CITY OF SUMAS
Grant No. G1000056

CITY OF SUMAS
SHORELINE MASTER PROGRAM UPDATE

SHORELINE INVENTORY AND CHARACTERIZATION REPORT
TASK 2.3

December 31, 2010 Draft

This document was funded in part through a cooperative agreement with the National Oceanic and Atmospheric Administration.

The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its sub-agencies.

Blank page

CITY OF SUMAS
SHORELINE INVENTORY
AND CHARACTERIZATION REPORT

DECEMBER 31, 2010 DRAFT

CITY OF SUMAS
SHORELINE MASTER PROGRAM UPDATE

ACKNOWLEDGEMENTS

We would like to thank the following individuals for their assistance in relation to this project: Sumas Mayor Bob Bromley, Members of the Sumas City Council, Sumas City staff, and Berry Wenger from the Washington Department of Ecology.

This project was funded in part by the Washington Department of Ecology with a Coastal Zone Management grant from the National Oceanic and Atmospheric Administration.

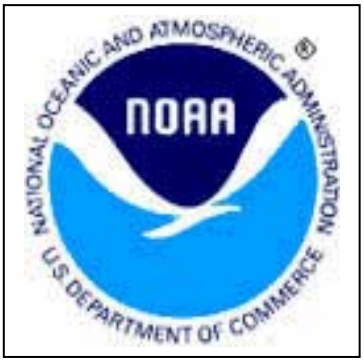

TABLE OF CONTENTS

MAPS

APPENDIX

Shoreline Inventory Data Sheets for Reaches 1-16 including References prepared by Northwest Ecological Services

Acronyms

BOD – Biological Oxygen Demand
CMZ – Channel Migration Zone
CREP – Conservation Reserve Enhancement Program
DBH – diameter breast height
DO – Dissolved Oxygen
DOE – Washington State Department of Ecology
ESU – Evolutionarily significant unit
FEMA – Federal Emergency Management Agency
LWD – Large woody debris
NWI – National Wetlands Inventory
OHWM – ordinary high watermark
PFOC – palustrine, open water, forested, seasonally flooded wetland
PHS – Priority Habitat Species
POWH – palustrine, open water, permanently flooded wetland
PSSC – palustrine, scrub-shrub, seasonally flooded wetland
SR – State Route
SWMP – Stormwater Management Master Program
TMDL – Total Maximum Daily Load
UGA – Urban Growth Area
USFWS – United States Fish & Wildlife Services
VCA – Vegetation Conservation Area
WAC – Washington Administrative Code
WDFW – Washington State Department of Fish & Wildlife

1.0 INTRODUCTION

1.1 SETTING

The City of Sumas is located in the north-central part of Whatcom County adjacent to the Canadian border. The City and its designated urban growth area (UGA) include portions of the Sumas River and Johnson Creek, each of which has a mean annual flow of over 20 cubic feet per second. These rivers, therefore, are within shoreline jurisdiction. They include over 5 miles of river shoreline within shoreline jurisdiction. A portion of Bone Creek, Sumas Creek and an unnamed ditch are also identified as being within shoreline jurisdiction to the extent they comprise wetlands located within the 100-year floodplain that are hydrologically connected to the primary shoreline water bodies identified above.

The Sumas River Watershed Management Unit (WMU) is part of the Fraser River basin. It is located north of the mainstem Nooksack River between the Lynden North and North Fork WMUs and encompasses approximately 82 square miles, roughly two thirds of which are within Whatcom County (the remainder are in Canada). The City of Sumas is located entirely within this WMU.

Although topographically separated from the Nooksack River system (by levees), the Sumas River WMU includes a portion of the historic Nooksack floodplain. During major flood events, a portion of the Nooksack River sometimes flows north into Canada via Johnson Creek and the Sumas River. The Sumas River and portions of three of its major tributaries–Johnson Creek, Breckenridge Creek, and Saar Creek–are the only shorelines of the state in this WMU.

1.2 METHODOLOGY

This report has been prepared as part of the City of Sumas's comprehensive update of its Shoreline Management Master Program. This document contains two main sections: the Ecosystem-wide Processes section and the Shoreline Reach Inventory and Analysis section. This report is intended to satisfy Task 2.3 of the Department of Ecology Grant Agreement No. G1000056 for the City of Sumas.

The goal of Task 2.3 is to compile and analyze relevant data sources and information for the shoreline jurisdictional areas within the City of Sumas and its designated UGA. The Ecosystem-wide Processes section of the report was developed primarily based on inventory work completed by Whatcom County and addresses the ecosystem-wide processes for the Sumas River watershed. This section focuses on those processes most important to the shorelines within the City of Sumas. The final section of the report provides a detailed Reach Inventory and Analysis of the land and water areas within shoreline jurisdiction. This section not only addresses the physical features and characteristics present, but also includes an analysis of the shoreline functions provided in each reach.

2.0 ECOSYSTEM-WIDE PROCESSES

2.1 OVERVIEW

WAC 173-26-201(3(d)(i)) requires that an evaluation of ecosystem-wide processes affecting areas within shoreline jurisdiction be included in the shoreline inventory analysis and characterization report prepared in conjunction with an updated Shoreline Master Program (SMP). This evaluation provides information on the Sumas River Watershed Management Unit (WMU) and ecosystem-wide processes that have an effect on the shorelines within the City of Sumas and the City Urban Growth Areas (UGA). Whatcom County has completed an extensive review of the Sumas River WMU. This prior work, Whatcom County Shoreline Management Program Draft Inventory and Characterization Report (2006), is referenced in this evaluation of the shorelines of the City of Sumas. Citations and maps referenced in section 2.0 of this report are drawn from the Whatcom County Shoreline Management Program Draft Inventory and Characterization Report (2006) and the accompanying map portfolio.

The relevant ecosystem-wide processes are viewed at the watershed level to understand how natural processes work and affect the City of Sumas shoreline areas. The City of Sumas shoreline areas are located on the shores of the Sumas River and Johnson Creek. The City is located within the Sumas River watershed management unit. See the Whatcom County Aquatic Resources Map for the location of the City and aquatic resources within this WMU.

The Sumas River WMU is part of the Fraser River basin. It is located north of the mainstem Nooksack River between the Lynden North and North Fork WMUs and encompasses approximately 82 square miles, roughly two thirds of which are within Whatcom County (the remainder are in Canada). The cities of Sumas and Nooksack are located within this WMU, as is the easternmost part of the City of Everson.

Although topographically separated from the Nooksack River system (by levees), the Sumas River WMU includes a portion of the historic Nooksack floodplain. During major flood events, a portion of the Nooksack River sometimes flows north into Canada via Johnson Creek and the Sumas River. The Sumas River and portions of three of its major tributaries─Johnson Creek, Breckenridge Creek, and Saar Creek–are the only shorelines of the state in this WMU.

2.2 LAND USE AND LAND COVER

The Sumas River WMU supports intense agricultural land uses, which occupy almost the entire land area in the lowland region. Forestry is the dominant land use in the upland area of Sumas Mountain. Most of the higher elevations are coniferous forest, with mixed and predominately deciduous forests at lower elevations.

2.3 CLIMATE

Precipitation along Sumas Mountain averages around 70 inches annually, but drops off with elevation to around 50 inches in the lowlands. Snowfall and rain-on-snow events are common on Sumas Mountain, but rainfall is the dominant form of precipitation in the

lowlands. Most precipitation falls from October through January, but snowmelt drives runoff patterns in early summer.

2.4 GEOLOGY

Underlying Geology

The Sumas River WMU has three northwest-southeast trending bands of unique surficial geology. The northwestern portion is characterized by outwash deposits with an extensive network of wetlands. The central band running from Nooksack to Sumas is located on an outwash terrace of fine-grained drift containing sporadic deposits of alluvium, undifferentiated outwash, and till. Till also forms a swath separating the terrace deposits from the Huntington sedimentary bedrock and Chilliwack sedimentary and metamorphic bedrock that comprise Sumas Mountain in the eastern portion of the WMU (Easterbrook 1973*).

Topography and Bathymetry

Topography generally follows surficial geology. The eastern part of the WMU has high relief with elevations of approximately 2,700 feet on Sumas Mountain. Moving west the landform falls off quickly to the lowlands. The Sumas River lies approximately 80 feet above sea level in the City of Nooksack, approximately 40 feet above sea level in Sumas, and only 27 feet above sea level where it crosses into Canada.

The Sumas River gradient averages approximately 0.08 percent across all reaches and flows through an unconfined valley. The river has a high sinuosity averaging approximately 2 across all reaches, although some reaches have a noticeably lower sinuosity than other reaches. Although the channel planform is similar to that of the lower Nooksack, overall reach morphology is somewhat different. Sediment supply does not appear to be sufficiently greater than transport capacity for the Sumas River to develop an elevated meander belt that lies above the floodplain. Instead, the stream probably developed its sinuous morphology as a result of a historically equilibrated supply-transport mechanism and highly stable, well-vegetated banks that limited migration, particularly avulsions. These characteristics are indicative of the Rosgen Type E channel (Rosgen 1994*) that is part of the pool-riffle process domain (Montgomery and Buffington 1994*). This type of stream also generally has a very low width:depth ratio.

While sediment supply has increased, channel morphology remains relatively intact. Areas of active bank erosion appear limited; thus sinuosity and the low width:depth ratio have been preserved. Maintaining bank stability is key to protecting sinuosity and the very low width:depth ratio and will facilitate restoration of instream habitat conditions via sediment control and increased LWD recruitment.

2.5 HYDROLOGY

Hydrologic Processes

The rain-on-snow zones in high elevations of the Sumas River tributary drainages (which flow off Sumas Mountain) are process-intensive areas for peak runoff (Map 18-2*).

