented PHS usage includes: Chinook, coho, chum, bull trout and sea-run cutthroat salmonids. Presence of bull trout is presumed in this reach. Chinook salmon and bull trout are listed as a Federal threatened species and by the State as a candidate species. Sea-run cutthroat and coho salmon are listed as a Federal species of concern and have no State status.

9.5.4 Ecological Functions

Water Quality: The reach has been listed by the Washington Department of Ecology as Category 5 "Polluted Water" for dissolved oxygen, fecal coliform, temperature, zinc and pentachlorophenol. The water is also listed as a concern for pH and temperature. There are no stormwater discharges indicated, however, based on the location of storm drain lines and topography, it appears that there are two possible discharges in SMA jurisdiction. A sewer main is located along Squalicum Way. There are no documented toxic sites in this segment.

Vegetation: The majority of the reach is currently used for agricultural purposes. The remainder, area north of Birchwood Ave, is developed with institutional buildings. The

agricultural portion of the reach is dominated by herbaceous grasses and weedy species. Scattered native trees and shrubs are located along the mainstem and secondary channel. A small area of deciduous trees and shrubs is located in the south eastern corner of the reach. Creek canopy cover and overall quality of the vegetation is poor.

Wildlife: Documented fish use includes: sea-run cutthroat, Chinook, coho, chum and steelhead salmon. Approximately 65% of the reach supports garter snakes and lizards, urban and some non-urban mammals, an equal mix of urban and non-urban birds and native amphibians. Large to medium sized animal movement is easy in this reach. The potential for wildlife use in this area is higher due to its proximity to quality native vegetation and habitat in Cornwall Park which is adjacent to the reach.

Habitat: Average creek buffer in this reach is approximately 50 feet with a width of 200 feet in about 30% of the reach. Scattered trees and shrubs with a ground cover of herbaceous grasses and weedy species constitute the immediate creek buffer through the entire reach. Beyond this area, the buffer is dominated by herbaceous species, both mowed and un-mowed. The buffer in the upper most extent of the reach is reduced on the northern side of the creek due to proximity to Birchwood Ave. Habitat quality is low, however, the reach does have good connectivity to higher quality habitat in Cornwall Park which is adjacent to the reach. PHS and SC species use approximately 65% of the reach as habitat for breeding and/or rearing.

There are no fish barriers mapped in this reach. However, the culverts located under Birchwood Ave/Squalicum Way are impassible during low flows.

9.5.5 Opportunities

Preservation

- The best available opportunity for fish habitat improvement, together with significant wildlife habitat corridor preservation and restoration, in the City of Bellingham, is in the Squalicum Creek watershed. The potential still exists in this watershed to preserve undeveloped property and improve habitat through the entire length of the watershed.

Enhancement or Restoration Opportunities

The potential to improve the habitat in Reach 5 is high. The importance of this area is also high due to location of the reach. Improving habitat would significantly increase the connectivity of habitat along the Squalicum Creek corridor through the city. The entire reach south of Birchwood Ave should be considered for preservation and restoration of both fish and wildlife habitat, including:

- Preservation of creek and buffer (acquisition).
- Discontinuation of current use.

- Habitat restorations – establish native tree and shrub species, with a long term goal of coniferous forest canopy with a native shrub component and ground cover.
- Improve fish passage under Birchwood Ave/Squalicum Way.
- Invasive plant species control and eventual elimination when tree canopy has been established.

Decisions on fish habitat improvements, including passage barriers, should be considered in conjunction with restoration and preservation goals for the Squalicum valley between and including Reach 5 to Reach 8.

9.6 Reach Analysis: Segment E (Reach 6)

9.6.1 Landscape Setting

This reach is approximately 115 acres in size. Glacial outwash dominates the geology of the valley floor; glacial marine drift dominates the outer edges of the valley and the valley walls. Hydrologic soil group D dominates the valley floor. Some Group C soils are mapped along the southern valley wall. Group D soils have very slow infiltration rates and high erosion potential. Group C soils have a slow infiltration rate and generally have a layer that impedes the downward movement of water, or soils of moderately fine to fine texture. Approximately 17% of the reach has soils with a severe risk of erosion by water. Steep slopes are present at the valley walls.

The hydrology of Squalicum Creek was changed dramatically with the construction of Interstate-5. Most of the intense changes occurred in this reach. The original stream location was changed to accommodate excavation of gravel in the valley and the location of the new highway, which was elevation above the valley floor on a man-made berm. The Interstate now acts as a barrier or dam for water flow through the valley, except for the elevated bridge over the railway and culverts. Two borrow pits were excavated for gravel in order to make concrete for the new roadbed. These pits became Sunset Pond and Bug Lake. Squalicum Creek now flows through Sunset Pond, under James Street, through a modified channel to Interstate-5 where it flows through two 225 foot corrugated metal pipes approximately eight feet in diameter, through a meandering channel, into Bug Lake and then flows out of Bug Lake at the corner of Squalicum Way and Birchwood Ave through three culverts. The exact location of the creek channel prior to construction of Interstate-5 is unknown. All these activities amounted to dramatic changes in the hydrology of the valley, thus affecting stream flow, hydroperiod and in-stream habitat. Creek substrate data is unavailable for this reach.

9.6.2 Land Use

Land Use: Industrial and institutional zoning dominates this reach. The institutional zoning is located south of Bug Lake, adjacent to the hospital. The remainder of the reach, except Bug Lake and Sunset Pond which are publicly owned, is zoned industrial. The valley wall south of Sunset Pond is zoned residential. Current uses include residential

multi-family south of Sunset Pond. The remainder of the reach is undeveloped and at significant risk for development under the current zoning. Said development would greatly impact the creek and habitat in the area. Nineteen buildings are located within the SMA jurisdiction covering approximately 0.96 acres.

Transportation and Utilities: Two arterials, Squalicum Way and James Street are located in the reach. Both streets cross the creek. Interstate-5 bisects the reach. The creek passes under each of these roadways via culverts.

Public Access: The majority of this segment is publicly owned.

Shoreline Modifications: The extent of in-water shoreline modifications is unknown. On average, impervious surfaces constitute 11% of segment, semi-pervious surfaces 13% and pervious surfaces 75%.

9.6.3 Critical Areas

Wetlands/ Regulated Streams: Nearly the entire valley floor is mapped as wetland. The southern portion of the valley between Interstate-5 and James Street is not mapped as wetland. The extent of wetland presence has not been confirmed. Some areas may have less wetland or may be a complex system of wetlands and uplands. The wetlands in this portion of the valley have also been affected by the hydrology changes and creek modifications. Generally, the wetlands are associated with the creek and its floodplain. The mainstem of Squalicum Creek flows through Sunset Pond and Bug Lake. It is possible that old mainstem channels also exist in this area, particularly south of Bug Lake.

FEMA: FEMA 100 year floodplain is associated with the creek through the entire reach. Approximately 60% of the reach is in floodplain. Floodplain tends to exist throughout the entire valley floor in Reaches 6 and 7 except in areas where the elevation is just above flood. Two areas outside of floodplain in this reach are: the area north of Bug Lake and the southern portion of the reach between Interstate-5 and James Street.

Slopes: Steep slopes are present along the southern edge of the SMA jurisdiction throughout the majority of this reach. These slopes are associated with the south valley wall. Whatcom County Planning has identified the valley walls as seismic geohazards based upon geologic units.

Potential PHS/TSE Species: Documented PHS usage includes: Chinook, coho, chum, bull trout and sea-run cutthroat salmonids. Presence of chum and bull trout is presumed in this reach. Chinook salmon and bull trout are listed as a Federal threatened species and by the State as a candidate species. Sea-run cutthroat and coho salmon are listed as a Federal species of concern and have no State status.

9.6.4 Ecological Functions

Water Quality: The portion of the reach up to Sunset Pond has been listed by the Washington Department of Ecology as Category 5 “Polluted Water” for dissolved oxygen, fecal coliform, temperature, zinc and pentachlorophenol. The water is also listed as a concern for pH and temperature. There are no listings above Sunset Pond, nor any listings for Bug Lake. There are no stormwater discharges indicated, however, based on the location of storm drain lines and topography, it appears that there are six possible discharges in SMA jurisdiction. Sewer mains and storm drains are located south of Sunset Pond, along James Street and in the old railroad grade north of Sunset Pond. There are no documented toxic sites in this segment.

Vegetation: A mix deciduous forest and wetland forest/shrub/emergent vegetation dominates the reach. These plant communities also dominate the riparian vegetation. A small area of industrial development and housing is also located in the reach. Approximately 83% of the reach has diverse multi-structured native habitat of high quality and is forested with a mature component and emerging young trees. Canopy cover is generally good along the length of the creek channel and poor for Bug Lake and Sunset Pond. Invasive species in this reach include: tansy ragwort, meadow knapweed, yellow flag iris, reed canary grass, Himalayan blackberry, hairy willow herb and knotweed.

Wildlife: Documented fish use includes: sea-run cutthroat, Chinook, coho and steelhead salmon. Warm water fish use in Sunset Pond includes: largemouth bass, yellow perch, bluegill, brown bullhead and yellow bullhead. Approximately 83% of the reach supports an abundance of garter snakes and lizards including denning habitat, a variety of non-urban mammals including habitat specific species, a variety of non-urban birds including habitat specific species, and salamanders, newts and frogs. Large to medium sized animal movement is easy in 54% of the reach and movement of all sizes of animals is possible in 32% of the reach. Generally, the composition of wildlife tends to be more non-urban due to the higher quality of habitat, the larger size of uninterrupted habitat and the connectivity to other habitat types.

Habitat: Creek buffer width tends to be high in this reach. The buffer in many areas is 200 feet and vegetated with native plant species and forested. The majority of the undeveloped area of the reach, which constitutes more than 75% of the reach, is characterized by mature native habitat, both upland forest and wetland communities including forested, shrub and emergent wetland. Habitat quality tends to be of medium to high quality. One of the largest impacts to habitat quality through this reach is the transportation corridors that are barriers to animal movement. Connectivity to other habitat types, particularly up stream, is good. PHS and SC species use approximately 30% of the reach as habitat for breeding and/or rearing, and 54% of the reach is used by multiple PHS and SC species for breeding, rearing and/or wintering.

There are no mapped fish barriers in this reach. However, culverts under Squalicum Way are impassible during low flows – flow becomes subsurface, culverts under I-5 impassible during mid to higher flows due to high velocity, and the outlet of Sunset Pond is impassible during low flows – flow becomes subsurface.

9.6.5 Opportunities

Preservation

- To the greatest extent possible, undeveloped property in the floodplain should be protected from development – particularly those area through which the creek flows, or will flow, and the adjacent riparian area (buffers of at least 150 feet).

Enhancement or Restoration Opportunities

In order to restore creek ecology and shoreline function, fish passage barriers should be improved and Squalicum Creek should not flow through Bug Lake or Sunset Pond. Improving culvert passages, or routing the creek under Interstate-5 through the bridge opening, are straight forward improvements. At the very least, the three blockages (Squalicum Way culverts, Interstate-5 culverts, and Sunset Pond outlet) should be improved. Further restoration within this reach, deciding how to bypass the two artificial ponds, is more complicated. The following offer a brief outline of some of the possible alternatives:

- *Removal of Bug Lake and Sunset Pond.* From an ecological standpoint, the best alternative is to remove the artificial ponds entirely. Each pond could be filled and the areas restored into a wetland/stream complex. Maintaining an undeveloped valley with wetlands in the floodplain would help aid in flood attenuation. Floodplain wetlands would also provide salmonid rearing habitat. Replacing the ponds with a natural creek channel would also remove predation from warm water fish in the ponds and would improve water temperature.
- *Bypass Bug Lake.* This alternative was proposed in 2002 by GeoEngineers in their draft re-rout feasibility study. See study for details.
- *Bypass Bug Lake and Sunset Pond.* This alternative was proposed in 2002 by GeoEngineers in their draft re-rout feasibility study. See study for details
- Where practicable, invasive species control and elimination measures should be implemented.
- Native coniferous tree species should be planted in the upland and wetland forest areas.

9.7 Reach Analysis: Segment F (Reaches 7 & 8)

9.7.1 Landscape Setting

This reach is approximately 102 acres in size. Glacial outwash dominates the geology of the valley floor; glacial marine drift dominates the southern edge of the segment which corresponds to the south valley wall. Hydrologic soil group D dominates the valley

floor. Some Group C soils are mapped along the southern valley wall. Group D soils have very slow infiltration rates and high erosion potential. Group C soils have a slow infiltration rate and generally have a layer that impedes the downward movement of water, or soils of moderately fine to fine texture. There are no soils with severe risk of erosion by water in the segment. Steep slopes, valley wall, are present along the southern portion of the segment.

The segment is just up stream of the physical changes that occurred in the valley due to construction of Interstate-5. Structural changes in this segment that have affected stream channel location and flow is the railroad grade in the northern and central portion of the valley. The railroad grade was constructed in the early 1900s. The railroad is not actively used today, however, the raised grade remains and affects the creek through Reach 9. The creek currently flows through or under the railroad grade once each in Reaches 7 and 8. In Reach 7, the creek flows through a former bridge site in the railroad grade. The grade confines the creek but the crossing is not maintained so migration of the creek is a possibility. The condition of the creek crossing in Reach 8 is unknown. The creek channel flows along the railroad grade in the lower half of Reach 7. The grade is preventing the creek from migrating to the north. The creek also flows under Hannegan Road at the junction of Reaches 7 and 8. It is presumed that the location of portions the creek through this segment have been changed over the last 100 years. The exact location of the natural creek channel is unknown. The hydroperiod through this segment has been affected by development and increased flashy stormwater events. Creek substrate data is unavailable for this reach.

9.7.2 Land Use

Land Use: Industrial zoning dominates Reach 7 and publicly owned land dominates Reach 8. A large portion of land north of the railroad grade in Reach 7 is owned by the City of Bellingham. A small portion of residential zoning is located along the southern most portion of the segment, along the valley wall. Nearly the entire segment is undeveloped. The majority of Reach 7 (52 acres) is undeveloped industrial zoned land and is at significant risk for development. Reach 8, above the railroad grade, is also at risk due to industrial zoning. Said development would greatly impact the creek, the hydrology of the valley and habitat, both existing and potential. Increasing impervious surfaces in the valley would intensify flooding downstream. Six buildings are located within the SMA jurisdiction covering approximately 0.12 acres.

Transportation and Utilities: One major arterial, Hannegan Road, bisects the segment. The creek passes under Hannegan Road and through or under the railroad grade twice in the segment.

Public Access: No public access is indicated. However, the city owns large parcel in the upper portion of Reach 7.

Shoreline Modifications: The extent of in-water shoreline modifications is unknown. On average, impervious surfaces constitute 5% of segment, semi-pervious surfaces 23% and pervious surfaces 72%.

9.7.3 Critical Areas

Wetlands/ Regulated Streams: The entire valley floor is mapped as wetland. The wetlands in this portion of the valley have been affected by the hydrology changes and creek modifications. There are no tributaries to Squalicum Creek in this segment.

FEMA: FEMA 100 year floodplain is associated with the creek through the entire reach. The entire valley floor is in floodplain. This constitutes the entire segment, except for the south valley wall and the elevated railroad grade.

Slopes: Steep slopes are present along the southern edge of the SMA jurisdiction throughout the entire segment. These slopes are associated with the south valley wall. Whatcom County Planning has identified the valley walls as seismic geohazards based upon geologic units.

Potential PHS/TSE Species: Documented PHS usage includes: Chinook, coho, chum, bull trout and sea-run cutthroat salmonids. Presence of chum and bull trout is presumed in this reach. Chinook salmon and bull trout are listed as a Federal threatened species and by the State as a candidate species. Sea-run cutthroat and coho salmon are listed as a Federal species of concern and have no State status.

9.7.4 Ecological Functions

Water Quality: Reach 8 has been listed by the Washington Department of Ecology as Category 5 "Polluted Water" for dissolved oxygen and fecal coliform. The water is also listed as a concern for temperature. There are no listings for Reach 7. There are no stormwater discharges indicated, however, based on the location of storm drain lines and topography, it appears that there are four possible discharges in SMA jurisdiction in Reach 7 and 2 possible in Reach 8. Sewer mains and storm drains are located along the north valley wall and in the old railroad grade. There are no documented toxic sites in this segment.

Vegetation: *Reach 7.* The entire reach is located within the floodplain of Squalicum Creek. The lower half of reach is mixed deciduous/coniferous forest with a shrub understory. The upper half of the reach is dominated by pasture grasses, predominately reed canary grass. The southern buffer of the creek is dominated by shrubs and regenerating young trees. The majority of the vegetation in this reach is characterized by wetland plant species. Creek canopy cover is good in the lower half of the reach and moderate to low in the upper half where the vegetation becomes more herbaceous. Invasive reed canary grass is well established in this reach.

Reach 8. The entire reach is located within the floodplain of Squalicum Creek. Pasture grasses, reed canary grass, dominate the vegetation on the western side of the creek. The eastern side of the creek is a mix of shrubs and deciduous trees, with trees (deciduous and coniferous) becoming more prevalent further from the creek. Invasive reed canary grass is well established in this reach.

Wildlife: Documented fish use includes: sea-run cutthroat, Chinook, coho and steelhead salmon. Approximately 96% of the segment supports an abundance of garter snakes and lizards including denning habitat, a variety of non-urban mammals including habitat specific species, a variety of non-urban birds including habitat specific species, and salamanders, newts and frogs. Large to medium sized animal movement is easy in nearly the entire reach. Generally, the composition of wildlife tends to be more non-urban due to the moderate to higher quality of habitat, the larger size of uninterrupted habitat and the connectivity to other habitat types. Wildlife usage and diversity could be higher if the habitat in the herbaceous areas that is dominated by reed canary grass was more diversified for both plant species and structurally.

Habitat: Creek buffer width tends to be high in this segment. The buffer in the majority of the segment is 200 feet. Vegetation varies from native forest/shrub to non-native herbaceous. About half of the segment is characterized by diverse multi-structured native habitat of medium to high quality. The remainder of the segment is characterized by monotypic herbaceous vegetation (grasses and weedy species) typical of disturbed sites. Monotypic vegetation provides far fewer habitat opportunities than diverse mature systems. Habitat values in these areas are low. Connectivity to other habitat types, particularly in Reach 8, is good. Connectivity is lower in Reach 7 due to the Hannegan Road barrier and the lack of quality habitat to the north. Multiple PHS and SC species use approximately 96% of the Reach 7 as habitat for breeding, rearing and/or wintering. PHS and SC species use approximately 90% of Reach 8 for breeding and/or rearing. Fish accessible wetlands are associated with Squalicum Creek in Reach 7.

There are no mapped fish barriers in this reach. However the creek does pass through a culvert or tunnel under Hannegan Road. The condition of the structure is unknown.

9.7.5 Opportunities

Preservation

- *Reach 7.* Preserve floodplain valley and associated uplands along the south valley wall. The undeveloped floodplain and wetlands in the valley provide flood water storage during storm events, which is critical to maintaining habitat and protecting downstream development.
- *Reach 8.* The majority of this reach is publicly owned (Dept. of Natural Resources). Preservation of the floodplain and wetlands (see remarks for Reach 7). Preservation of exiting habitat, including forested upland habitat outside of SMA jurisdiction should be considered.

Enhancement or Restoration Opportunities

- *Reach 7.* Habitat improvement. Emergent wetland vegetation in the upper reach could be enhanced by planting native trees and shrubs. Canopy cover could be improved in the upper half of the reach. Habitat north of the creek in the lower half of the reach could be enhanced with native vegetation.
- *Reach 8.* Low quality emergent wetland vegetation could be improved by planting native trees and shrubs.
- Stream habitat could be improved by adding in-stream structures.

9.8 Reach Analysis: Segment G (Reaches 9, 10 & 11)

9.8.1 Landscape Setting

This reach is approximately 67 acres in size. Glacial outwash dominates the geology of the valley floor; glacial marine drift dominates the northern most portion of Reach 11 which corresponds to the north valley wall. The creek valley begins to widen in this area of the watershed, tending toward one-half mile wide. Hydrologic soil group D dominates the valley floor. Some Group C soils are mapped along the northern valley wall. Group D soils have very slow infiltration rates and high erosion potential. Group C soils have a slow infiltration rate and generally have a layer that impedes the downward movement of water, or soils of moderately fine to fine texture. About nine acres of soils with severe risk of erosion by water are mapped in Reach 9. Steep slopes, valley wall, are present along the northern portion of Reach 11.

These upper reaches of Squalicum Creek are located at the outer limits of the city where development is not as dense. The glacial creek valley becomes broader. Disturbances to the natural hydrology of the valley are less structural (creek channel manipulation and control) and more a function of vegetation changes (agriculture and imperious surfaces versus forest) and transportation corridors. The exception to this is in Reach 9 where the creek has probably been modified by the current industrial development and railroad grade that parallels the creek through the entire reach. The creek is confined between the industrial development and the railroad. The railroad grade is a barrier between the creek and wetland system to the east. The railroad grade is not a factor in Reaches 10 and 11. The creek currently flows under an access road in Reach 9 and under Bakerview Road between Reaches 10 and 11. The Bakerview Road crossing is a bridge; condition of the crossing in Reach 9 is unknown. The hydroperiod through this segment has been affected by development and increased flashy stormwater events. Creek substrate data is unavailable for this reach.

9.8.2 Land Use

Land Use: Industrial zoning dominates the segment, except for the upper half of Reach 11 which is zoned residential. Current uses include industrial development in Reaches 9 and 10, and rural residential/agriculture in Reach 11. About half of Reach 10 and all of

Reach 11 is under-developed based upon current zoning and is at significant risk for development. Dense industrial development would greatly impact the creek, the hydrology of the valley and habitat, both existing and potential. Increasing impervious surfaces in the valley would intensify flooding downstream. Six buildings are located within the SMA jurisdiction in Reach 9 covering approximately 0.62 acres, one building in Reach 10 covering 0.49 acres, and ten buildings in Reach 11 covering 0.37 acres.

Transportation and Utilities: One arterial, Bakerview Road, bisects the segment. The creek passes under Bakerview Road via a bridge.

Public Access: No public access is indicated for this segment.

Shoreline Modifications: The extent of in-water shoreline modifications is unknown. On average, impervious surfaces in Reach 9 constitute 49%, semi-pervious surfaces 19% and pervious surfaces 32%; impervious surfaces in Reach 10 constitute 35%, semi-pervious surfaces 46% and pervious surfaces 20%; and impervious surfaces in Reach 11 constitute 6%, semi-pervious surfaces 70% and pervious surfaces 24%.

9.8.3 Critical Areas

Wetlands/ Regulated Streams: The eastern portion of Reach 9 is mapped as wetland. Surface water interaction between the wetland system and Squalicum Creek is confined by the railroad grade. There are no tributaries to Squalicum Creek in this segment.

FEMA: FEMA 100 year floodplain is associated with the creek through the entire reach. Approximately 80% of Reach 9 is in floodplain and 60% of Reaches 10 and 11 is in floodplain.