Process intensity is lower in the transition from the mountain to the lowlands, although some important infiltration areas are present. The coarse outwash deposits of the lowlands support a number of hydrologic mechanisms. Johnson Creek and Saar Creek have large floodplains with high storage potential. The Pangborn Lake area in the Johnson Creek drainage contains areas important for both infiltration and storage. Johnson Creek also receives runoff from the Nooksack River during events that overtop the river's levees. Although the Sumas River has a wide floodplain, it does not support multiple mechanisms to the same extent as Johnson Creek. However, a large infiltration area lies west of the floodplain where the lowland meets the glaciomarine terrace.

Forest practices on the slopes of Sumas Mountain have altered forest cover, but there is relatively little bare land/immature vegetation in rain-on-snow zones, so the effects of forest clearing on peak flows may be less pronounced than in the high elevation areas of the Nooksack basin (e.g. North Fork WMU) (Map 18-3*).

Impervious surfaces are not very extensive in the Sumas River WMU, except locally in the municipalities of Nooksack and Sumas. These cities do not overlie areas of high infiltration/recharge potential, so effects of impervious area on baseflow and groundwater recharge are expected to be low compared to other areas where urban development occurs on important permeable deposits (e.g. City of Lynden in the Lynden North WMU).

Several mining operations, including near Pangborn Lake, northeast of Nooksack, and near the Sumas River north of Minaker Road lie on infiltration/recharge zones, but the impact of these activities on infiltration/recharge is unclear. Other infiltration/recharge areas are zoned rural residential or agriculture and are typically non-forested agricultural fields.

Surface water storage mechanisms in this WMU are highly impaired, particularly in the Johnson Creek drainage (Map 18-4*). Johnson Creek and its major tributaries, including Pangborn Creek and the North Fork Johnson Creek, have been modified along their entire length to improve drainage. This reduces storage potential and floodplain function. Ditching is evident in almost all areas mapped as historic depressional wetlands, and vast areas of these wetlands on the Johnson Creek, Sumas River, Bone Creek, and Saar Creek floodplains and in the Pangborn Lake area have been filled or drained. Wetlands just east of the Kamm Slough drainage in the Lynden North WMU have been maintained leaving the one area in the WMU that has limited alteration.

No documentation of significantly impaired peak flows was found for the Sumas WMU. However, Ecology has closed this WMU to additional water rights, which suggests that summer low flows are impaired throughout the watershed.

Sediment Transport

Outside of Sumas Mountain, slopes steep enough to be highly unstable are relatively scarce in the WMU. A relatively high percentage (16 to 23 percent) of the Swift Creek drainage contains unstable slopes, but other drainages have low frequencies of unstable slopes, so process-intensive areas for mass wasting are limited (Map 18-5*). A major slide is present adjacent to Swift Creek on the western slope of Sumas Mountain. Significant quantities of sediment containing naturally-occurring asbestos are carried by Swift Creek and deposited into the Sumas River. Soil samples of bank deposits all the

way to the Canadian border have been found to contain potentially hazardous levels of asbestos.

The Sumas WMU does contain a number of areas with naturally high erosion potential, the largest of which is the Nooksack overflow area in the upper Johnson Creek and Sumas River drainages. Other smaller areas on the floodplains of this stream and river also have high erosion potential.

Road density in the drainage most at-risk for mass wasting (Swift Creek) is <2 mi/mi^2. Road densities are moderate (2.1 to 3.0 mi/mi^2) in the Dale and Saar Creek drainages and over 3.1 mi/mi^2 in the lower Sumas/Breckenridge Creek drainage (Map 18-5.5*). All of these drainages extend into the lowlands and it is difficult to determine to what extent the road network impacts the portions of these upper drainages where landslides are most likely to occur.

In the lowlands, most of the areas with high risk for surface erosion have been cleared of forest cover and/or converted to agriculture land, the majority of which is cultivated (Map 18-6*). Because of the predominance of high impact land uses, surface erosion is believed to be altered throughout the WMU, but particularly so in high-risk areas.

Water Quality

Historically, wetlands in the Sumas River WMU provided substantial water quality function, storing and transforming nutrients and pathogens. Large wetland complexes in the lower Johnson Creek drainage, the Johnson Creek floodplain, Upper Squaw Creek, and near Mud Slough were particularly important for removing nutrients from both surface and groundwater. Lower Swift Creek is one area that contained wetlands with all three contaminant storage mechanisms (surface water, groundwater, and hyporheic storage).

The Nooksack River and Sumas River floodplains and the Sumas/Johnson headwaters contain areas of important hyporheic function. The largest wetland complexes are those encompassing the boundary of Johnson Creek and Kamm Slough in the Lynden North WMU, but groundwater water quality function is likely limited here. Peat deposits in the Pangborn Creek drainage likely support extensive groundwater nutrient transformations (Mitchell et al. 2005*). Sumas River riparian wetlands are still mostly intact and provide a sink for nutrients and contaminants (Map 18-7*).

As indicated in the hydrology section, a majority of the wetlands in the Sumas WMU have been filled and/or drained (see Map 18-4*). From a water quality standpoint, Saar Creek and Johnson Creek appear to have been impacted most. Although some wetlands that support surface water quality functions remain, most of the wetlands that supported groundwater quality function have been lost. In addition, channelization of the Johnson Creek drainage and tributaries likely limits hyporheic exchanges.

As the dominant land uses in the Sumas WMU lowlands, dairies and till agriculture are the primary sources of nutrients and fecal coliform (Mitchell et al. 2005*), as well as contaminants such as pesticides. The presence of shallow groundwater and loss of groundwater quality functions described above suggest that groundwater and surface

water may be contaminated with nutrient and fecal coliforms. Similar land uses in Canada also deliver nutrients via groundwater (Mitchell et al. 2005*) (Map 18-8*).

Areas of dense rural residential development are not apparent in the WMU, although sparsely scattered onsite septic systems rim the foot of Sumas Mountain and extend east along Sorenson, Alm, and Lindsay Roads. These systems are also potential sources of pathogen contamination. The Cities of Everson, Nooksack and Sumas all have sanitary wastewater collection systems. Sumas sends its wastewater to the treatment facility in Abbottsford, B.C. and sewage from the City of Nooksack system flows to the Everson wastewater treatment plant located adjacent to the Nooksack River.

Water quality functional responses in the Sumas River watershed include elevated fecal coliform and low dissolved oxygen in surface waters, both of which impair water quality across a broad array of stream reaches (Ecology 2004*). Pangborn Creek, Clearbrook Creek, Sumas River at the Canadian border and downstream of Collins Creek, three reaches of Squaw Creek, seven reaches of Johnson Creek, and Sumas Creek have impaired fecal coliform levels (Ecology 2004*). The same reaches in the Sumas River, Johnson Creek, and Sumas Creek have impaired dissolved oxygen levels (Ecology 2004*). A TMDL was established in 2000 for fecal coliform and dissolved oxygen in the Johnson Creek drainage. A TMDL was also established in 1996 for chlorine, ammonia-nitrogen, and BOD in the Sumas River drainage.

NWIC (2004*) reports that dissolved oxygen still regularly fails to meet Ecology water quality criteria. Recent evidence suggests that fecal coliform contamination in the Sumas River is declining (George Boggs, personal communication of May 11, 2005*; NWIC 2004*); however, recent monitoring suggests a mixed record in regard to meeting TMDL standards. Sampling conducted on the Sumas River and Squaw, Johnson and Pangborn Creeks all met the geometric mean standard for fecal coliform, but only Johnson Creek met the 90th percentile standard (NWIC 2005*). Pangborn Creek samples failed to meet both the geometric mean and 90th percentile TMDL standards (NWIC 2005*). Dissolved oxygen concentrations at sites on these four streams also exceeded Ecology Class A water quality criteria.

The WRIA 1 groundwater study reports that the Sumas River WMU has some of the highest nitrate concentrations in the County, exceeding EPA limits for annual maximum concentration in 8 of 11 years during the 1990s (USU 2002*; Mitchell et al. 2005*). In addition, data from groundwater wells show increased levels of the pesticide ethylene dibromide in the Johnson Creek drainage (USU 2002*). Mitchell et al. (2005*) also reports that surface water nitrate concentrations in Pangborn Creek and Johnson Creek suggest anthropogenic influence.

Organic Matter

Intensive areas for LWD recruitment in the Sumas watershed historically included areas adjacent to stream channels and bank erosion/channel migration zones. Potentially unstable slopes along Sumas Mountain also likely contributed wood via mass wasting mechanisms. Hillslope sources would have been especially important in headwater tributaries (Map 18-9*).

Most forest cover in the lowland portion of the WMU has been lost and recruitment potential is presumed to be low in most stream reaches. Most headwaters on Sumas

Mountain are in coniferous forest, although timber production has resulted in a range of seral stages. Forest cover in the transition from Sumas Mountain to the lowlands has been converted to deciduous and mixed forest stands. Coniferous forest in the Saar Creek drainage near the Canadian border has been replaced with mixed and deciduous forest along the length of the drainage.

Based on available forest cover and land use information, LWD recruitment potential is inferred to be low in lowland areas. Recruitment potential may be higher on streams draining Sumas Mountain, and hillslope sources not adjacent to the stream may contribute LWD from debris flows, but the presence of deciduous-dominated forest and forest practices indicate impairment, although perhaps not to the extent that other lowland areas (e.g., Lynden North) are impaired for LWD recruitment (Map 18-10*).

The lower reaches of lowland streams generally have low LWD densities (Smith 2002* citing David Evans and Associates 1998*). The upper reaches of tributaries like Johnson Creek and Sumas Creek have generally higher LWD densities than lowland reaches. No information is available for other Sumas Mountain drainages, but they are likely similar to conditions in Sumas Creek and potentially better, given what appears to be more extensive areas of coniferous forest.

2.6 HABITAT

Riparian habitat exists along sections of the Sumas River, and Johnson, Sumas and Bone Creeks. Emergent and scrub-shrub wetlands associated with the Sumas River provide wildlife habitat and water quality/quantity protection. Salmon and trout have been documented in all reaches. Habitat for bull trout is presumed to be provided throughout the Sumas WMU.