Slopes: Steep slopes are present along the northern most edge of the SMA jurisdiction in Reach 11. These slopes are associated with the north valley wall. Whatcom County Planning has identified the valley walls as seismic geohazards based upon geologic units.

Potential PHS/TSE Species: Documented PHS usage includes: Chinook, coho, chum, bull trout and sea-run cutthroat salmonids. Presence of chum and bull trout is presumed in this reach. Chinook salmon and bull trout are listed as a Federal threatened species and by the State as a candidate species. Sea-run cutthroat and coho salmon are listed as a Federal species of concern and have no State status.

9.8.4 Ecological Functions

Water Quality: Reaches 9 and 10 have been listed by the Washington Department of Ecology as Category 5 "Polluted Water" for dissolved oxygen and fecal coliform. The reaches are also listed as a water of concern for temperature. Reach 11 is listed as Category 5 water for fecal coliform, temperature and dissolved oxygen, and a Category

2 water of concern for pH. There are no stormwater discharges indicated, however, based on the location of storm drain lines and topography, it appears there may be discharges in SMA jurisdiction along Bakerview Road at the juncture of Reach 10 and 11. Sewer mains and storm drains are located along Bakerview Road. There are no documented toxic sites in this segment.

Vegetation: Very limited areas of native vegetation remain in this segment. The vegetation has been cleared in nearly the entire segment for industrial development and agriculture. Reach 9 is dominated by industrial use. A narrow corridor of native and non-native naturalized vegetation exists along the creek. Native wetland vegetation, including herbaceous, shrub and deciduous tree species, remains in the eastern most portion of Reach 9 (east of the railroad grade and outside current industrial development). Reach 10 has been cleared of vegetation and is now characterized by industrial development and mowed herbaceous species. Sparse shrubs and deciduous trees are growing in a narrow buffer area along the creek. Reach 11 is dominated by agricultural pasture. The northern most portion of the reach, where the slopes increase, is characterized by shrub and deciduous trees. Vegetation along the creek is mixed, with some scattered shrubs and trees. Some diverse, multi-structured, native habitat exists in Reaches 9 and 11. Creek canopy cover is poor throughout the entire segment. Invasive reed canary grass is well established in this reach.

Wildlife: Documented fish use includes: sea-run cutthroat, Chinook, coho and steelhead salmon. For Reaches 9 and 10, approximately 57% supports an abundance of garter snakes and lizards including denning habitat, a variety of non-urban mammals including habitat specific species, a variety of non-urban birds including habitat specific species, and a variety of native only amphibians. For Reach 11, approximately 80% supports garter snakes and lizards with denning habitat, a variety of non-urban mammal, a variety of non-urban birds, including habitat specific species, and salamanders or newts and frogs. Movement is possible for all sizes of animals, including amphibians throughout portions of the segment. In general, wildlife usage tends to be limited by the lack of quality habitat in this segment and the industrial/agriculture development. However, there are areas of good native habitat and there is some connectivity to other habitat types.

Habitat: Creek buffer widths tend to be narrow and highly disturbed through this segment. The vegetation tends to be non-native and herbaceous in areas where the buffer width is 200 feet or greater. In Reaches 9 and 10, where industrial development exists, the buffer tends to be more narrow with sparse to moderate shrub and tree coverage. The best quality habitat in the segment is in eastern half of Reach 9 and the northern portion of Reach 11, where vegetation tends to be more diverse and multi-structured. Cleared areas tend to be characterized by monotypic herbaceous vegetation (grasses and weedy species) typical of disturbed sites. Monotypic vegetation provides far fewer habitat opportunities than diverse mature systems. Habitat values in these

areas are low. Connectivity to other habitat types in Reaches 9 and 11 is good. Connectivity in Reach 10 is low due to Bakerview Road and development barriers. Multiple PHS and SC species use approximately 50% of Reach 9, 65% of Reach 10 and 81% of Reach 11 as habitat for breeding and/or rearing. Wetlands do not appear to be accessible from the creek due to the railroad grade barrier between the two features.

There are no mapped fish barriers in this reach. However the creek does pass through an unknown structure under an access road in the industrial development in Reach 9.

9.8.5 Opportunities

Preservation

- Maintain maximum buffer widths.
- Preserve existing wetland complex east of Reach 9 (beyond SMA jurisdiction as necessary to maintain current system). Explore feasibility of reconnecting wetland complex to creek.
- Protect and preserve headwater wetlands in the upper watershed to the greatest extent possible. Headwater wetlands help maintain base flow and attenuate flood potential.

Enhancement and Restoration Opportunities

- Enhance existing buffer vegetation and canopy cover by planting native trees, shrubs and ground cover species.
- Maintain or improve, as needed, stormwater treatment from industrial development.
- Stream habitat could be improved by adding in-stream structures.
- Improve access road crossing in industrial development.

10.0 MARINE SMA

Summary: The Marina SMA is 928.8 acres in size and includes a wide variety of land uses. Industrial and commercial uses dominate the central portion of the SMA; whereas the other areas are predominately residential. This SMA currently is functioning at range of levels for ecological function. The industrial and commercially dominated areas have limited habitat for both aquatic and terrestrial wildlife species. The northern and southern ends of the Marine SMA provide high to moderate level ecological functions. The SMA has received an extensive amount of review from a variety of studies. There is significant documentation addressing suggested enhancement, restoration and areas of proposed preservation within this SMA. Data sheets for the Marine SMA are located in Appendix K.

10.1 Watershed Analysis

10.1.1 Landscape Setting

Bellingham Bay was formed by glaciations between 14,000 and 18,000 years ago. The resulting geology includes continental sedimentary deposits and bedrock represented in the Chuckanut Formation dominated the eastern shore of Bellingham Bay from Governor's Point north to Whatcom Creek. Glacial outwash and marine drift are evident from the mouth of Whatcom Creek to the edge of the Nooksack delta. Artificial fill and a variety of land modifications currently dominate the Bellingham Bay shoreline from the Mount Baker Plywood site south and east to the south end of the Cornwall Landfill and again in the vicinity of the Ferry Terminal and Industrial area in Fairhaven (Anchor Environmental 2000). Soils originating from marine drift are very impermeable with little to no water infiltration. Glacial outwash material is highly permeable with moderate to rapid water infiltration.

Bellingham Bay is approximately twelve miles long and three miles wide, with its opening to the south and southwest. Bellingham Bay exchanges water with Rosario Straits via a system of interconnected bays. Marine water enters Bellingham Bay from Rosario Straight and Bellingham Channel. A lesser exchange of water occurs via Hale Passage. Data indicates bottom currents a net southward flow. Within inner Bellingham Bay, deep currents vary with tidal fluctuation (Anchor Environmental 2000).

Major tributaries to the Bay are the Nooksack River, Squalicum Creek, Whatcom Creek, Padden Creek and Chuckanut Creek. Silver Creek drains areas in the northern part of the City and is a tributary to the Nooksack River. The historic mouth of the Nooksack River was diverted from north of the Lummi Peninsula to its current outlet into Bellingham Bay.

Steep Slopes of 20 to 50% surround most of the Bay. The toe of the slope marks the original high water line prior to shoreline modifications. The slopes on the northern portion of the bay are composed of glacial marine drift. There these bluffs have retained contact with the marine system, they provide source of sediment to the marine system. Slopes south of the Cornwall landfill are indicated to be sedimentary and bedrock and are less susceptible to erosion.

10.1.2 Land Use

Land Use: The current shoreline of Bellingham Bay is result of combined efforts of the original geologic and oceanographic processes and human changes. Historical conditions of Bellingham Bay included large tidal flats at the mouths of Squalicum, Whatcom and Padden Creeks. Beginning in the late 1800's the construction of three waterways (Whatcom, I&J, and Squalicum Creek) were approved by the federal government. Periodic episodes of filling surrounding tide lands occurred up thorough the 1960's. The shoreline along the industrial portions of the bay has also been modified by rip-rap and bulks (Anchor Environmental 2000).

Current land use within Bellingham Bay includes public parkland, marinas, heavy industrial, commercial and residential uses. The northern extent of the marine SMA is relatively undisturbed (Segment A). Segment B is highly modified and dominated by the Port of Bellingham marina, industrial and water dependent activities. Public access, city owned shoreline areas dominate Segment C and 13. Shorelines south of Marine Park, Segments G-K) are relatively undisturbed.

Transportation and Utilities: The dominant transportation feature within the Marine SMA is the Burlington Northern/Santa Fe (BNSF) railway line which follows the high tide line along nearly the entire length of the SMA, with the exception of Segment A. Major arterials within the Marine SMA includes Squalicum Parkway, Holly Street, South State. The remaining roads are secondary feeder roads.

The City of Bellingham sewer treatment plant is located in Segment 13. Sanitary sewer mains and lines are in many areas of this SMA. Twenty City of Bellingham storm sewer outfalls and eleven other point and non-point sources are documented to discharge directly into the marine system along the SMA. No retention or water quality systems are recorded to be present within the Marine SMA area (Anchor Environmental 2000).

Public Access: Public access is provided in a variety of locations along the Marine SMA. Public parks include Squalicum Park, Zuanich Park, Boulevard Park, Taylor Street boardwalk, Marine Park, a small restoration site in Padden Lagoon, and an unnamed park at Chuckanut Bay. Other areas of public access include the Port of Bellingham marina, a beach access at the end of Cornwall Ave., and Post Point. These areas do not have official access but are regularly used by the public. Other small pocket beaches along the shoreline are also used regularly by the public.

Shoreline Modifications: The railed has had a profound influence on the shoreline processes by reducing backshore habitat, stabilizing bluffs, affecting nearshore oceanic processes. Approximately ninety percent of the SMA has been armored by rip-rap or bulkheads. The only SMA reaches that do not have significant shoreline alterations are 1, 2, 15 and 16. Reaches 3-7 and 11 have extensive numbers of docks, piers and other in-water structures. The Squalicum marina dominates Reaches 3 and 4. Segments B and E have the greatest percentage of impervious surface area; whereas Segment A and J have the lowest percentage of amount of pervious area.

10.1.3 Critical Areas

Wetlands/ Regulated Streams: Little Squalicum, Squalicum, Whatcom, and Padden Creeks are all mapped streams entering the marine SMA. Wetland areas are limited with in the SMA. One wetland is located in association with Little Squalicum Creek in Reach 2 and another small wetland is located north of the Taylor Street Dock in Reach 9.

FEMA: The entire marine shoreline occurs within the FEMA floodplain, but is restricted to the immediate shoreline area. The only Floodways are associated with incoming streams.

Slopes: Steep slopes are associated with a bluff system that rings most of the entire bay. In some locations the bluffs are back from the shoreline, which resulted from historic fill and mark the original shoreline location. The Whatcom County Geohazard maps indicate “Landslide Hazard” areas along some areas. They also indicate possible “Seismic Hazard” for areas with artificial fill.

Potential PHS/TSE Species: The following species may occur within the Marine Shoreline SMA. This data originates from US Fish and Wildlife Service. This data is regional in nature not all species listed below have been recorded within Bellingham Bay or their occurrence is very rare (i.e. Steller’s sea-lion and gray whale).

| Common Name | Scientific Name | Federal Status | State Status |
|------------------------|---------------------------------|-----------------------|--------------|
| Puget Sound bull trout | <i>Salvelinus confluentus</i> | Listed Threatened | Candidate |
| Puget Sound chinook | <i>Oncorhynchus tshawytscha</i> | Listed Threatened | Candidate |
| Puget Sound coho | <i>Oncorhynchus kisutch</i> | Candidate for listing | None |
| Bald Eagle | <i>Haliaeetus leucocephalus</i> | Listed Threatened | Threatened |
| Peregrine Falcon | <i>Falco Peregrinus</i> | Species of concern | Sensitive |
| Marbled murrelet | <i>Brachyrampus marmoratus</i> | Listed Threatened | Threatened |
| Steller sea-lion | <i>Eumetopias jubatus</i> | Listed Threatened | Threatened |
| Gray Whale | <i>Eschrichtius Robustus</i> | None | Sensitive |

10.1.4 Ecological Functions

Overall the Marine SMA is providing ecological functions at a range of levels. Several limitations to ecological function have been identified for the Marine SMA particularly reduced intertidal habitat and habitat shelters for out-migrating salmonids.

Past studies performed by the DOE and others in the 1970’s showed that water quality within inner Bellingham Bay was historically degraded as the result of direct discharge of municipal wastes, pulp and paper mill process water, and other point and non-point discharges to the Bay. Efforts to address contamination issues in Bellingham Bay have been ongoing since the 1970’s, resulting in reductions in the levels of contaminants discharged to the bay and corresponding improvements to water quality(Anchor Environmental 2000).

Bellingham Bay is currently classified as a ‘Class A’ water (excellent). However excursions from water quality standards were identified in DOE’s 1998 Section 303(d) listing of surface water for Fecal coliform and pH, in addition to sediment impairments.

The Bellingham Bay Comprehensive Strategy final environmental impact statement indicates 40 waterfront surface water discharge source locations are present in the bay and could potentially affect water and/or sediment quality in localized areas in the Bay (Anchor Environmental 2000).

Groundwater flows into Bellingham Bay from the surrounding uplands where it discharges both vertically and laterally. As it moves through contaminated upland soils it transfers these contaminants in concentrated levels to the marine system. In Bellingham Bay, five areas are known to be sources for local groundwater contamination and focused cleanup investigations have and are being performed at these sites. These areas are: G-P log pond; R.G. Haley site, Cornwall Ave. landfill, Roeder Ave. landfill, and the Chevron Bulk Fuels facility. Bellingham Bay Comprehensive Strategy final environmental impact statement provides a summary of each site, its contaminants and actions being taken (Anchor Environmental 2000).

Identified sediment contamination sites include: six sites in the Whatcom Waterway, the Cornwall Ave. Landfill, the Harris Avenue Shipyard, G-P Outfall, Olivine Nearshore Area, Taylor Avenue Dock, Squaticum Harbor Inner Boat Basin, and Weldcraft Steel and Marine. Bellingham Bay Comprehensive Strategy final environmental impact statement provides a summary of each site, its contaminants and actions being taken (Anchor Environmental 2000).

Intertidal substrate has been well mapped, but foreshore and backshore substrate and habitat features have not been characterized for most areas of the Marine SMA.

Riparian vegetation along Segments B - G is absent or dominated by non-native species. Segments A, H-K have moderate to high quality shoreline vegetation. Invasive plant species control is recommended in most areas of the Marine SMA.

The Marine SMA provides moderate to high quality habitat for fish and wildlife species associated with deepwater habitats. Habitat for species dependent on shallow and intertidal habitats is limited in Segments B-G and good within Segments A, H-K. Connectivity and shoreline habitat for terrestrial associated wildlife species is limited in most areas along the Marine SMA, but excellent shoreline habitat and connectivity to other high quality habitats persists for Segments J and K in the vicinity of Clark's Point and Chuckanut Bay.

10.2 Reach Analysis: Segment A (Reach Marine 1 and 2)

10.2.1 Landscape Setting

This segment extends from the City limits northwest of Bellingham southeast to the west side of the Bellingham Plywood site. This segment has a total size of 133.7 acres with 54.9 acres occurring on land. This segment is located on glacial marine drift with areas of continental outwash. The marine bluffs range from 75 feet to 120 feet from the mean low

water. Soils are upland soils in Drainage Class D or C, which have moderate to high runoff rates. The risk of erosion within the reach soils ranges from slight to severe. The marine shoreline along this segment has been categorized as partially enclosed and receives fairly high energy waves. Drift movement within Reach 1 is indicated to be northwesterly and southeasterly for Reach 2 within this segment.

10.2.2 Land Use

Land Use: The overlaying zoning for this segment includes 50.1 acres of residential, 18.8 acres of industrial, 2.7 acres as public and 0.2 as heliport. Current land use includes low to moderate density single family residential at the top of the marine bluff with interspersed undeveloped forested or agricultural property. An inactive cement plant is located in this segment. This area is not served by City sewer and the houses are on private septic systems. Thirty-one buildings are mapped for this segment. Current zoning and platted lots indicate the potential for greater density in this segment.

Transportation: No roads intersect this segment. The BNSF tracks touch the SMA area at the top of the bluff in a couple of locations. The railway does not occur below the bluff at any point along this reach. No utility mains are documented for this reach.

Public Access: Little Squalicum Beach is a public beach at the eastern edge of this segment. Informal beach use occurs along the entire segment during low tides.

Shoreline Modifications: The shoreline is unarmored along the length, except for a small rip-rapped area adjacent to the Bellingham Plywood site at the eastern edge of Reach 2. Two in-water structures are located at the interface of Reach 1 and 2. An overwater line from the cement plant and the Cement Plant Pier off the west end of Squalicum Beach. Both structures are supported with creosote piles. Average ground cover for this segment is calculated at 32% impervious, 33% semi-pervious and 35% is pervious. Pervious ground cover is predominately native shrub and forest cover on the marine bluffs.

10.2.3 Critical Areas

Wetlands/ Regulated Streams: A palustrine scrub-shrub/forested/emergent wetland is located at the mouth of Little Squalicum Creek in Reach 2. The outflow of the wetlands seeps through the backshore substrate and discharges directly into the Bay. Little Squalicum Creek discharges in the same location and manner. A variety of seeps are located on the bluff face along this segment.

FEMA: 110.2 acres of this segment are mapped within the FEMA Floodplain. No Floodway is mapped for this segment.

Slopes: lopes on the marine bluff are mapped at 20% to 100% and mapped on the Whatcom County Geohazard Maps as “Landslide Hazard Areas”. Upland areas at the top of bank are mapped as a seismic hazard geological unit.

Potential PHS/TSE Species: Bull trout presence is possible and presence is based on suitable habitat and prey. Bull trout are federally listed as a threatened species. Puget Sound Chinook and Puget Sound coho salmon may occur seasonally within this segment. Puget Sound chinook is federally listed as a threatened species. Puget Sound coho salmon are a candidate species for Federal listing. Marbled Murrelets may occur seasonally offshore along this segment. Marbled Murrelets are federally listed threatened species.

10.2.4 Ecological Functions

Water Quality: No specific data was located on water quality for this segment.

Vegetation: The bluffs range from heavily vegetated with native shrubs and/or invasive ground cover such as Himalayan blackberry to unvegetated. Mapped aquatic vegetation includes 2.5 acres of eelgrass, 16.1 acres of green algae, 0.1 acres of mixed algae, and 1.1 acres of salt marsh. These numbers may not include eelgrass and algae populations occurring greater than 200 feet from shore. The non-native eelgrass species *Zostera japonica* is mapped at the northwest edge of this segment. This species typically occurs at higher tidal elevations than the native *Z. marina*.

Wildlife: This segment provides documented spawning habitat for both sand lance and surf smelt. These species both spawn at high tide coarse sand and fine gravels of the upper beach areas. The old cement plant pier is a significant roost area for Double-crested cormorants (Wahl 1995). The tidelands serve as a winter foraging area for Bald Eagles (Wahl 1995). Trees along the shoreline can serve as perches for bald eagles. The Whatcom County Fish and Wildlife Folio indicates the intertidal area at the western edge of this segment is a concentration area for swans. Additionally, the segment includes seabird nesting sites, seasonal foraging habitat for dabbling ducks and soft sediment shorebird concentrations and high diving bird concentrations in the winter.

Habitat: This segment provides high quality habitat and ecological function and provides multiple resources for a variety of fish and wildlife species. Intertidal substrate has a diverse distribution of substrate sizes which are optimal for spawning of sand lance and surf smelt and intertidal algae and eelgrass establishment. Bathymetry is fairly shallow with a mean depth of minus five feet. GIS data indicates that 9.1 acres of beach area are present between high and low tides within this reach. Little Squalicum Creek is documented to have a variety of pollutants originating from sediments and groundwater contamination. Creosote supports on the Cement Plant pier may present a potential water quality hazard. No specific water quality limitations are indicated for the marine environment in this segment.

10.2.5 Opportunities

Preservation

- None indicated

Enhancement or Restoration Opportunities

- Removal of creosote piles on Cement Plant Pier (however this could impact cormorant roost on pier).

Ongoing and/or Proposed Restoration Actions

- None indicated

10.3 Reach Analysis: Segment B (Reaches Marine 3-7)

10.3.1 Landscape Setting

This segment extends from the Bellingham Plywood, south to end of the Cornwall landfill. The segment covers 352.5 acres, of which 142.01 is land. This segment is located predominately on artificial fill or modified land. The majority of the soils are upland soils that are in Drainage Class D with very slow infiltration rates. The erosion risk for most soils in this segment is severe. Areas outside of breakwaters are classified as being partially enclosed and exposed to moderate to heavy wave action. Areas inside the marina and breakwaters are classified as a lagoon or channel with low exposure to wave action. Drift cell movement is indicated to be north on the north side of the Whatcom Waterway and south on the south side of the Waterway.

10.3.2 Land Use

Land Use: The current zoning overlaying this segment is predominately commercial and industrial with a small portion of public space at Pete Zuanich Park. Current land use is consistent with the zoned uses. One hundred twenty-one buildings covering 18.4 acres are mapped for this reach.

Transportation: Roeder Avenue is the primary arterial serving this segment. Numerous secondary roads provide access to Bellingham Cold Storage, the Marina and Tom Glenn spit. The Burlington Northern-Santa Fe rails follow the base of the bluffs east of Roeder Avenue. Three marine waterways are located in this segment including: Squalicum, I/J and Whatcom.

Public Access: Public access is provided via Pete Zuanich Park and associated trails and less formally via the Port of Bellingham Marine docks. Informal public use occurs at the beach area at the end of the I/J Waterway. A small undeveloped beach is located at the west end of Cornwall Ave.

Shoreline Modification: The shoreline has been extensively modified throughout this reach. Modifications include artificial fill, bulkheads, rip-rap, docks and jetties. Nearly

all of the shoreline along this segment has been armored. The segment has average ground cover as follows: 81% is imperious, 15% is semi-pervious and 3% is pervious. Areas with pervious cover are predominately weedy herbaceous cover.

10.3.3 Critical Areas

Wetlands/Regulated Streams: No wetlands are recorded for this segment. Squalicum and Whatcom Creeks both enter the marine system in this segment. Whatcom Creek still retains a partially functioning estuary; whereas little of the Squalicum estuary remains.

FEMA: Localized areas lay within the 100 year floodplain with a small area in the vicinity of Squalicum and Whatcom Creeks within the Floodway.

Slopes: Artificial fill material is located under portions of the marina, GP and Cornwall landfill. These areas are mapped as “seismic hazard areas” on the Whatcom County Geohazard Maps.

Potential PHS/TSE Species: Bull trout presence is possible and presence is based on suitable habitat and prey. Bull trout are federally listed as a threatened species. Puget Sound Chinook and Puget Sound coho salmon may occur seasonally within this segment. Puget Sound chinook are federally listed as a threatened species. Puget Sound coho salmon are a candidate species for federal listing. Marbled Murrelets may occur seasonally offshore along this segment. Marbled Murrelets are federally listed threatened species.