*Citations and maps referenced in section 2.0 of this report are drawn from the Whatcom County Shoreline Management Program Draft Inventory and Characterization Report (2006) and the accompanying map portfolio.

3.0 REACH INVENTORY AND ANALYSIS

The Shoreline Guidelines require jurisdictions to include an inventory and analysis of current shoreline conditions of those areas within shoreline jurisdiction. The following sections of this report describe the characteristics and functions of those areas within the City of Sumas shoreline jurisdiction, generally described as the land area within 200 feet of the ordinary high watermark (OHWM) of the Sumas River and Johnson Creek, plus the associated wetland areas located within the 100-year floodplain. See ***City of Sumas Shoreline Jurisdiction Vicinity Map*** for the location of shoreline jurisdiction within the vicinity of the City. For the purposes of this inventory the shorelines within Sumas have been divided into 16 reaches based on factors such as physical and biological characteristics, existing land use patterns and future development plans. The following analysis will characterize shoreline functions and will identify opportunities for resource protection, restoration, public access and shoreline use.

This portion of the Sumas Shoreline Inventory Report provides a detailed inventory and analysis of the land and water resources present within the jurisdiction of the Sumas Shoreline Management Master Program. This inventory was prepared based on a review of available data, such as City and County GIS mapping, state databases and local planning documents, and limited field verification. The primary inventory work was completed by Northwest Ecological Services (NES) during the first half of 2010. The results of the NES inventory investigation were provided in a series of tables or data sheets that presented the inventory information and analysis required by the Department of Ecology Guidelines, WAC 173-26. One data sheet was prepared for each of the 16 shoreline reaches identified by the City at the beginning of the inventory work. Copies of the data sheets have been included in the Appendix to this report.

3.1 REACH 1

Reach 1 is defined as the shoreline of the Sumas River south of Front Street and Rock Road and west of Swartwood Road. A portion of the shoreline west of where Bone Creek enters as a tributary falls into Reach 12. See the attached Data Sheet for Reach 1 for full inventory and analysis.

Land Use and Zoning

The current shoreline designation in Reach 1 is Urban. Land use is rural residential and agriculture (pasture/hay), with one greenhouse and a tree farm. Zoning is primarily Residential Low Density, with a small amount of Residential Medium Density and Residential High Density.

Physical Environment

Within the 10.7 acres of Reach 1, there are 10 residential/mixed structures present. Roads include a partial residential driveway and Front Street and Rock Road at the northern terminus of the reach, and there is 0.9 acre of impervious surface. There are no data on culverts/stormwater utilities, but it is likely that no such facilities are present.

The geology of Reach 1 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soils are Briscot silt loam and Mt. Vernon fine sandy loam. Sediment from Swift Creek potentially containing naturally-occurring asbestos is likely present in Reach 1. Topography is at 35 to 45 feet elevation and approximately half of the reach (the area immediately adjacent to the river and the area near Front Street) is within the 100-year floodplain. One tributary, Bone Creek, flows into the river's west side from Reach 12.

There was no aquatic vegetation present at the single observation point. Terrestrial vegetation within the reach is mixed. A large portion of the reach is pasture/agricultural land or lawns associated with residences–these areas are vegetated with native and non-native herbaceous species. Portions of the reach (maybe one-third total) adjacent to the stream also have a native mixed deciduous tree and shrub cover. Himalayan blackberry patches are present along the stream, as are tansy ragwort and reed canarygrass (all non-native and invasive). A tree farm with evergreen trees occurs near the northern extent; but, overall, vegetation provides little shade to the stream.

Potential Species Present

Fall chinook, cutthroat, fall chum and winter steelhead presence has been documented, while bull trout/Dolly Varden presence is presumed. Emergent and scrub-shrub wetlands associated with the Sumas River provide wildlife habitat and water quality/quantity protection. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present, and there are no data regarding invasive wildlife/fish species.

Riparian Function

The aquatic substrate type of Reach 1 is silt with a high quantity of substrate fines. The channel gradient of the Sumas River is low (0.08%), and the channel appears unconfined due to topography, with an unknown migration zone. There are no data on creosote structures and no in-water structures or fish passage blockages were observed. Incidence of large woody debris is probably low due to agriculture in the area and the condition of the buffers. The lack of LWD and high fine content make the probability of riffles and pools low. The DOE 303(d) list designates Reach 1 as Category 2 (water of concern) for DO. No toxic sites/landfills are listed; however, two hazardous waste generators are in the vicinity (Front Street). Point sources of pollution consist of scattered low intensity residential uses and higher intensity agriculture, including livestock in the reach and up stream.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. An historic site is referenced near Rock Road, but there are no archeological sites indicated and no parks or designated public access points. Visual access is available from the road crossing at Front Street.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is precipitation dominated (snow and rain), with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture.
- Shoreline vegetation is impaired overall, but some areas present are functioning. The majority of the reach has been converted to agriculture (pasture or crop), with few areas of native vegetation (trees and shrubs).
- The terrestrial habitat is impaired overall due to agriculture; small pockets of habitat along river are isolated. The aquatic habitat is at risk due to the fine sediment problem from Swift Creek drainage, as well as a possible migration restriction at the pump station in Abbotsford, B.C.

Limiting Factors

The following limiting factors have been identified:

- Existing land uses
- Water quality
- Zoning

Functions

- Hydrologic, shoreline vegetation, terrestrial and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.

Priority Actions

- Improve water quality.
- Establish wider vegetated buffers on river.

Current Enhancement Projects

- None known.

Preservation/Enhancement Opportunities

- Preservation of terrestrial vegetation, habitat and associated corridors – particularly riparian corridors.
- Enhancement of riparian buffer by increasing the width and native species diversity of native shoreline vegetation in pasture areas.

Public Access Opportunities

- No opportunities for increased public access have been identified in this reach.
- The provision of increased public access in Reach 1 is not appropriate due to the likely presence of Swift Creek sediment potentially containing naturally-occurring asbestos.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 1 is Urban. Based on the available inventory information it appears that this environment designation should be retained.

3.2 REACH 2

Reach 2 is defined as the western shoreline of the Sumas River, north of Front Street and south of Victoria Street. See the attached Data Sheet for Reach 2 for full inventory and analysis.

Land Use and Zoning

The current shoreline designation in Reach 2 is Urban. Land use is rural residential and agriculture (pasture/hay). Zoning is primarily Residential High Density, with a small amount of Residential Low Density.

Physical Environment

Within the 6.8 acres of Reach 2, there are eight residential or garage structures present. Roads include a residential access road, two residential driveways, and Front Street at the southern terminus of the reach. There is 1.0 acre of impervious surface. There are no data on culverts/stormwater utilities, but it is likely that no such facilities are present.

The geology of Reach 2 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soils are Briscot silt loam and Mt. Vernon fine sandy loam. Sediment from Swift Creek potentially containing naturally-occurring asbestos is likely present in Reach 2. Topography is at 35 to 45 feet elevation and the entire reach is within the 100-year floodplain.

There are no data regarding aquatic vegetation, and terrestrial vegetation within the reach is mixed. The majority of the reach is developed with rural residences, associated lawns, pasture, or agricultural (corn) uses. Pasture areas are vegetated with native and non-native herbaceous species, including reed canarygrass, an invasive species. A number of native deciduous trees and shrubs are present along the northern extent, with a Himalayan blackberry understory. Vegetation provides little shading to the stream overall.

Potential Species Present

Fall chinook, cutthroat, fall chum and winter steelhead presence has been documented, while bull trout/Dolly Varden presence is presumed. Coho rearing is also present. Emergent and scrub-shrub wetlands associated with the Sumas River provide wildlife habitat and water quality/quantity protection. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present. There are no data regarding invasive wildlife/fish species.

Riparian Function

The aquatic substrate type of Reach 2 is silt with a high quantity of substrate fines. The channel gradient of the Sumas River is low (0.08%), and the channel appears unconfined due to topography, with an unknown migration zone. There are no data on creosote or in-water structures and no fish passage blockages were observed. Incidence of LWD is probably low, although there is some recruitment potential in parts of the reach. The lack of LWD and high fine content make the probability of riffles and pools low. The DOE 303(d) list designates Reach 2 as Category 5 for DO and fecal Category 4A for fecal coliform. No toxic sites/landfills are listed; however, two hazardous waste generators are in the vicinity (Front Street). Point sources of pollution consist of scattered low intensity residential uses and agricultural pasture.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological or historic sites indicated and no parks or designated public access points. Visual access is available from the road crossing at Front Street.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is precipitation dominated (snow and rain), with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture.
- Shoreline vegetation is impaired, with one large area present that is functioning (northern half of the reach). Agriculture (crop) and residential development have reduced native vegetation; however, a large section of native trees and shrubs remains in the northern half.
- The terrestrial habitat is impaired overall due to agriculture and residential development. There are small pockets of habitat along the river in the northern half with some connectivity to upland habitat outside of shoreline jurisdiction. The aquatic habitat is at risk due to the fine sediment problem from Swift Creek drainage, as well as a possible migration restriction at the pump station in Abbotsford, B.C.

Limiting Factors

The following limiting factors have been identified:

- Existing land uses
- Water quality
- Zoning

Functions

- Hydrologic, shoreline vegetation, terrestrial and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.

Priority Actions

- Enhancement and preservation of the riparian corridor.
- Water quality improvement.

Current Enhancement Projects

- None known.

Preservation/Enhancement Opportunities

- Preservation of terrestrial vegetation, habitat and associated corridors.
- Enhancement of the riparian buffer by increasing the width of native shoreline vegetation.

Public Access Opportunities

- No opportunities for increased public access have been identified in this reach.
- The provision of increased public access in Reach 2 is not appropriate due to the likely presence of Swift Creek sediment potentially containing naturally-occurring asbestos.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 2 is Urban. Based on the available inventory information it appears that this environment designation should be retained.