10.3.4 Ecological Functions

Water Quality: This segment has been listed by the WA Dept. of Ecology as a Category 2 “Water of Concern” for 1,2,4-Trichlorobenzene and mercury in samples taken in 1996 and 1997. Documented toxic sites and land fills are located within this segment including the Mount Baker Product site, the Weldcraft Steel and Marine site, the Squalicum Harbor site, the Harbor Marine fuel site, the Whatcom Waterway site, the Roeder Avenue landfill, the Georgia Pacific Log Pond site, the Georgia Pacific Bio-Treatment Lagoon, the Colony Warf site, the Burlington Northern Site, the Cornwall Landfill and the Haley International Corp. site.

Vegetation: Aquatic marine vegetation has been mapped for this segment. The primary vegetation communities are green algae beds and mixed algae beds. Two small eelgrass beds are mapped for this segment: one located near the I/J waterway and the other offshore of the Cornwall Landfill site. A large historical colony of eelgrass is documented in the vicinity of the current Port of Bellingham Marina. No significant terrestrial shoreline vegetation is present.

Wildlife: Potential mustelid and pinniped habitat may occur along the entire shoreline of this segment. There is documented regular harbor seal use of logs for haul outs off the Georgia Pacific site and along the outer rock bulkhead of the marina and GP lagoon. California sealion use of a dock in the I/J waterway is recorded and confirmed by NES staff.

Caspian terns and Glaucous-winged gulls are documented to use the roof of the Bellingham Cold Storage and Marina buildings. High winter concentrations of diving birds occur in the marine waters along this segment.

Surf smelt spawning beach is recorded within the marina inner harbor along the eastern beach and the north side of the I/J Waterway. Low to moderate populations of crab and pandalid shrimp are documented offshore of this segment.

Habitat: This SMA segment is located within heavy industrial and commercial uses and has poor connections to other non-marine habitats. Primary connections to other habitat are limited to the Squalicum and Whatcom Creek riparian corridors. Nearshore habitat in this segment has been manipulated and is dominated by rip-rap, bulkheads, docks and other structures. Beach areas are limited to pocket beaches located at the eastern end of the I/J waterway, pockets within the Whatcom Waterway, the GP log pond site and small beaches adjacent to the Cornwall Landfill.

Marine substrates within this segment are mapped predominately as artificial substrate (i.e. rip-rap) or mixed fine substrates. Mixed fines are primarily located in the small pocket beaches within the segment. A fairly large sandy substrate area is located on the south side of the I/J Waterway. The average depth of water within 200 feet of the shoreline is 29 feet. The greatest water depth is located in Reach 3 and is 43 feet below MLLW; whereas the shallowest water is located in Reach 7 with a depth of 14 feet.

10.3.5 Opportunities

Recommendations within this section originate from the Final Workshop Report: Opportunities and Ideas for Habitat Restoration and Water Access on Urban Bellingham Bay (Anchor Environmental and Coastal Geologic Services 2004). For more details regarding this options please refer to the above documents. Only recommendations relating to habitat restoration were included in this review. The report also addresses public access.

Preservation

- Protect eelgrass and algal beds
- Conservation of existing mudflat area on the Bay side of the Roeder Bridge.
- Conservation of extensive riparian plantings on south side of Whatcom Creek.

Enhancement or Restoration Opportunities

- Beach nourishment of the I/J Waterway beach in enhance forage fish spawning habitat;
- Consideration of forage fish substrate should be given to GP Log Pond, Cornwall Avenue beach and Cornwall Landfill;
- Restoration of the Squalicum Creek Delta site via estuarine marsh and mudflat restoration (would involve relocating Mt. Baker Plywood, and create an estuarine habitat northwest of the existing navigation channel);
- Estuarine marsh and mudflat restoration at the GP Aeration and Settlement pond, GP log pond, Citizens dock/Roeder Bridge mudflat, Holly Street landfill/Whatcom Creek Estuary.
- Jetty removal at southeast tip of Mt. Baker Plywood site;
- Creation of salmon habitat benches to aid in salmon migration- listed as an early action priority if monitoring demonstrates the feasibility of using Squalicum Waterway dredge material (see reports for detailed locations);
- Addition of shoreline riparian vegetation to beaches at Roeder bridge, GP Log Pond, Cornwall Avenue Beach, Cornwall landfill north and south, and between the north bank of the Whatcom Waterway and Holly Street and the Roeder Street Bridge;
- Stormwater drain outfall day lighting and water quality treatment with pocket marshes;
- Remove over-water structures and creosote pilings. (Roeder Bridge area, Squalicum delta area, and
- Restoration of the Cornwall landfill is recommended to address scattered landfill debris mixed with eelgrass bed.

Ongoing and/or Proposed Restoration Actions

- Removal of creosote pilings in the Squalicum Creek delta associated with removal of one wood pier and adjacent in-water wood structures. A new pier is propose to be rebuilt with new non-toxic material and connect to the Bellingham Cold Storage wharf;
- Shoreline riparian plantings are proposed for the GP Log Pond site.
- An environmental cleanup and estuary restoration project is underway at the City owned Sash and Door property.
- Riparian plantings and removal of in-water surface landfill debris is proposed for the Cornwall landfill site.
- Widening of the Whatcom Creek Estuary is proposed at the Holly Street Bridge in conjunction with bridge replacement.
- Removal of creosote pilings between the Cornwall Landfill and the terminus of Cornwall Avenue. One existing pier and over-water building on the GP Log Pond is proposed to be removed.

10.4 Reach Analysis: Segment C (Reach Marine 8 and 9)

10.4.1 Landscape Setting

This segment extends from the southern edge of the Cornwall Landfill to south of the Taylor Street dock and includes two reaches. The segment is 56.5 acres in size of which 25 acres are terrestrial. This SMA is located in continental sedimentary deposits and bedrock. The soils are upland soils that are in Drainage Class B or C. The erosion risk for soils in this reach is either slight or severe. Both reaches are located in areas of moderate to high exposure to wave energy. The general drift cell direction for this segment is south.

10.4.2 Land Use

Land Use: The current zoning overlaying this reach is 37% in a public designation, 8% in residential and 2% in commercial zoning. Current land use is dominated by Boulevard Park and associated Greenways Trails. Residential use is located on the bluff northeast of Boulevard Park. The Chrysalis Inn is the primary existing commercial uses. Current zoning and platted lots indicate the potential for greater density in the residentially zoned portions of the segment, but the majority of the segment is retained as City Park property.

Transportation: South State Street (12th Street) is the primary arterial serving this segment. Secondary roads provide access to Boulevard Park and residential and commercial areas. The Burlington Northern-Santa Fe rails follow the shoreline along the entire segment.

Public Access: Boulevard Park, associated Greenways trails and the Taylor Street Dock are all public access points to the marine system in this segment.

Shoreline Modification: The majority of the shoreline along the segment has been rip-rapped to protect the BNSF railed. Areas that have not been rip-rapped are exposed bedrock. In water structures along this segment include a dock at the north end of Boulevard Park and boardwalk at the south end. A concrete retaining wall is located at the south end of the Boulevard Park. Another board walk connects the recently restored Taylor Street Dock with the Boulevard Park trail system. Numerous old pilings are dotted along this segment. The segment has average ground cover as follows: 38% is impervious, 42% is semi-pervious and 21% is pervious. Areas with pervious cover include grass areas, mixed shrub and forested cover and localized weedy herbaceous cover.

10.4.3 Critical Areas

Wetlands/ Regulated Streams: One small wetland is located north of the Taylor Street dock, landward of the BNSF tracks. No streams are recorded for this segment.

FEMA: No areas within this segment are identified on FEMA maps.

Slopes: Artificial fill material under portions of Boulevard Park is mapped as “seismic hazard areas” on the Whatcom County Geohazard Maps.

Potential PHS/TSE Species: Bull trout presence is possible and presence is based on suitable habitat and prey. Bull trout are federally listed as a threatened species. Puget Sound Chinook and Puget Sound coho salmon may occur seasonally within this segment. Puget Sound chinook are Federally listed as a threatened species. Puget Sound coho salmon are a candidate species for federal listing. Marbled Murrelets may occur seasonally offshore along this segment. Marbled Murrelets are federally listed threatened species. The area is designated as an area of importance and vulnerability for water birds (high concentrations of diving birds in winter). Gray whales have occurred offshore of this segment.

10.4.4 Ecological Functions

Water Quality: Documented toxic sites include the offshore Starr Rock Site, a site off Boulevard Park, the upland Exxon Mobil Oil Corp. site and the Taylor Avenue Dock site.

Vegetation: Aquatic marine vegetation has been mapped for this segment. Both green algae beds and eelgrass beds are mapped for this segment. The eelgrass beds are scattered small colonies along this segment. Upland vegetation is a mix of native shrub and tree species at the northern end of the segment, shifting to lawns through Boulevard Park. The upland vegetation includes native trees, shrubs and weedy herbaceous species south of Boulevard Park. Himalayan Blackberry is well established on the upland slopes above the railed.

Wildlife: Potential mustelid and pinniped habitat may occur along the entire shoreline of this segment. Vulnerable concentrations of winter diving birds occur along this segment. Gray whales have been recorded offshore of this segment, but this is a rare occasion. Records of pigeon guillemot nesting occur for this segment (Taylor Street Dock).

Surf smelt and sand lance spawning beaches are recorded midway along this segment. Low to moderate populations of demersal groundfish and pandalid shrimp are documented offshore of this segment.

Habitat: This SMA segment is dominated by public uses and includes a mix of native mixed forest/shrub communities and extensive landscaped area dominated by lawns. Primary connections to other habitats are limited to the adjacent shoreline habitats. There is no significant upland connection to other significant habitat types from this segment. Nearshore habitat in this segment has been modified by the BNSF rail bed, separating the marine system from native soils, except where bedrock outcrops occur. The shoreline along Boulevard Park has been reinforced with rip-rap and concrete

bulkheads. No significant backshore occurs through the main portion of the part. Pocket beaches are located the north end of Boulevard Park and adjacent to the two boardwalks.

Mapped marine substrates provide a moderately diverse variety of substrate types including mixed coarse, mixed fines, gravels and artificial. This provides a range of habitat opportunities for marine flora and fauna. The average depth of water within 200 feet of the shoreline is 14 feet. The greatest water depth is -24 feet below MLLW; whereas the shallowest water is -3 feet.

10.4.5 Opportunities

Recommendations within this section originate from the Final Workshop Report: Opportunities and Ideas for Habitat Restoration and Water Access on Urban Bellingham Bay (Anchor Environmental and Coastal Geologic Services 2004). For more details regarding this options please refer to the above documents. Only recommendations relating to habitat restoration were included in this review. The report also addresses public access.

Preservation

- This segment contains a portion of the largest eelgrass beds in the City's waterfront. This eelgrass bed should get priority protection.

Enhancement or Restoration Opportunities

- Beach nourishment to forage fish spawning areas.
- Boulevard Park enhanced beaches should be considered for suitable forage fish spawning substrate.
- Shoreline riparian vegetation should be included to beaches at Boulevard Park.
- Day-lighting and enhancement of stormwater outfall north of Taylor Street Dock.
- Removal of concrete debris from the shoreline of Boulevard Park and rebuild more natural beach shorelines.

Ongoing and/or Proposed Restoration Actions

- An extensive beach nourishment and debris removal is proposed along the railroad tracks at the north end of Boulevard Park.
- Creosote pilings are proposed to be removed at the north end of Boulevard Park.

10.5 Reach Analysis: Segment D (Reach Marine 10)

10.5.1 Landscape Setting

This segment extends south of Taylor Street Dock to the north end of the Fairhaven Boatyards. It is 9.8 acres in size, of which 4.5 acres are land. This SMA is located in continental sedimentary deposits and bedrock. The soils are upland soils that are in Drainage Class B. The erosion risk for soils in this segment are either slight or severe. This segment is indicated to receive moderate to heavy wave action.

10.5.2 Land Use

Land Use: The current zoning overlaying this reach is 23% industrial, 21% commercial and <1% in a public designation. Current land use is predominately undeveloped land. Reid Boiler Works is located midway along this segment located at the top of bluff. Current zoning and platted lots indicate the potential for greater density and alteration within this segment.

Transportation: 10th Street and an access road to the Fairhaven Boatyards is the only road within the SMP designation. The BNSF railroad is located along the shoreline and parallels the entire segment.

Public Access: No public access is provided to properties within this reach. Informal access the beach is utilized by the public at low tides.

Shoreline Modification: The majority of the shoreline along the segment has been rip-rapped to protect the BNSF railed. The segment has average ground cover as follows: 50% is impervious, 40% is semi-pervious and 9% is pervious. Areas with pervious cover are predominately covered with Himalayan blackberry.

10.5.3 Critical Areas

Wetlands/ Regulated Streams: No regulated wetlands or streams are indicated for this segment.

FEMA: No areas within this segment are identified on FEMA maps.

Slopes: Artificial fill materials under portions of Boulevard Park are mapped as “seismic hazard areas” on the Whatcom County Geohazard Maps.

Potential PHS/TSE Species: Bull trout presence is possible and presence is based on suitable habitat and prey. Bull trout are federally listed as a threatened species. Puget Sound Chinook and Puget Sound coho salmon may occur seasonally within this segment. Puget Sound chinook are federally listed as a threatened species. Puget Sound coho salmon are a candidate species for federal listing. Marbled Murrelets may occur seasonally offshore along this segment. Marbled Murrelets are federally listed threatened species. The area is designated as an area of importance and vulnerability for water birds (high concentrations of diving birds in winter). Gray whales have occurred offshore or this segment.

10.5.4 Ecological Functions

Water Quality: The only documented toxic site is the Exxon Mobil Oil Corp site at 908 10th Street.

Vegetation: Aquatic marine vegetation has been mapped for this segment. Green algae beds are mapped for this segment. Upland vegetation is predominately Himalayan blackberry intermixed with native shrub and trees.

Wildlife: Potential pinniped habitat may occur along the entire shoreline of this segment. Harbor seal haul outs are indicated on offshore logs. Vulnerable concentrations of winter diving birds occur along this segment.

Sand lance spawning habitat is documented along this entire segment. Low to moderate populations of demersal groundfish and pandalid shrimp are documented offshore of this segment.

Habitat: This SMA segment is dominated by Himalayan blackberry and interspersed patches of native shrubs. Primary connections to other habitats are limited to the adjacent shoreline habitats. There is no significant upland connection to other significant habitat types from this segment, although a limited corridor exists along the South Bay trail. Nearshore habitat in this segment has been modified by the BNSF rail bed, separating the marine system from native soils, except where bedrock outcrops occur. The shoreline along Boulevard Park has been reinforced with rip-rap and concrete bulkheads. No significant backshore occurs through the main portion of the part. Several small pocket beaches are present at low tide.

Mapped marine substrates provide a moderately diverse variety of substrate types including mixed coarse and mixed fines. This provides a range of habitat opportunities for marine flora and fauna. The water depth is -11 feet below MLLW.

10.5.5 Opportunities

Recommendations within this section originate from the Final Workshop Report: Opportunities and Ideas for Habitat Restoration and Water Access on Urban Bellingham Bay (Anchor Environmental and Coastal Geologic Services 2004). For more details regarding this options please refer to the above documents. Only recommendations relating to habitat restoration were included in this review. The report also addresses public access.

Preservation

- This segment contains a portion of the largest eelgrass beds in the City's waterfront. This eelgrass bed should get priority protection.

Enhancement or Restoration Opportunities

- Enhancement of shoreline vegetation with native trees and shrubs.

Ongoing and/or Proposed Restoration Actions

- None identified.

10.6 Reach Analysis: Segment E – Fairhaven Marina/Ferry Terminal (Reach Marine 11)

10.6.1 Landscape Setting

This segment extends along the industrial marine area around the Fairhaven Marina and Alaskan Ferry Terminal south to the north end of Marine Park. The segment is 27.9 acre in size, of which 11.7 is land. This SMA is located in continental sedimentary deposits and bedrock. The Ferry Terminal vicinity is constructed on artificial fill. The soils are upland soils that are in Drainage Class D. The erosion risk for soils in this reach is severe. The segment is located in an area with moderate exposure to wave action.

10.6.2 Land Use

Land Use: The current zoning overlaying this reach includes 12.2 acres of industrial and 0.5 acres public. Current land use is predominately marine dependent industrial intermixed with ferry and marina uses. A total of 32 buildings are mapped for this reach.

Transportation: Harris Avenue is primary arterial within the SMP designation. Access roads and parking for waterfront businesses are present. The BNSF railroad is located along the water at the north side of the segment and crosses inland near the Bellingham Cruise Terminal.

Public Access: Public access areas include a public boat ramp and the Bellingham Cruise Terminal.

Shoreline Modification: Extensive shoreline modifications are present in this segment. The entire shoreline of this segment has been rip-rapped or protected with bulkheads. A large number of in-water structures are located in this reach including docks and pilings. Impervious surface is calculated to be at 96% of reach and 4% of the reach groundcover is semi-pervious and 0% is pervious and 44% is water (channel).

10.6.3 Critical Areas

Wetlands/ Regulated Streams: No wetlands or streams are identified for this reach.

FEMA: Portions of this reach are identified on FEMA maps as occurring in the floodplain.

Slopes: Artificial fill material under portions of Fairhaven Cruise Terminal and associated industrial areas are mapped as “seismic hazard areas” on the Whatcom County Geohazard Maps.

Potential PHS/TSE Species: Bull trout presence is possible and presence is based on suitable habitat and prey. Bull trout are federally listed as a threatened species. Puget Sound Chinook and Puget Sound coho salmon may occur seasonally within this

segment. Puget Sound chinook are federally listed as a threatened species. Puget Sound coho salmon are a candidate species for federal listing. Marbled Murrelets may occur seasonally offshore along this segment. Marbled Murrelets are federally listed threatened species. The offshore area is designated as an area of importance and vulnerability for water birds (high concentrations of diving birds in winter).

10.6.4 Ecological Functions

Water Quality: There is no documentation of degraded water quality within the inner bay within this segment. DOE 303(d) data indicates the outer bay is designated as a Category 5 for dissolved oxygen, Category 2 for pH and Category 1 for fecal coliform, pH and temperature. No toxic sites or landfills are documented for this segment.

Vegetation: Aquatic marine vegetation has been mapped for this segment. Green algae beds are mapped for this segment along with a small patch of eelgrass at the mouth of Padden Lagoon. Little upland vegetation is present.

Wildlife: Potential pinniped and mustelid habitat may occur along the entire shoreline of this segment. Vulnerable concentrations of winter diving birds occur along this segment. Pigeon guillemot nesting has been documented on old piers in this area. Large numbers of European starlings are nesting under the docks of the Fairhaven Cruise Terminal. Sand lance spawning habitat is documented along the northwest edge of this segment.

Habitat: Little terrestrial vegetation is present through this segment. Connections to other habitats (either marine or terrestrial) are limited due to upland and in water modifications. There is no significant upland or marine connection to other significant habitat types from this segment. The shoreline has been reinforced with rip-rap and concrete bulkheads. No significant backshore occurs through the main portion of the part. A small pocket beaches is present at low tide west of the Bellingham Cruise Terminal.

Mapped marine substrates provide limited diversity most of the area is artificial fill with areas of mixed fines and small areas of coarse gravel. The mean water depth is -6.5 feet below MLLW.

10.6.5 Opportunities

Preservation

- None identified

Enhancement or Restoration Opportunities

- None identified

Ongoing and/or Proposed Restoration Actions

- None identified

10.7 Reach Analysis: Segment F- Padden Lagoon (Reach Marine 12)

10.7.1 Landscape Setting

This segment extends around Padden Lagoon. The segment is 13.1 acre in size, of which 9.17 is land. This SMA is located in continental sedimentary deposits and bedrock. The soils are upland soils that are in Drainage Class D with very slow infiltration rates. The erosion risk for soils in this reach is severe.

10.7.2 Land Use

Land Use: The current zoning overlaying this reach includes 9.4 acres of industrial, 0.1 acres commercial and 0.1 acres public. Current land use is predominately marine dependent industrial intermixed with ferry and marina uses. At total of 6 buildings are mapped for this reach. Current zoning and platted lots indicate the potential for greater density in the residentially zoned portions of the segment, south of Harris Avenue.

Transportation: Harris Avenue is primary arterial within the SMP designation. Access roads and parking for waterfront businesses are present. The BNSF railroad is located along the water at the north side of the segment, separating this segment from the open marine system.

Public Access: Public access areas include the easement area of Harris Avenue and Port of Bellingham owned property on the west side of the segment.

Shoreline Modification: Extensive shoreline modifications are present in this segment. The entire shoreline of this segment has been rip-raped. In water structures include a dock on the east side of the lagoon, old pilings and the BNSF rail crossing at the outlet of the lagoon. Impervious surface is calculated to be at 77% of reach and 23% of the reach groundcover is semi-pervious and 0% is pervious and 31% is water (channel).

10.7.3 Critical Areas

Wetlands/ Regulated Streams: No wetlands are identified for this reach. Padden Creek enters the lagoon in the southeast corner and exits under the BNSF tracks.

FEMA: Portions of this reach are identified on FEMA maps as occurring in both the floodplain and floodway.

Slopes: Artificial fill materials around portions of Padden Lagoon are mapped as "seismic hazard areas" on the Whatcom County Geohazard Maps.

Potential PHS/TSE Species: Bull trout presence is possible and presence is based on suitable habitat and prey. Bull trout are federally listed as a threatened species. Puget Sound Chinook salmon may occur seasonally within this segment. Puget Sound chinook are federally listed as a threatened species. The segment includes WDFW priority estuarine and riparian habitat.

10.7.4 Ecological Functions

Water Quality: There is no documentation of degraded water quality within the inner bay within this segment. DOE 303(d) data indicates the outer bay is designated as a Category 5 for dissolved oxygen, Category 2 for pH and Category 1 for fecal coliform, pH and temperature. Documented toxic sites include the Tolly Craft Yachts Corps is just outside this segment. This site includes suspected contaminated sediments and confirmed contaminated groundwater.

Vegetation: Aquatic marine vegetation has been mapped for this segment. Green algae beds and salt marsh vegetation are mapped for this segment. Salt marsh vegetation is located on the western and southern shores of the lagoon. Little upland vegetation is present along the northern and eastern sides of the lagoon, but a narrow backshore supports a mix of native and non-native terrestrial plant species on the southern and western sides of the lagoon. An intensive native planting project was installed by the City along the western edge of the lagoon.

Wildlife: Potential mustelid habitat may occur along the entire shoreline of this segment. Purple martin houses have been installed in the lagoon. This species is a historic resident of this area. The lagoon provides important estuarine habitat to juvenile salmon entering the marine system from Padden Creek.