3.3 REACH 3

Reach 3 is defined as Johnson Creek along the southern city limit boundary. See the attached Data Sheet for Reach 3 for full inventory and analysis.

Land Use and Zoning

The current shoreline designation in Reach 3 is Conservancy, with an area adjacent to the creek designated as a Natural System Protection Area in the City Comprehensive Plan. Land use is agriculture (crop) and industrial. Zoning is primarily Industrial, with a small amount of Agriculture.

Physical Environment

Within the 15.3 acres of Reach 3, there is one structure present and no roads. There is 0.9 acre of impervious surface. There are no data on culverts/stormwater utilities; however, the outfall from the stormwater pond serving the cogeneration plant is located in this reach.

The geology of Reach 3 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil is Briscot silt loam. Topography is at approximately 35 feet elevation and all but a few fringe buffer areas of the reach are within the 100-year floodplain.

There are no data regarding aquatic vegetation, and terrestrial vegetation within the reach is mixed. Approximately half of the reach is characterized by native deciduous shrubs and some trees. The remainder of the reach is pasture/agricultural land–these areas are vegetated with native and non-native herbaceous species. Native vegetation present provides shade and overhanging vegetation over the creek and has the potential to provide good habitat. Patches of Himalayan blackberry are present throughout the reach.

Potential Species Present

Sockeye presence has been documented and winter steelhead presence is presumed. Chum, cutthroat and coho are mapped as present and coho rearing is also present. Emergent and scrub-shrub wetlands associated with Johnson Creek provide wildlife habitat and water quality/quantity protection. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present, and there are no data regarding invasive wildlife/fish species.

Riparian Function

No data are available describing the aquatic substrate type of Reach 3. The channel gradient of Johnson Creek is low (0.07%), and the channel is confined within the bank full width and unconfined in the basin due to topography, with an unknown migration zone. There are no data on creosote or in-water structures and no fish passage blockages were observed. No data are available on riffles/pools or on the presence of LWD; however, there is a low recruitment potential as the vegetation is mostly shrubs and small trees. The DOE 303(d) list designates Reach 3 as Category 4A for fecal and DO. No toxic sites/landfills are listed within the reach; however, just north of the reach there is an industrial area where a confirmed toxic site is located. Point and non-point sources of pollution have contributed to increased levels of ethylene dibromide in groundwater wells and anthropogenic nitrate concentrations in surface water. Agriculture, higher intensity industrial uses and other possible sources are located adjacent to the reach. Higher intensity sources are located in the upper watershed where dairy and agriculture is more prevalent.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological or historic sites indicated, and no parks or designated public access points.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is rainfall dominated, with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture.
- Shoreline vegetation is functioning, with some impairment. Vegetation is moderate in the majority of the reach, with some areas not as dense or with fewer trees. The reach is flanked by agriculture and industry. The quality of

vegetation has benefited from its location near property boundaries. Agriculture reduces the width of vegetation in some areas. Some work to enhance riparian vegetation has been completed within this reach.
- The terrestrial habitat is impaired. Although the aquatic habitat is functioning with impairments due to water quality and temperature, it is most likely functioning better for fish support than the Sumas River.

Limiting Factors

The following limiting factors have been identified:
- Existing land uses
- Water quality
- Zoning

Functions
- Hydrologic, shoreline vegetation, and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.
- Without a major change in the surrounding land use, the terrestrial habitat is not sustainable.

Priority Actions
- Preservation of current riparian corridor.
- Water quality improvement.

Current Enhancement Projects
- None known. Reach 3 is designated as a Natural System Protection Area in the City Comprehensive Plan.

Preservation/Enhancement Opportunities
- Enhancement of the riparian buffer by increasing the width and species diversity of native shoreline vegetation and by adding evergreen species.

Public Access Opportunities
- No opportunities for increased public access have been identified in this reach.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 3 is Conservancy. Based on the available inventory information it appears that this environment designation should be retained.

3.4 REACH 4

Reach 4 is defined as Johnson Creek from the southern City limits north to the railroad (south of Front Street). See the attached Data Sheet for Reach 4 for full inventory and analysis.

Land Use and Zoning

The current shoreline designation in Reach 4 is Conservancy. There is some Natural System Protection Area in the southwest portion of the reach. Land use is agriculture (crop, livestock) and industrial, and zoning follows suit with 6.4 acres zoned Agriculture and 3.0 acres zoned Industrial.

Physical Environment

Within the 9.4 acres of Reach 4, there are two industrial buildings present, a railroad at the northern terminus of the reach, and a railspur near the industrial use. There are 1.2 acres of impervious surface. There are no data on culverts/stormwater utilities, but it is likely that no such facilities are present.

The geology of Reach 4 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil is Briscot silt loam. Topography is at approximately 35 feet elevation and all but a few small buffer areas of the reach are within the 100-year floodplain.

There are no data regarding aquatic vegetation. There is no road access to this reach; vegetation data is from aerial photographs. Approximately two-thirds of the reach is characterized by pasture/agricultural land; these areas are vegetated with native and non-native herbaceous plants or planted in corn. The remaining buffer areas are vegetated with deciduous shrubs, an occasional deciduous tree, and likely patches of Himalayan blackberry. Overall, vegetation provides little shading.

Potential Species Present

Sockeye presence has been documented and winter steelhead presence is presumed. Chum, cutthroat and coho are mapped as present and coho rearing is also present. Emergent and scrub-shrub wetlands associated with Johnson Creek provide wildlife habitat and water quality/quantity protection. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. The majority of the wetland indicated north of the stream appears to be farmed (corn). No threatened or endangered wildlife species are present. There are no data regarding invasive wildlife/fish species.

Riparian Function

No data are available describing the aquatic substrate type of Reach 4 or the channel gradient. The channel is confined within the bank full width and unconfined in the basin due to topography, with an unknown migration zone. There are no data on creosote structures, but the possibility of a railroad trestle exists, as the railroad crosses the creek. No in-water structures were observed and there are no fish passage blockages. No data are available on riffles/pools or on the presence of LWD; however, there is a low recruitment potential as the vegetation is mostly shrubs and small trees. The DOE 303(d) list designates Reach 4 as Category 4A for fecal and DO. No toxic sites/landfills are listed within the reach; however, just north of the reach there is an industrial area where a confirmed toxic site is located. Point and non-point sources of pollution have contributed to increased levels of ethylene dibromide in groundwater wells and anthropogenic nitrate concentrations in surface water. Agriculture, higher intensity

industrial uses and other possible sources are located adjacent to the reach. Higher intensity sources are located in the upper watershed where dairy and agriculture are more prevalent.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological or historic sites indicated and no parks or designated public access sites.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is rainfall dominated, with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture.
- Shoreline vegetation is impaired and consists mostly of shrubs, which are likely non-native. Agriculture (crop) has impacted buffer width and vegetation. Most of the reach is undeveloped with impervious surfaces.
- The terrestrial habitat is impaired as well. The aquatic habitat is functioning with impairments due to water quality and temperature. There is very little thermal cover. It is most likely functioning better for fish support than the Sumas River.

Limiting Factors

The following limiting factors have been identified:

- Existing land uses
- Water quality
- Zoning

Functions

- Hydrologic, shoreline vegetation, and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.
- Without a major change in the surrounding land use, the terrestrial habitat is not sustainable.

Priority Actions

- Preservation of riparian corridor.
- Water quality improvement.

Current Enhancement Projects

- None known. The southern portion of Reach 4 is designated as a Natural System Protection Area in the City Comprehensive Plan.

Preservation/Enhancement Opportunities

- Enhancement of the riparian buffer by increasing the width and species diversity of native shoreline vegetation and by adding evergreen species.
- Removal of any invasive species.

Public Access Opportunities

- No opportunities for increased public access have been identified in this reach.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 4 is Conservancy. Based on the available inventory information it appears that this environment designation should be retained.

3.5 REACH 5

Reach 5 is defined as Johnson Creek from the railroad south of Front Street to the railroad west of Cherry Street. See the attached Data Sheet for Reach 5 for full inventory and analysis.

Land Use and Zoning

The current shoreline designation in Reach 5 is Conservancy, with an area adjacent to the creek designated as a Natural System Protection Area in the Comp. Plan. Land use is agriculture, industrial, residential and railroad corridors. Zoning is primarily Industrial with some Business Traffic-Oriented.

Physical Environment

Within the 18.6 acres of Reach 5, there are four business buildings present, a railroad at the north and south ends of the reach, one access road (Johnson Street), and an arterial bisecting the reach (Front Street). There are 4.4 acres of impervious surface. There are no data on culverts/stormwater utilities, but it is likely that no such facilities are present.

The geology of Reach 5 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil is Briscot silt loam. Topography is at approximately 35 feet elevation and all but three small areas of buffer are within the 100-year floodplain.

There are no data regarding aquatic vegetation. The majority of the reach is characterized by native mixed deciduous trees and shrubs. Native vegetation has the potential to provide shading to the stream and good habitat. Smaller patches within the reach contain pasture; these areas are vegetated with native and non-native herbaceous species, or reed canarygrass, an invasive species. A patch of Himalayan blackberry is present near the northern end. A wetland mitigation site and native plantings are also located near the northern end. A trucking business and truck parking is located mid-reach on Johnson Street.

Potential Species Present

Sockeye presence has been documented and winter steelhead presence is presumed. Chum, cutthroat and coho are mapped as present and coho rearing is also present. Emergent and scrub-shrub wetlands associated with Johnson Creek provide wildlife habitat and water quality/quantity protection. This area is within the ESU for coho and

fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present, and there are no data regarding invasive wildlife/fish species.