Habitat: Little terrestrial vegetation is present through this segment except in a narrow strip on the south and west sides of the lagoon. Connections to other habitats are available for both the marine and terrestrial habitats. The segment connects to the riparian corridor associated with Padden Creek. Limited backshore is present in this segment.

Mapped marine substrates are predominately mud and mixed fines.

10.7.5 Opportunities

Recommendations within this section originate from the Final Workshop Report: Opportunities and Ideas for Habitat Restoration and Water Access on Urban Bellingham Bay (Anchor Environmental and Coastal Geologic Services 2004). For more details regarding this options please refer to the above documents. Only recommendations relating to habitat restoration were included in this review. The report also addresses public access.

Preservation

- This segment contains a one of the largest estuarine marsh habitats on the City's waterfront and should get priority protection.

Enhancement or Restoration Opportunities

- Enhancement of shoreline vegetation with native trees and shrubs.
- Restoration of estuarine marsh and mudflats in Padden Creek Lagoon. Removal of fill along the eastern edge of the lagoon to expand the estuary and allow a more natural channel to form.
- Beach nourishment of the intertidal areas between Padden Creek Lagoon and Boulevard Park to restore forage fish spawning habitat.
- Day-lighting of a stormwater outflow northeast of Padden Creek Lagoon.
- Removal of an old wood pier north of Padden Lagoon, and a dock within the lagoon.

Ongoing and/or Proposed Restoration Actions

- Padden Creek Estuary planting on the southwest portion of the segment was installed by the City of Bellingham.

10.8 Reach Analysis: Segment G- Marine Park (Reach Marine 13)

10.8.1 Landscape Setting

This segment extends along Marine Park, south of the property fronting the City of Bellingham sewer treatment plan. This SMA is located in continental sedimentary deposits and bedrock. The soils are upland soils that are in Drainage Class B and D. The erosion risk for soils in this reach is slight to severe. Most slopes in the reach are less than 20%, but slopes of 20% to 50% are present at the south end of the segment.

10.8.2 Land Use

Land Use: The current zoning overlaying this reach includes 12.9 acres of public and 0.3 acres of residential and 0.2 acres of industrial. Current land use is predominately public park with residential uses at the south end of the segment. Industrial uses is limited to the an area north of the sewer treatment use. At total of 8 buildings are mapped for this reach. Current zoning and platted lots indicate the area is near its maximum density.

Transportation: No significant roads are located in this segment. The BNSF railroad is located along this entire segment.

Public Access: Extensive public access is provided in this segment via Marine Park and public access provided around the City sewer treatment plant.

Shoreline Modification: The entire segment has been rip-rapped for the BNSF railroad. Impervious surface is calculated to be at 51% of reach and 45% of the reach groundcover is semi-pervious and 4% is pervious and 51% is water.

10.8.3 Critical Areas

Wetlands/ Regulated Streams: The Bellingham Wetland Inventory indicates the lagoon area to be a estuarine subtidal and intertidal wetland that includes aquatic bed and emergent vegetation classes. No streams are documented for this segment.

FEMA: No areas within this segment are identified on FEMA maps.

Slopes: Slopes at the south end of this segment have slopes ranging from 20% to 50%. Slopes in this reach are mapped on the Whatcom County Geohazard Maps as "Landslide Hazard Areas".

Potential PHS/TSE Species: Bull trout presence is presumed based on suitable habitat and prey. Bull trout are Federally listed as a threatened species. Surf smelt and sand lance spawning habitat is documented for the area fronting Marine Park. A great blue heron colony is located in forested area immediately outside of the south end of the segment.

10.8.4 Ecological Functions

Water Quality: There is no documentation of degraded water quality within the inner bay within this segment. DOE 303(d) data indicates the outer bay is designated as a Category 5 for dissolved oxygen, Category 2 for pH and Category 1 for fecal coliform, pH and temperature. Documented toxic sites include the Port of Bellingham Harris Avenue Shipyard site. This site includes confirmed contaminated sediments and suspected contaminated groundwater.

Vegetation: Aquatic marine vegetation has been mapped for this segment. A large eelgrass bed is mapped along this reach. Other marine vegetation includes green and mixed algae beds and salt marsh vegetation. Terrestrial vegetation ranges from lawns in Marine Park to native deciduous forest along the marine bluff at the south end of the segment. Significant vegetation is lacking around much of the lagoon.

Wildlife: Potential mustelid and pinniped habitat may occur along the entire outer shoreline of this segment. The lagoon may provide important estuarine habitat to juvenile salmon out migrating from local streams. Offshore pandalid shrimp and crap populations are documented for this segment. A great blue heron colony is located immediately outside the SMA near the southern end of this segment.

Habitat: Terrestrial vegetation is well developed at the southern portion of the segment, providing a moderate corridor along the southern shoreline. Diverse aquatic vegetation

and substrate provide good cover for a variety of marine species. Mapped marine substrates include mixed coarse, mixed fines, sand and artificial substrate (rip-rap). Limited backshore is present in this segment due to the BNSF tracks.

10.8.5 Opportunities

Preservation

- Preservation of eel grass beds of Marine Park and the Post Point Lagoon.
- Preservation of a great blue heron rookery just outside the SMA.
- Maintain canopy cover and forested buffer.
- Place a high priority on best management practices that control erosion and protect native soils.

Enhancement or Restoration Opportunities

- Restoration of the Post Point Lagoon, including removal of fill along the southern side to allow for expansion of the marsh; reducing the size of the dog off-leash area and limiting dog access to the area southeast the sewage treatment plant.
- Day-lighting of a stormwater outfall near the Post Point Lagoon.

Ongoing and/or Proposed Restoration Actions

- Beach enhancement in Marine Park.
- Education of dog owners regarding pick up of droppings.

10.9 Reach Analysis: Segment H (Reaches Marine 14, 16)

10.9.1 Landscape Setting

This segment includes two reaches that are located south of the sewer treatment plant and north of Clark's Point. The reaches have been grouped together based on their physical similarities (lack lagoons). The total segment size is 39.8 acres in size, of which 17 acres is land. This SMA is located in continental sedimentary deposits and bedrock. The soils are upland soils that are in Drainage Class B or D. The erosion risk for soils in this reach is slight to severe. Marine bluff slopes along this segment are mapped at 20% to 70%.

10.9.2 Land Use

Land Use: The current zoning overlaying this reach includes 19.6 acres of residential use. Current land use is consistent with the overlaying zoning. A total of 6 buildings are mapped for this reach. Current zoning and platted lots indicate the segment is near its maximum density, based on current zoning and neighborhood place limitations.

Transportation: No roads are located within the SMP designation. The BNSF railroad parallels the base of the bluff along the entire segment.

Public Access: No formal public access is provided in this segment, but informal use of the Marine Point area occurs. The BNSF rail line limits formal access.

Shoreline Modification: The entire segment has been rip-rapped for the BNSF railroad, except in a small area at Post Point where bedrock abuts the marine shoreline. Average impervious surface for this segment is calculated to be at 35% of reach and 40% of the reach groundcover is semi-pervious and 25% is pervious and 55% is water.

10.9.3 Critical Areas

Wetlands/ Regulated Streams: No City regulated wetlands or streams are documented for this segment.

FEMA: No areas within this segment are identified on FEMA maps.

Slopes: Slopes at the south end of this segment have slopes ranging from 20% to 50%. Slopes in this reach are mapped on the Whatcom County Geohazard Maps as "Landslide Hazard Areas".

Potential PHS/TSE Species: Bull trout presence is presumed based on suitable habitat and prey. Bull trout are Federally listed as a threatened species. Puget Sound Chinook salmon may occur seasonally within this segment. Puget Sound Chinook are Federally listed as a threatened species. This segment occurs in a documented harlequin duck and rock substrate concentration areas.

10.9.4 Ecological Functions

Water Quality: The DOE 303 (d) data does not indicate any water quality limitations for this segment. No documentation of toxic sites or landfills were located for this segment.

Vegetation: Aquatic marine vegetation has been mapped for this segment. A diverse complex of aquatic algae communities occurs in this segment and includes eelgrass, brown algae beds, green algae beds, mixed algae beds. The marine bluffs are dominated by predominately native shrubs, intermixed with non-native Himalayan blackberry and English ivy. The top of bank is predominately lawns and ornamental gardens. Little vegetation inhabits the base of slope due to the railroad ballast. Native plant communities dominate areas on Post Point and include Nookta rose, Sitka alder and serviceberry.

Wildlife: Potential mustelid and pinneped habitat may occur along the entire outer shoreline of this segment. Seasonal concentrations of harlequin duck and rocky substrate shorebird occur along this segment. High offshore densities of pandalid shrimp and crab densities recorded near this segment.

Habitat: Terrestrial vegetation along the marine bluff provides a corridor with moderate connections to other habitats along the shoreline. This corridor is best developed for bird movement. Trees are lacking in most areas. Diverse aquatic vegetation and substrate

provide good cover for a variety of aquatic marine species. Mapped marine substrates include mixed coarse, mixed fines, sand and artificial substrate (rip-rap). Limited backshore is present in this segment due to the BNSF tracks. A small sand and gravel beach is located immediately north of Post point.

10.9.5 Opportunities

Preservation

- Maintain canopy cover and forested buffer.
- Place a high priority on best management practices that control erosion and protect native soils.

Enhancement or Restoration Opportunities

- Control noxious weeds within reach with a high priority given to Scott's broom and ivy control.
- Add canopy species to bluff areas.

Ongoing and/or Proposed Restoration Actions

- None documented

10.10 Reach Analysis: Segment I – Lagoons (Reaches Marine 15, 17)

10.10.1 Landscape Setting

This segment includes two reaches that are located south of the sewer treatment plant and north of Clark's Point. The reaches have been grouped together based on their physical similarities (lagoons present). The total segment size is 40.3 acres in size, of which 11.7 acres is land. This SMA is located in continental sedimentary deposits and bedrock. The soils are upland soils that are in Drainage Class B, C or D. The erosion risk for soils in this reach is slight to severe. Marine bluffs along this segment are mapped at 20% to 70% slope.

10.10.2 Land Use

Land Use: The current zoning overlaying this reach includes 25.0 acres of residential use. Current land use is consistent with the overlaying zoning. A total of 17 buildings are mapped for this reach. Based on current zoning and neighborhood place limitations, current zoning and platted lots indicate the segment is near its maximum density. However, a new development is being constructed immediately outside Reach 17 in this segment.

Transportation: No roads are located within the SMP designation. The BNSF railroad parallels the base of the bluff along the entire segment.

Public Access: No formal public access is provided in this segment, but informal and private use occurs along the shoreline. The BNSF rail line limits formal access.

Shoreline Modification: The entire segment has been rip-rapped for the BNSF railroad, except in a small area at the north part of Reach 17 where bedrock abuts the marine shoreline. Average impervious surface for this segment is calculated to be at 28% of reach and 47% of the reach groundcover is semi-pervious and 27% is pervious and 54% is water.

10.10.3 Critical Areas

Wetlands/ Regulated Streams: The City of Bellingham Wetland Inventory indicates two lagoons described as intertidal flats and salt marsh habitats. No city regulated streams are documented for this segment.

FEMA: No areas within this segment are identified on FEMA maps.

Slopes: Bluffs at the south end of this segment have slopes ranging from 20% to 50%. Slopes in this reach are mapped on the Whatcom County Geohazard Maps as "Landslide Hazard Areas".

Potential PHS/TSE Species: Bull trout presence is presumed based on suitable habitat and prey. Bull trout are Federally listed as a threatened species. Puget Sound Chinook salmon may occur seasonally within this segment. Puget Sound Chinook are Federally listed as a threatened species. This segment occurs in a documented harlequin duck and rock substrate concentration areas.