Riparian Function

No data are available describing the aquatic substrate type of Reach 5 or the channel gradient. The channel is confined within the bank full width and unconfined in the basin due to topography, with an unknown migration zone. There are no data on creosote structures, but the possibility of a railroad trestle exists, as the railroad crosses the creek. No in-water structures were observed and there are no fish passage blockages. No data are available on the presence of LWD; however, there is a low recruitment potential as the vegetation is mostly shrubs and small trees. Substantial pool and backwater habitat, with potentially spawnable riffles are present. The DOE 303(d) list designates Reach 5 as Category 4A for fecal and DO upstream of Front Street. No toxic sites/landfills are listed within the reach. Point and non-point sources of pollution have contributed to increased levels of ethylene dibromide in groundwater wells and anthropogenic nitrate concentrations in surface water. Additional point sources include scattered low intensity residential uses, light agriculture, and some light industrial. Higher intensity sources are located in the upper watershed where dairy and agriculture are more prevalent.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological or historic sites indicated and no parks or designated public access sites. Visual access is available at Front Street.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is rainfall dominated, with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture in the upper watershed.
- Shoreline vegetation is functioning, with some areas impaired. Many areas in this reach are undeveloped. The undeveloped areas are generally vegetated with native trees and shrubs, while the developed areas are generally open space agriculture, with some industrial and residential use.
- The terrestrial habitat is functioning in approximately half of the reach. The aquatic habitat is functioning with impairments due to water quality. Thermal cover is better in this reach than in adjacent reaches and it is most likely functioning better for fish support than the Sumas River.

Limiting Factors

The following limiting factors have been identified:

- Water quality
- Zoning

Functions

- Hydrologic, shoreline vegetation, and terrestrial and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.

Priority Actions

- Preservation of the riparian corridor and the terrestrial habitat.
- Water quality improvement.

Current Enhancement Projects

- A wetland mitigation project is located at the western southern end of the reach. Reach 5 is designated as a Natural System Protection Area in the City Comprehensive Plan.

Preservation/Enhancement Opportunities

- Preservation of terrestrial vegetation, habitat and associated corridors, particularly riparian corridors.
- Enhancement of the riparian buffer by increasing the width of native shoreline vegetation in pasture areas.
- Removal of any invasive species (Himalayan blackberry and reed canarygrass).
- Relocation of truck parking outside of shoreline jurisdictional area.

Public Access Opportunities

- No opportunities for increased public access have been identified in this reach.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 5 is Conservancy. Based on the available inventory information it appears that this environment designation should be retained.

3.6 REACH 6

Reach 6 is defined as Johnson Creek between the railroad and Cherry Street. See the attached Data Sheet for Reach 6 for full inventory and analysis.

Land Use and Zoning

The current shoreline designation in Reach 6 is Urban and land use is business and railroad corridor. Zoning is primarily Business, Traffic-Oriented and Industrial, with some Business District, General.

Physical Environment

Within the 8.5 acres of Reach 6, there are eight business buildings present and the railroad runs the entire length of the reach. Retail business parking, an arterial (Third Street), and a major arterial (Cherry Street) are also located within Reach 6. There are 4.7 acres of impervious surface. There are no data on culverts/stormwater utilities and there are no culverts for the railroad and road crossings.

The geology of Reach 6 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil is Briscot silt loam. Topography is at approximately 35 feet elevation and the entire reach, with the exclusion of some railroad areas, is within the 100-year floodplain.

A little less than half of the reach is characterized by native mixed trees and shrubs, while the remainder of the reach is developed (commercial, railway, roads). Multiple invasive species were observed in the understory. Much of the channel is dominated by reed canarygrass and the majority of vegetation does not provide adequate shading over the channel. One tributary, Sumas Creek, flows into the left bank of Johnson Creek near the midpoint of the reach.

Potential Species Present

Sockeye presence is documented. Fall chum (to Sumas Creek only) and winter steelhead presence is presumed. Chum, cutthroat and coho are mapped as present; coho rearing is also present. Emergent and scrub-shrub wetlands associated with Johnson Creek provide wildlife habitat and water quality/quantity protection. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present, and there are no data regarding invasive wildlife/fish species.

Riparian Function

No data are available describing the aquatic substrate type of Reach 6 or the channel gradient. The channel is confined within the bank full width and unconfined in the basin due to topography, with an unknown migration zone. There are no data on creosote or in-water structures, and none were observed. The possibility of a railroad bridge exists, as the railroad crosses the creek. There are no fish passage blockages. No LWD was observed and recruitment potential is low, as the vegetation is mostly shrubs and small trees. Substantial pool and backwater habitat, with potentially spawnable riffles are present. The DOE 303(d) list has nothing designated for Reach 6. One leaking storage tank is listed within the reach as a potential toxic site. Point and non-point sources of pollution have contributed to increased levels of ethylene dibromide in groundwater wells and anthropogenic nitrate concentrations in surface water. Additional point sources include retail businesses (including fuel stations) and the railroad, which dominate uses within the reach. Higher intensity sources are located in the upper watershed where dairy and agriculture are more prevalent.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological or historic sites indicated and no parks or designated public access sites. Visual access is available from Third Street and Cherry Street.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is rainfall dominated, with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture in the upper watershed.
- Shoreline vegetation is functioning with impairments. Native trees and shrubs located throughout the reach provide some shading and habitat; however, many areas of the understory are dominated by non-native, invasive species. Only about 50% of the buffer is vegetated.
- The terrestrial habitat is impaired. The aquatic habitat is functioning with impairments due to water quality and thick vegetation in the channel.

Limiting Factors

The following limiting factors have been identified:

- Existing land uses
- Water quality
- Zoning

Functions

- Hydrologic, shoreline vegetation, and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.
- Terrestrial habitat is not sustainable without a major change in adjacent land use.

Priority Actions

- Preservation of the riparian corridor.
- Water quality improvement.

Current Enhancement Projects

- None known.

Preservation/Enhancement Opportunities

- Preservation of terrestrial vegetation, habitat and associated corridors, particularly riparian corridors.
- Enhancement of the riparian buffer by increasing the width of native shoreline vegetation and adding vegetation to provide shading.
- Removal of any invasive species (Himalayan blackberry and field bindweed).

Public Access Opportunities

- No opportunities for increased public access have been identified in this reach.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 6 is Urban. Based on the available inventory information it appears that this environment designation should be retained.

3.7 REACH 7

Reach 7 is defined as Johnson Creek from Cherry Street to Lawson Street. See the attached Data Sheet for Reach 7 for full inventory and analysis.

Land Use and Zoning

The current shoreline designation in Reach 7 is Urban and land use consists of residential, public park, business, and undeveloped parcels. Zoning is primarily Residential High Density, with areas of Public, Business District General, Business Low Impact, and Business Traffic-Oriented.

Physical Environment

Within the 11.7 acres of Reach 7, there are 27 mixed-use buildings present. One major arterial at the western terminus (Cherry Street) and three arterials (Sumas Avenue, Vancouver Street, and Columbia Street) run through Reach 7. There are 4.4 acres of impervious surface. There are no data on culverts/stormwater utilities; however, culverts run under Cherry Street and Sumas Avenue.

The geology of Reach 7 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil is Briscot silt loam. Topography is at approximately 35 feet elevation and the entire reach is within the 100-year floodplain.

The majority of the reach is vegetated with grasses and herbaceous species to the top of the creek bank. Grasses are mowed, but not directly adjacent to the bank. Deciduous trees, native and non-native, are present in the park. A limited number of deciduous trees and shrubs are located south of the channel. Himalayan blackberry patches are present along the stream. Vegetation provides little to no shading.

Potential Species Present

Sockeye presence is documented. Fall chum and winter steelhead presence is presumed. Chum, cutthroat and coho are mapped as present; coho rearing is also present. Emergent and scrub-shrub wetlands associated with Johnson Creek provide wildlife habitat and water quality/quantity protection. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present, and there are no data regarding invasive wildlife/fish species.

Riparian Function

The aquatic substrate type of Reach 7 is silt. There are no data on the channel gradient. The channel is confined within the bank full width and unconfined in the basin due to topography, with an unknown migration zone. There are no data on creosote or in-water structures, and none were observed. There are no fish passage blockages. No LWD was observed and recruitment potential is very low. Tree cover along the shoreline is low to moderate. Riffle and pool occurrence is low, with a homogenous habitat throughout the reach. The DOE 303(d) list designates Reach 7 as category 4A for fecal and DO downstream of Sumas Avenue. No toxic sites or landfills are listed. Point and non-point

sources of pollution have contributed to increased levels of ethylene dibromide in groundwater wells and anthropogenic nitrate concentrations in surface water. Additional point sources include scattered urban residential uses and roadways. Higher intensity sources are located in the upper watershed where dairy and agriculture are more prevalent.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological sites indicated. Sumas Methodist Church and Thomas House are listed as historic sites and there is a public park at the northwestern end of the reach. A trail system is planned.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is rainfall dominated, with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture in the upper watershed.
- Shoreline vegetation is impaired. Native vegetation is lacking and there is very little diversity of species or structure, and no thermal cover. Some larger trees exist in the public park but their distance from the creek offers little cover.
- The terrestrial habitat is impaired, with potential for improvement in areas. The aquatic habitat is functioning but impaired.

Limiting Factors

The following limiting factors have been identified:

- Existing land uses
- Water quality
- Zoning

Functions

- Hydrologic, shoreline vegetation, and terrestrial and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.

Priority Actions

- Enhancement of the riparian buffer.
- Water quality improvement.

Current Enhancement Projects

- None known.

Preservation/Enhancement Opportunities

- Enhancement of the riparian buffer by increasing the width and species diversity of native shoreline vegetation and by installing plants along the bank for shading.
- Preservation of undeveloped property along the north side of the creek (possibly in public ownership).
- Removal of any invasive species.

Public Access Opportunities

- The Sumas City Park located in this reach provides the primary public access point within the City of Sumas.
- Development of a public trail system adjacent to the creek is planned.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 7 is Urban. Based on the available inventory information it appears that this environment designation should be retained.

3.8 REACH 8

Reach 8 is defined as Johnson Creek from Lawson Street to the eastern extent of Vancouver Street. See the attached Data Sheet for Reach 8 for full inventory and analysis.

Land Use and Zoning

The current shoreline designation in Reach 8 is Urban and land use is residential. Zoning is primarily Residential High Density, with some Agriculture.

Physical Environment

Within the 6.2 acres of Reach 8, there are 12 residential buildings present. Roads include two residential driveways and arterial access (Vancouver Street). There are 1.2 acres of impervious surface. There are no data on culverts/stormwater utilities but it is likely that no such facilities are present.

The geology of Reach 8 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil is Briscot silt loam. Topography is at approximately 35 feet elevation and the entire reach is within the 100-year floodplain, except for a very small portion of buffer.

The majority of the reach is characterized by native mixed trees and shrubs. Small areas of lawn from adjacent residences encroach in a number of places. A small area in the northeast corner is agricultural land (corn). Native vegetation present has the potential to provide good habitat.

Potential Species Present

Sockeye presence is documented. Fall chum and winter steelhead presence is presumed. Chum, cutthroat and coho are mapped as present; coho rearing is also present. Emergent and scrub-shrub wetlands associated with Johnson Creek provide wildlife habitat and water quality/quantity protection. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present, and there are no data regarding invasive wildlife/fish species.

Riparian Function

No data are available describing the aquatic substrate type of Reach 8 or the channel gradient. The channel is confined within the bank full width and unconfined in the basin due to topography, with an unknown migration zone. There are no data on creosote or in-water structures, and none were observed. There are no fish passage blockages. Although there are no data on LWD and its presence is unknown, recruitment potential is low to moderate due to tree density in the reach. Riffle and pool occurrence is low, with a homogenous habitat throughout the reach. The DOE 303(d) list designates Reach 8 as category 4A for fecal and DO. No toxic sites or landfills are listed. Point and non-point sources of pollution have contributed to increased levels of ethylene dibromide in groundwater wells and anthropogenic nitrate concentrations in surface water. Additional point sources include urban residential uses. Higher intensity sources are located in the upper watershed where dairy and agriculture are more prevalent.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological or historic sites indicated. A trail system is planned.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is rainfall dominated, with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture in the upper watershed.
- Shoreline vegetation is functioning, with some areas impaired. Vegetation is mostly native with good diversity and structure; lawn encroaches into some areas. Overall this reach offers better habitat potential even though it is located in a residential area. Vegetation in the eastern end of the reach adjacent to the agricultural area (crop) is impaired.
- The terrestrial habitat is functioning with impairments due to residential uses. The aquatic habitat is functioning with impairments also.

Limiting Factors

The following limiting factors have been identified:

- Existing land uses
- Water quality
- Zoning

Functions

- Hydrologic, shoreline vegetation, and terrestrial and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership and potential land development.

Priority Actions

- Preservation of the riparian corridor, which currently has well established native vegetation and a good habitat potential.

- Water quality improvement.

Current Enhancement Projects
- None known.

Preservation/Enhancement Opportunities
- Preservation of terrestrial vegetation, habitat and associated corridors, particularly riparian corridors.
- Enhancement of the riparian buffer by increasing the width of native shoreline vegetation in lawn areas.

Public Access Opportunities
- A public access trail system is planned in this reach.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 8 is Urban. Based on the available inventory information it appears that this environment designation should be retained.

3.9 REACH 9

Reach 9 is defined as Johnson Creek from the eastern extent of Vancouver Street to the area south of Wilson Lane. See the attached Data Sheet for Reach 9 for full inventory and analysis.

Land Use and Zoning

The current shoreline designation in Reach 9 is Urban on the north side and Conservancy on the south side. Land use is residential and light agriculture with some undeveloped parcels, while zoning is primarily Residential High Density, with some Agriculture.

Physical Environment

Within the 11.1 acres of Reach 9, there are 15 buildings present which are either residential or partially residential. Roads include two residential driveways and there are 1.1 acres of impervious surface. There are no data on culverts/stormwater utilities, but it is likely that no such facilities are present.

The geology of Reach 9 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil is Sumas silt loam. Topography is at approximately 35 feet elevation and the entire reach is within the 100-year floodplain.

The majority of the reach is characterized by pasture areas vegetated with native and non-native grasses and herbaceous species, as well as large patches of Himalayan blackberry. A number of trees, deciduous and evergreen, are located throughout the

reach. A small area near the southwest reach is agriculture (crop). The vegetation present provides little shade.

Potential Species Present

Sockeye presence is documented. Fall chum and winter steelhead presence is presumed. Chum, cutthroat and coho are mapped as present; coho rearing is also present. Emergent and scrub-shrub wetlands associated with Johnson Creek (upper basin) provide wildlife habitat and water quality/quantity protection. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present, and there are no data regarding invasive wildlife/fish species.

Riparian Function

No data are available describing the aquatic substrate type of Reach 9 or the channel gradient. The channel is confined within the bank full width and unconfined in the basin due to topography, with an unknown migration zone. There are no data on creosote or in-water structures, and none were observed. There are no fish passage blockages. No LWD was observed and recruitment potential is low due to low tree cover along the shoreline. Riffle and pool occurrence is low, with a homogenous habitat throughout the reach. The DOE 303(d) list designates Reach 9 as category 4A for fecal and DO. No toxic sites or landfills are listed. Point and non-point sources of pollution have contributed to increased levels of ethylene dibromide in groundwater wells and anthropogenic nitrate concentrations in surface water. Additional point sources include scattered residential uses and crop agriculture. Higher intensity sources are located in the upper watershed where dairy and agriculture are more prevalent.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological or historic sites indicated and no parks or designated public access points.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is rainfall dominated, with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture in the reach and upper watershed.
- Shoreline vegetation is impaired. The majority of the vegetation is non-native, with very little diversity of species or structure. The habitat value is low and there is very little cover provided to the creek.
- The terrestrial habitat is impaired but could be improved. The aquatic habitat is functioning with impairments.

Limiting Factors

The following limiting factors have been identified:

- Existing land uses
- Water quality
- Zoning

Functions
- Hydrologic, shoreline vegetation, and terrestrial and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.

Priority Actions
- Preservation of the riparian corridor and enhancement with trees and native vegetation for habitat and thermal cover.
- Water quality improvement.

Current Enhancement Projects
- None known.

Preservation/Enhancement Opportunities
- Enhancement of the riparian buffer by increasing the width of native shoreline vegetation in pasture areas, adding species diversity and adding plants along the banks for shading.
- Removal of invasive species (Himalayan blackberry).

Public Access Opportunities
- No opportunities for increased public access have been identified in this reach.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 9 is Urban on the north side and Conservancy on the south side of the creek. Based on the available inventory information it appears that these environment designations should be retained.

3.10 REACH 10

Reach 10 is defined as Johnson Creek from the area south of Wilson Lane to Heron Lane. See the attached Data Sheet for Reach 10 for full inventory and analysis.

Land Use and Zoning

The current shoreline designation in Reach 10 is Urban on the north side and Conservancy on the south side. Land use is residential and zoning is Residential High Density.

Physical Environment

Within the 3.9 acres of Reach 10, there are 17 residential buildings present. Roads include an access road (Heron Lane) at the eastern terminus of the reach, and there is

1.0 acre of impervious surface. There are no data on culverts/stormwater utilities, but it is likely that no such facilities are present.

The geology of Reach 10 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil is Briscot silt loam, Oridia silt loam and Sumas silt loam. Topography is at approximately 35 feet elevation and the entire reach is within the 100-year floodplain.

The majority of the reach is characterized by native deciduous trees and shrubs. A few small areas of lawn are also present. Native vegetation present has the potential to provide good habitat. Overhanging vegetation and shading are not present along the majority of the reach. Reed canarygrass is present in patches along the channel.

Potential Species Present

Sockeye presence is documented. Fall chum and winter steelhead presence is presumed. Chum, cutthroat and coho are mapped as present; coho rearing is also present. Emergent and scrub-shrub wetlands associated with Johnson Creek (upper basin) provide wildlife habitat and water quality/quantity protection. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present, and there are no data regarding invasive wildlife/fish species.

Riparian Function

The aquatic substrate type of Reach 10 is silt. There is no channel gradient. The channel is confined within the bank full width and unconfined in the basin due to topography, with an unknown migration zone. There are no data on creosote or in-water structures and none were observed. There are no fish passage blockages. No LWD was observed and recruitment potential is moderate due to moderate tree cover along the shoreline. Riffle and pool occurrence is low, with a homogenous habitat throughout the reach. The DOE 303(d) list designates Reach 10 as category 4A for fecal and DO. No toxic sites or landfills are listed. Point and non-point sources of pollution have contributed to increased levels of ethylene dibromide in groundwater wells and anthropogenic nitrate concentrations in surface water. Additional point sources include residential uses. Higher intensity sources are located in the upper watershed where dairy and agriculture are more prevalent.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological or historic sites indicated and no parks or designated public access points.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is rainfall dominated, with flashy winter and early spring peaks, low summer, and variable spring and

fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture in the upper watershed.
- Shoreline vegetation is functioning in some areas and impaired in others. There is some native tree and shrub habitat along the shoreline, along with open areas with blackberry and reed canarygrass. Residential lawn encroaches in areas. Fallow agricultural practice has allowed tree and shrubs to re-vegetate the shoreline and buffer – although not all species are native. There is potential for restoration.
- The terrestrial and aquatic habitats are both functioning with impairments.

Limiting Factors

The following limiting factors have been identified:
- Existing land uses
- Water quality
- Zoning

Functions
- Hydrologic, shoreline vegetation, and terrestrial and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.

Priority Actions
- Preservation of the riparian corridor, with buffer enhancement plantings to improve habitat and structure.
- Water quality improvement.

Current Enhancement Projects
- None known.

Preservation/Enhancement Opportunities
- Preservation of terrestrial vegetation, habitat and associated corridors, particularly riparian.
- Enhancement of the riparian buffer by increasing the width and species diversity of native shoreline vegetation and adding plants along the banks to provide shading.