10.10.4 Ecological Functions

Water Quality: The DOE 303 (d) data does not indicate any water quality limitations for this segment. No documentation of toxic sites or landfills were located for this segment.

Vegetation: Aquatic marine vegetation has been mapped for this segment. A diverse complex of aquatic algae communities occurs in this segment and includes eelgrass, brown algae beds, green algae beds, mixed algae beds. The marine bluffs are dominated by predominately native shrubs, intermixed with non-native Himalayan blackberry and English ivy. The top of bank is predominately lawns and ornamental gardens. Little vegetation inhabits the base of slope due to the railroad ballast. Salt marsh communities are located in the two lagoons. The dominant plant species recorded is pickleweed (*Salicornia virginica*).

Wildlife: Potential mustelid and pinniped habitat may occur along the entire outer shoreline of this segment. Seasonal concentrations of harlequin duck and rocky substrate shorebird occur along this segment. High offshore densities of pandalid shrimp and crab densities recorded near this segment.

Habitat: Terrestrial vegetation along the marine bluff provides a corridor with moderate connections to other habitats along the shoreline. This corridor is best developed for bird movement. Trees are lacking in most areas. Diverse aquatic vegetation and substrate provide good cover for a variety of aquatic marine species. Mapped marine substrates include mixed coarse, mixed fines, sand and artificial substrate (rip-rap). Limited backshore is present in this segment due to the BNSF tracks. The estuarine habitat located in the lagoons may serve as important refugia for out-migrating juvenile salmon.

10.10.5 Opportunities

Preservation

- Maintain canopy cover and forested buffer.
- Place a high priority on best management practices that control erosion and protect native soils.

Enhancement or Restoration Opportunities

- Control noxious weeds within reach with a high priority given to Scott's broom and ivy control.
- Add canopy species to bluff area.
- Increase size of openings under railroad.

Ongoing and/or Proposed Restoration Actions

- None documented.

10.11 Reach Analysis: Segment J – Clark's Point (Reach Marine 18/20)

10.11.1 Landscape Setting

This segment is located on Clark's Point and immediately south of Chuckanut Bay in Reach 46. The segment 91.5 acres in size, of which 40.9 is land. This SMA is located in continental sedimentary deposits and bedrock. Most of the shoreline is exposed bedrock. The soils are upland soils that are in Drainage Class B or C. The erosion risk for soils in this reach is slight to severe. Shoreline slopes are mapped at 20% or greater.

10.11.2 Land Use

Land Use: The current zoning overlaying this reach includes 45.0 acres of residential and 1.7 acres in public use. Current land use includes several single family residence on the point and a recently purchased City park property across the bay. The entire point has been put in conservancy. At total of 3 buildings are mapped for this segment. Current zoning and an overlaying conservation easement prohibits further development on this Point.

Transportation: A private road accesses the point, but is outside the SMA area. The BNSF rail line touches the northern edge of this segment.

Public Access: No formal public access is provided in this segment.

Shoreline Modification: Most of the shoreline is natural bedrock. Two private docks and a small jetty are located at the southern end of the point. Impervious surface for this segment is calculated to be at 6% of reach and 58% of the reach groundcover is semi-pervious and 55% is pervious.

10.11.3 Critical Areas

Wetlands/ Regulated Streams: The City of Bellingham Wetland Inventory indicates a small palustrine forested wetland near the south end of the point. No city regulated streams are documented for this segment.

FEMA: No areas within this segment are identified on FEMA maps.

Slopes: Slopes at the south end of this segment have slopes ranging from 20% to 100%. Slopes in this reach are mapped on the Whatcom County Geohazard Maps as "Landslide Hazard Areas".

Potential PHS/TSE Species: Bull trout presence is presumed based on suitable habitat and prey. Bull trout are Federally listed as a threatened species. Puget Sound Chinook salmon may occur seasonally within this segment. Puget Sound Chinook are Federally listed as a threatened species. This segment occurs in a documented harlequin duck and rock substrate concentration areas. Seasonal diving bird concentrations recorded on the southwest side of Clark's Point. A bald eagle nesting territory is documented for the east side of Clark's Point (no nest recorded in this segment). Shallows on the east side of the point support documented intertidal hard-shell clam beds.

10.11.4 Ecological Functions

Water Quality: The DOE 303 (d) data does not indicate any water quality limitations for this segment. No documentation of toxic sites or landfills were located for this segment.

Vegetation: Aquatic marine vegetation has been mapped for this segment. A diverse complex of aquatic algae communities occurs in this segment and includes eelgrass, brown algae beds, green algae beds, mixed algae beds. The marine bluffs are dominated by predominately native coniferous forest and shrubs. Remnant bald communities are interspersed along the shoreline of this segment.

Wildlife: Potential mustelid and pinniped habitat may occur along the entire shoreline of this segment. Seasonal concentrations of harlequin duck, rocky substrate shorebird, and diving birds occur along this segment. A bald eagle nesting territory is listed for this segment. High offshore densities of pandalid shrimp and crab densities recorded near this segment.

Habitat: This segment is dominated by native plant communities. A well developed coniferous forest dominates interspersed with “bald communities” along the shoreline. This segment provides high value habitat for a wide variety of wildlife species. It is a large tract contiguous with other habitats associated with Chuckanut Bay, Chuckanut Creek and Chuckanut Mountain. Diverse aquatic vegetation and substrate provide good cover for a variety of aquatic marine species. Mapped marine substrates include bedrock, boulders, mixed fines and sand. Limited backshore is present in this segment due to the bedrock geology. A small pocket beaches are interspersed in coves along the point.

10.11.5 Opportunities

Preservation

- Maintain canopy cover and forested buffer.
- Place a high priority on best management practices that control erosion and protect native soils.

Enhancement or Restoration Opportunities

- None identified.

Ongoing and/or Proposed Restoration Actions

- None documented.

10.12 Reach Analysis: Segment K – Chuckanut Bay (Reach Marine 19)

10.12.1 Landscape Setting

This segment is located within Chuckanut Bay. The BNSF rail trestle is the western edge of this segment. The segment size is 132.3 acres in size of which 40.1 is land. This SMA is located in continental sedimentary deposits and bedrock. The soils are upland soils that are in Drainage Class B, C or D. The erosion risk for soils in this reach is slight to severe. Steep slopes are located on the northern and southern side of the Bay. The slopes range from 20% to 100% are present in these locations.

10.12.2 Land Use

Land Use: The current zoning overlaying this reach includes 41.4 acres of residential and 11.4 acres of public use. Current land use is consistent with the overlaying zoning. At total of 26 buildings are mapped for this reach. Current zoning and platted lots indicate the segment has the potential for additional infill, particularly on the northern side of the segment.

Transportation: Only secondary roads are located within this SMP designation. The BNSF rail trestle crosses the mouth of Chuckanut Bay.

Public Access: Public access is provided an undeveloped park at the east side of Chuckanut Bay. Additional public property is located in the SMA on the southern side of the bay. These areas are currently in the planning stages for public access.

Shoreline Modification: The BNFS trestle crosses the mouth of the bay. The trestle is constructed of fill reinforced with rip-rap. The trestle has a single opening. The interior shoreline of the bay is mostly unmodified. There are several in water structures including docks, jetties and old buildings near the mouth of Chuckanut Creek. A poorly maintained boat ramp and a number of old creosote pilings at the end of Fairhaven Avenue. A boathouse is located at the base of the bluff in the southwestern portion of the segment. Average impervious surface for this segment is calculated to be at 26% of reach and 42% of the reach groundcover is semi-pervious and 32% is pervious.

10.12.3 Critical Areas

Wetlands/ Regulated Streams: The City of Bellingham Wetland Inventory indicates four wetlands within this segment. All of the wetlands include forested, emergent and estuarine community types and are located on the eastern or southern part of the segment. Chuckanut Creek enters the eastern portion of this segment.

FEMA: No areas within this segment are identified on FEMA maps.

Slopes: Slopes on the north and south sides of this segment have slopes ranging from 20% to 100%. Slopes in this reach are mapped on the Whatcom County Geohazard Maps as "Landslide Hazard Areas".

Potential PHS/TSE Species: Bull trout presence is presumed based on suitable habitat and prey. Bull trout are Federally listed as a threatened species. Puget Sound Chinook and coho salmon may occur seasonally within this segment. Puget Sound Chinook are Federally listed as a threatened species Puget Sound coho salmon are a Federal candidate species for listing. This segment is indicated to have seasonal high concentration of dabbling ducks. Portions of this segment are located in a documented bald eagle nesting territory.

10.12.4 Ecological Functions

Water Quality: The DOE 303 (d) data does not indicate any water quality limitations for this segment. No documentation of toxic sites or landfills were located for this segment, however failing septic systems have been an issue in this segment in the past.

Vegetation: Aquatic marine vegetation has been mapped for this segment. Aquatic algae communities documented within this segment include eelgrass and green algae beds. The eelgrass beds are mapped in the northwest portion of the bay. The largest documented estuarine communities within the City limits are located in this segment. Remnant "bald communities" are scattered along the marine bluffs. Invasive plant

species in this segment include Scott's broom on bluffs; Japanese knotweed and yellow-flag iris in the wetland at the base of Fairhaven Avenue. The marine bluffs are vegetated by predominately native trees and shrubs.

Wildlife: Potential pinneped habitat may occur along on the west side of the trestle. Mustelid habitat occurs throughout the segment. Seasonal concentrations of dappling ducks occur along this segment. Chuckanut bay supports a intertidal hard-shell clam beds. Portions of the segment occur in a bald eagle nesting territory. The bay may provide important habitat to out migrating salmons exiting Chuckanut creek including coho and chum salmon and sea-run cutthroat and steelhead.

Habitat: This segment is dominated by native plant communities in most areas. A well developed coniferous forest dominates interspersed with wetland, riparian and bald communities along the shoreline. This segment provides high value habitat for a wide variety of wildlife species. It is a large tract contiguous with other habitats associated with Clark's Point, Chuckanut Creek and Chuckanut Mountain. Diverse aquatic vegetation and substrate provide good cover for a variety of aquatic marine species. Mapped marine substrates are predominately mud interspersed with mixed fines, mixed coarse, sand, boulders and bedrock. Artificial substrate is provided by the rip-rap on the rail trestle. Moderate backshore is present in this segment, mostly at the eastern end of the segment. This segment has extensive intertidal habitat.

10.12.5 Opportunities

Preservation

- Maintain canopy cover and forested buffer.
- Place a high priority on best management practices that control erosion and protect native soils.

Enhancement or Restoration Opportunities

- Repair none functioning septic fields in this segment.
- Control noxious weeds within reach with a high priority given to Scott's broom, knotweed and yellow flag iris control.
- Removal of in water creosote structures.

Ongoing and/or Proposed Restoration Actions

- The Washington Native Plant Society has performed some removal of yellow flag iris – results have not been determined.
- Some invasive plant control planned for Inspiration Point property.
- No other documented actions.

APPENDIX A: LITERATURE REVIEWED

APPENDIX B: GLOSSARY

APPENDIX C: FIGURES

APPENDIX D: PROPOSED SHORELINE DESIGNATIONS

APPENDIX E: CHUCKANUT CREEK DATA SHEETS

APPENDIX F: LAKE PADDEN DATA SHEETS

APPENDIX G: PADDEN CREEK DATA SHEETS

APPENDIX H: LAKE WHATCOM DATA SHEETS

APPENDIX I: WHATCOM CREEK DATA SHEETS

APPENDIX J: SQUALICUM CREEK DATA SHEETS

APPENDIX K: MARINE DATA SHEETS