Public Access Opportunities
- No opportunities for increased public access have been identified in this reach.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 10 is Urban on the north side and Conservancy on the south side of the creek. Based on the available inventory information it appears that these environment designations should be retained.

3.11 REACH 11

Reach 11 is defined as Bone Creek from SR9 to the ball field access drive just east of the trailer park area. See the attached Data Sheet for Reach 11 for full inventory and analysis.

Land Use and Zoning

The current land use of Reach 11 is trailer park, residential, and agriculture (crop). Zoning is Public, RV Park, and Residential High Density, with a small section of the reach zoned Business Traffic-Oriented.

Physical Environment

Roads include one farm driveway and the trailer park access and internal roadways. There are two possible culverts/stormwater utilities.

The geology of Reach 11 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil is Briscot silt loam and Mt. Vernon fine sandy loam. Topography is at 35 to 40 feet elevation and the 100-year floodplain is generally confined to the ordinary high water mark and the well-defined creek channel.

Terrestrial vegetation conditions are mixed. The majority of the reach is lawn or pasture vegetated with native and non-native herbaceous species. Native vegetation (deciduous trees and shrubs) is present in patches. Himalayan blackberry dominates the understory/ stream banks for much of this reach. Other invasive species were observed.

Potential Species Present

Coho and cutthroat presence is documented. Emergent and scrub-shrub wetlands associated with the Sumas River (upper basin) provide wildlife habitat and water quality/quantity protection. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present, and there are no data regarding invasive wildlife/fish species.

Riparian Function

There are no data on the aquatic substrate type or the channel gradient. The channel is confined within the bank full width and unconfined in the basin due to topography, with an unknown migration zone. There are no data on creosote or in-water structures and none were observed. There are no fish passage blockages. No LWD was observed and recruitment potential is low due to low to moderate tree cover along the shoreline. There are no data on riffle or pool occurrence and the DOE 303(d) list has nothing designated for Reach 11. No toxic sites or landfills are listed. Point sources of pollution consist of agriculture and an urban density trailer park.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological or historic sites indicated and no parks or public access. Visual access to Bone Creek is available from State Route 9.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is rainfall dominated, with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture.
- Shoreline vegetation is generally impaired; there is some restoration along a portion of the reach adjacent to State Route 9 and patches of native trees and shrubs are spotty. Agriculture and trailer park land uses have led to degradation of the vegetation.
- The terrestrial habitat is impaired. Some restoration along the creek will provide improved habitat in the future. The aquatic habitat is functioning with impairments.

Limiting Factors

The following limiting factors have been identified:

- Existing land uses
- Water quality
- Zoning

Functions

- Hydrologic, shoreline vegetation, and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.
- The terrestrial habitat is likely not sustainable in the majority of the reach due to land uses.

Priority Actions

- Water quality improvement.

Current Enhancement Projects

- Wetland/riparian enhancement project at the southwestern end of the reach.

Preservation/Enhancement Opportunities

- Preservation of terrestrial vegetation, habitat and associated corridors, particularly riparian corridors.
- Enhancement of the riparian buffer by increasing the width and species diversity of native shoreline vegetation.
- Removal of invasive plant material (Himalayan blackberry, yellow flag iris).
- Fish usage is documented; habitat enhancement could be an opportunity target.

Public Access Opportunities

- No opportunities for increased public access have been identified in this reach.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 11 is Conservancy wetland. Based on the available inventory information it appears that these environment designations should be retained.

3.12 REACH 12

Reach 12 is defined as Bone Creek from the ball field access drive just east of the trailer park area to the Sumas River (Reach 1). See the attached Data Sheet for Reach 12 for full inventory and analysis.

Land Use and Zoning

The current land use of Reach 12 is residential, agriculture (crop), and public recreation. Zoning is Public, Residential Medium Density and Residential High Density.

Physical Environment

Reach 12 includes 1.7 acres of buffer (Sumas River), no buildings, and negligible impervious surface. One foot bridge that crosses Bone Creek is present. There are no data on culverts/stormwater utilities, but there is a culvert under Hovel Road and a stormwater pond serving the ball fields.

The geology of Reach 12 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil is Mt. Vernon fine sandy loam. Topography is at 35 to 40 feet elevation and the 100-year floodplain is generally confined to the ordinary high water mark and well-defined creek channel.

Approximately half of the reach is characterized by native deciduous trees and shrubs. The remainder of the reach is pasture/agricultural land–these areas are vegetated with native and non-native herbaceous species. Multiple invasive species were observed, and Himalayan blackberry dominates the understory throughout the reach. Vegetation provides 80-100% cover to the creek along the southern end; the northern end has no cover.

Potential Species Present

Coho and cutthroat presence is documented. Emergent and scrub-shrub wetlands associated with the Sumas River (upper basin) provide wildlife habitat and water quality/quantity protection. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present, and there are no data regarding invasive wildlife/fish species.

Riparian Function

There are no data on the aquatic substrate type or the channel gradient. The channel is confined within the bank full width and unconfined in the basin due to topography, with an unknown migration zone. There are no data on creosote or in-water structures, and none were observed. There is a culvert at Hovel Road that does not pose a barrier to fish passage. Some woody debris was observed from the pedestrian bridge at the southern end of the reach. Recruitment potential is low to moderate due to low to moderate tree cover along the shoreline. There are no data on riffle or pool occurrence and the DOE 303(d) list has nothing designated for Reach 12. No toxic sites or landfills are listed. Point sources of pollution consist of urban density residential uses, light agriculture and recreational fields.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological or historic sites indicated. The southern portion of the reach is a public park and a trail system is planned for the area. The recreational area and footbridge provide public access to the shoreline area.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is rainfall dominated, with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture.
- Shoreline vegetation is generally impaired. Areas of native trees and shrubs in the southwestern portion of the reach provide habitat and creek cover. This is degraded in the northeastern half of the reach, adjacent to agriculture and new residential development, where there is no cover for the creek.
- The terrestrial habitat is impaired, with some opportunity for improvement in agricultural areas. The aquatic habitat is functioning with impairments.

Limiting Factors

The following limiting factors have been identified:

- Existing land uses
- Water quality
- Zoning

Functions

- Hydrologic, shoreline vegetation, and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.
- The terrestrial habitat is likely not sustainable in portions of the reach due to land uses (residential).

Priority Actions

- Preservation of riparian corridor.

- Water quality improvement.

Current Enhancement Projects
- None known.

Preservation/Enhancement Opportunities
- Preservation of terrestrial vegetation, habitat and associated corridors, particularly riparian corridors.
- Enhancement of the riparian buffer by increasing the width of native shoreline vegetation in pasture areas, increasing species diversity, and adding plantings on the banks to provide shading.
- Removal of invasive species (Himalayan blackberry).
- Fish usage is documented; habitat enhancement could be an opportunity target.

Public Access Opportunities
- The footbridge that crosses Bone Creek provides access to the shoreline area.
- The trail system planned for this area will increase opportunities for public access.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 12 is Conservancy wetland. Based on the available inventory information it appears that these environment designations should be retained.

3.13 REACH 13 (A AND B)

Reach 13 is defined as a ditch and seasonal wetland system that drains into Sumas Creek. See the attached Data Sheet for Reach 13 for full inventory and analysis.

Land Use and Zoning

The upper portion of Reach 13 is designated as a Natural System Protection Area in the Comp. Plan. The current land use is agriculture and industrial. Zoning is Industrial.

Physical Environment

Reach 13 includes an industrial park and related development. There are no data on culverts/stormwater utilities, but there is a culvert under the industrial parcel between Bob Mitchell Way and the railroad.

The geology of the reach is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil is Puget silt loam and Sumas silt loam. Topography is at approximately 40 feet elevation and the entire area is within the 100-year floodplain.

The majority of the reach is dominated by pasture (and reed canarygrass immediately adjacent to the ditch). A limited number of native deciduous trees and shrubs are

present just east of Bob Mitchell Way. Much of the area south of 13A is agriculture (crop). The majority of channels appear ditched and have no cover.

Potential Species Present

There are no wildlife species present and no fish species listed. In the western-most portion of the reach, emergent and scrub-shrub wetlands provide wildlife habitat and water quality/quantity protection. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. There are no data regarding invasive wildlife/fish species.

Riparian Function

Riparian function is not applicable to Reach 13. The DOE 303(d) list has nothing designated for Reach 13.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological or historic sites indicated and no parks or designated public access points.

Functional Analysis

Reach Function

- A wetland system is located in this area of the city, which is zoned for, and is being used for, industrial purposes. The system is draining to the east, into Johnson Creek, via a man-made ditch. Much of the wetland system remains intact but is degraded, as it has been converted to active, or currently fallow, pasture land. Forested wetland still remains in the western area of the reach. This system still provides good water quality functions and hydrologic functions (flood attenuation, water storage and base flow) to downstream areas, which include fish habitat. Habitat functions vary throughout the system, but are generally low in the reach as defined for this review.

  Functions in this system could be enhanced in areas that have not been developed. This system should be considered very important for its current functional level and for the potential this area holds, particularly with the loss of wetlands in the watershed.

Limiting Factors

The following limiting factor has been identified:

- Zoning

Priority Actions

- Wetland preservation.

Current Enhancement Projects

- None known. Upper portion of the reach is designated as a Natural System Protection Area in the City Comprehensive Plan.

Preservation/Enhancement Opportunities

- Wetland restoration/enhancement opportunities.

Public Access Opportunities

- No opportunities for increased public access have been identified in this reach.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 13 is Conservancy wetland. Based on the available inventory information it appears that these environment designations should be retained.

3.14 REACH 14

Reach 14 is defined as Sumas Creek from the western City limits along Kneuman Road (ditch). See the attached Data Sheet for Reach 14 for full inventory and analysis.

Land Use and Zoning

The current land use of Reach 14 is agriculture (crop) and zoning is Agriculture and Industrial. The reach is also designated as a Natural System Protection Area in the Comp. Plan.

Physical Environment

Reach 14 includes arterial access along the creek (Kneuman Road). There are three known culverts/stormwater utilities. Multiple ditches drain the adjacent wetland into this creek.

The geology of Reach 14 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil is Pangborn muck. Topography is at approximately 40 feet elevation and the entire reach is within the 100-year floodplain.

The stream is located in a ditch along the south side of Kneuman Road. Vegetation south of the stream is characterized as pasture/agricultural land–these areas are vegetated with native and non-native herbaceous species. A single row of native trees is present along the stream (restoration plantings).

Potential Species Present

Coho, chum and cutthroat presence is documented. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present, and there are no data regarding invasive wildlife/fish species.

Riparian Function

There are no data on the aquatic substrate type. The channel is confined within the ditch, adjacent to drained field/wetland area. The gradient is low, based on topography and the migration zone is unknown. There are no data on creosote or in-water structures; however, none were observed. There are three culverts that do not pose barriers to fish passage, as well as a partial barrier west of the city limits. No LWD was observed and recruitment potential is low due to low tree cover. There are no data on riffle or pool occurrence. The DOE 303(d) list designates Reach 14 as category 4A for fecal and DO. No toxic sites or landfills are listed. Point sources of pollution consist of agriculture–mainly cropland–located in the upper watershed.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological or historic sites indicated. No parks or designated public access sites have been identified in this reach.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is groundwater dominated along with rainfall, with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture. The wetland to the south has been trenched in several places, with water from the wetland draining directly into Sumas Creek.
- Shoreline vegetation is impaired; however, trees have been planted directly adjacent to the south side of the ditch Kneuman Road is on the north side. The remainder of the shoreline buffer is fallow agriculture.
- The terrestrial habitat is impaired, with potential for enhancement. The aquatic habitat is also impaired. As with Reach 13, the wetland systems associated with Sumas Creek are important for the functions they currently provide and for their rehabilitation potential; particularly in this reach as the wetland soils are organic in composition (see also discussion on Reach 13 data sheet).

Limiting Factors

The following limiting factors have been identified:

- Zoning
- Water quality

Functions

- Hydrologic, shoreline vegetation, and terrestrial and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.

Priority Actions

- Wetland preservation and rehabilitation.

Current Enhancement Projects

- Native plantings (trees and shrubs) along the ditch. This area is designated as a Natural System Protection Area in the City Comprehensive Plan.
- Large wetland enhancement project is underway south of the creek near the western end of the reach.

Preservation/Enhancement Opportunities

- Enhancement of the riparian buffer by increasing the width of native shoreline vegetation in pasture areas.
- Wetland restoration/enhancement.

Public Access Opportunities

- No opportunities for increased public access have been identified in this reach.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 14 is Conservancy wetland. Based on the available inventory information it appears that these environment designations should be retained.

3.15 REACH 15

Reach 15 is defined as Sumas Creek from the ditch at Kneuman Road to Bob Mitchell Way. See the attached Data Sheet for Reach 15 for full inventory and analysis.

Land Use and Zoning

Reach 15 consists of undeveloped parcels and industrial land use. The zoning is Industrial and Public. The reach is also designated as a Natural System Protection Area in the Comp. Plan.

Physical Environment

Reach 15 includes Kneuman Road at the western terminus, Bob Mitchell Way at the eastern terminus and a railroad spur to the south of the reach. There are no data on culverts/stormwater utilities; however a culvert was observed at the western terminus (at a farm residence).

The geology of Reach 15 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil is Briscot silt loam and Pangborn muck. Topography is at 35 to 40 feet elevation and the 100-year floodplain is generally confined to the ordinary high water mark.

The majority of the reach is characterized by native deciduous trees and shrubs. Native vegetation present has the potential to provide good habitat. Patches of Himalayan blackberry were also observed. The area of the reach south of the railroad is paved, with the exception of a small shrub wetland.

Potential Species Present

Coho, chum and cutthroat presence is documented. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present. There are no data regarding invasive wildlife/fish species.

Riparian Function

There are no data on the aquatic substrate type. The channel confinement is unknown. The gradient is low and the migration zone is unknown. There are no data on creosote or in-water structures; however, none were observed. There is one culvert, non-barrier to fish passage, within the reach. There are no data on LWD. With mostly shrubs and small trees in the reach, and some larger trees also present, recruitment potential is low to moderate. There are no data on riffle or pool occurrence. The DOE 303(d) list designates Reach 15 as category 4A for fecal and DO. No toxic sites or landfills are listed. Point sources of pollution consist of agriculture–mainly cropland–located in the upper watershed, and a railroad spur south of the reach.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological or historic sites indicated. Public zoning exists in the eastern-most portion of the reach, adjacent to Bob Mitchell Way; however, no designated public access points have been identified.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is groundwater dominated along with rainfall, with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture.
- Shoreline vegetation is functioning with some impairment. The western portion of the reach is degraded and dominated by non-native grasses and shrubs (agriculture use). Increasing amounts of trees and shrubs in the eastern portion provides more habitat and better cover for the creek, although non-natives are likely present.
- The terrestrial habitat is functioning with impairments. Some areas are degraded; some native trees and shrub areas are within the reach. Function is limited by industry to the south and the road to the north. The aquatic habitat is functioning with impairments.

Limiting Factors

The following limiting factors have been identified:

- Zoning
- Water quality

Functions

- Hydrologic, shoreline vegetation, and terrestrial and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.

Priority Actions

- Preservation of riparian corridor.

Current Enhancement Projects

- None known. This area is designated as a Natural System Protection Area in the City Comprehensive Plan.

Preservation/Enhancement Opportunities

- Preservation of terrestrial vegetation, habitat and associated corridors, particularly riparian corridors.
- Enhancement of the riparian buffer by increasing shading at the western end by installing plants on the banks.
- Removal of invasive species (Himalayan blackberry).

Public Access Opportunities

- No opportunities for increased public access have been identified in this reach.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 15 is Conservancy wetland. Based on the available inventory information it appears that these environment designations should be retained.

3.16 REACH 16

Reach 16 is defined as Sumas Creek from Bob Mitchell Way to Johnson Creek. See the attached Data Sheet for Reach 16 for full inventory and analysis.

Land Use and Zoning

Reach 16 consists of undeveloped parcels, residential, industrial, and agricultural land use. The zoning is Industrial, Business General, and Public. Portions of the reach are designated as Natural System Protection Areas in the Comp. Plan.

Physical Environment

Reach 16 includes three access arterials (Johnson, W. Second, and W. Third Streets), Bob Mitchell Way at the western terminus, and railroad tracks at the eastern terminus. There are no data on culverts/stormwater utilities; however culverts were observed under W. Third Street, W. Second Street, Johnson Street and Bob Mitchell Way.

The geology of Reach 16 is glacial outwash. There are no slope data listed by DOE, but site class and moderate to high liquefaction hazard are listed by Whatcom County. Soil

is Briscot silt loam and Puget silt loam. Topography is at 35 to 40 feet elevation and the entire reach is within the 100-year floodplain.

The majority of the reach is characterized by native deciduous trees and shrubs; however, large patches of Himalayan blackberry and reed canarygrass are also present along the reach. Knotweed was also observed south of W. Third Street.

Potential Species Present

Coho, chum and cutthroat presence is documented. This area is within the ESU for coho and fall/winter chum and the RU for bull trout. No threatened or endangered wildlife species are present, and there are no data regarding invasive wildlife/fish species.

Riparian Function

There are no data on the aquatic substrate type. The channel confinement is unknown. The gradient is low and the migration zone is unknown. There are no data on creosote or in-water structures; however, none were observed. There are no barriers to fish passage at the railroad and at the additional road crossings. There are no data on LWD. With mostly shrubs and small trees in the reach, recruitment potential is low. There are no data on riffle or pool occurrence. The DOE 303(d) list designates Reach 16 as category 4A for fecal and DO. No toxic sites or landfills are listed. Point sources of pollution consist of scattered low intensity residential uses, railroad, and light agriculture.

Historic and Cultural

Although there are no historic aerials online to review, it is presumed the geomorphology has been stable for several decades. There are no archeological sites indicated. No historic sites have been identified. Public zoning exists in the northwestern-most portion of the reach, adjacent to Bob Mitchell Way; however, no designated public access points have been identified.

Functional Analysis

Reach Function

- Hydrologically, the reach is functioning with impairments. It is groundwater dominated along with rainfall, with flashy winter and early spring peaks, low summer, and variable spring and fall flows. Impairment in the basin is due to loss of wetland area, draining, filling, ditching and removal of vegetation for agriculture.
- Shoreline vegetation is functioning with some areas impaired. Approximately half of the reach is located in a residential area where trees and shrubs exist along the shoreline. The remainder of the reach (south end) is degraded and is dominated by non-native grasses and shrubs.
- The terrestrial habitat is impaired, particularly in the southern half of the reach. The aquatic habitat is functioning, with impairments.

Limiting Factors

The following limiting factors have been identified:

- Zoning

- Water quality
- Property ownership

Functions

- Hydrologic, shoreline vegetation, and terrestrial and aquatic habitat are sustainable at current levels; however, this sustainability is affected by private property ownership.

Priority Actions

- Preservation of riparian corridor.
- Water quality improvement.

Current Enhancement Projects

- None known. The northern- and southern-most portions of this reach are designated as Natural System Protection Areas in the City Comprehensive Plan.

Preservation/Enhancement Opportunities

- Preservation of terrestrial vegetation, habitat and associated corridors, particularly riparian corridors.
- Enhancement of the riparian buffer by increasing the width of native shoreline vegetation in reed canarygrass areas.
- Removal of invasive species.

Public Access Opportunities

- No opportunities for increased public access have been identified in this reach.

Shoreline Environment Designation

Under the 1999 Sumas Shoreline Management Master Program the shoreline environment designation for Reach 16 is Conservancy wetland. Based on the available inventory information it appears that these environment designations should be retained.