DRAFT
SWIFT CREEK ACTION PLAN
Whatcom County, Washington

February 2019 DRAFT

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Cris Matthews (Primary contact)
Toxics Cleanup Program - Bellingham Field Office
913 Squalicum Way, Suite 101
Bellingham, WA 98225
(360) 255-4379 or Cris.Matthews@ecy.wa.gov

Tamara Cardona-Marek
Toxics Cleanup Program – NW Regional Office
3190 160th Ave. SE, Bellevue, WA 98008
(425) 649-7058 or Tamara.Cardona.Marek@ecy.wa.gov

Pete Kmet (Retired)
Washington State Department of Ecology
Toxics Cleanup Program - Headquarters Office
300 Desmond Drive
P.O. Box 47600
Olympia, WA 98504-7600

Table of Contents

List of Tables

List of Figures

List of Appendices

LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirements
Ca	calcium
CAP	cleanup action plan
SCAP	Swift Creek action plan
CERCLA	comprehensive environmental response compensation and liability act
CY	cubic yards
Ecology	department of ecology
EE/CA	engineering evaluation/cost analysis
EIS	environmental impact statement
EPA	United States environmental protection agency
J	estimated value
MFL	million fibers per liter
Mg	magnesium
mg/L	milligrams per liter
MTCA	Model Toxics Control Act (Chapter 70.105D RCW)
NTU	nephelometric turbidity units
PCME	phase contrast microscopy equivalent asbestos concentration
ppm	parts per million
RCW	revised code of Washington
RI/FS	remedial investigation/feasibility analysis
s/cc	asbestos structures per cubic centimeter
SPLP	synthetic precipitation leaching procedure
TCLP	toxic characteristic leaching procedure
TEE	terrestrial ecological evaluation
U	value not detected at reported concentration
ug/L	micrograms per liter
um	micrometers
WAC	Washington Administrative Code
WCH	Whatcom County health department

EXECUTIVE SUMMARY

This document presents the Swift Creek Action Plan (SCAP) for the Swift Creek/Sumas Mountain Site near Everson Washington. This SCAP was prepared by the Washington State Department of Ecology (Ecology) in collaboration with Whatcom County and the United States Environmental Protection Agency (EPA). This SCAP has been prepared to meet the requirements of the Model Toxics Control Act (MTCA) administered by Ecology under Chapter 173-340 of the Washington Administrative Code (WAC). This SCAP describes Ecology's proposed action for this site and sets forth the requirements the action must meet.

Background

Swift Creek is a small creek in the northeastern lowlands of Whatcom County. An ongoing landslide on Sumas Mountain that is believed to have started in the late 1930's or early 1940's has resulted in a large volume of sediment containing naturally occurring asbestos and metals continuously filling up the creek bed. For several decades Swift Creek has been dredged and the sediment managed to limit downstream flooding. This dredging and management of the sediment has created liability under the Model Toxics Control Act.

This Swift Creek Action Plan is intended to address those aspects of this site related to this historic liability and prospective liability for managing these sediments in the future. For context, it also describes broader actions needed beyond those required under MTCA to reduce environmental and human health risks resulting from this ongoing landslide and downstream flooding. It supports Ecology's commitment in a Joint Agency Agreement with EPA and Whatcom County to work together to manage the impacts of this landslide.

The landslide on Sumas Mountain where the sediment in Swift Creek originates is massive. The active part of the slide is approximately one mile long by one-quarter mile wide and encompasses approximately 225 acres, with an estimated volume of 68 million cubic yards. This landslide is slowly moving down Sumas Mountain within a layer of slippery serpentinite bedrock. Precipitation that falls within the watershed encompassing this landslide gravitates to the toe of the slide, where the south fork of Swift Creek emerges.

As the water flows along the surface of the landslide and emerges from the toe of the landslide, it picks up large amounts of sediment and debris (e.g. boulders, trees) and carries it downstream[1]. Then as Swift Creek flows down slope onto its alluvial fan, the terrain and stream gradient flattens out, and the water velocity slows, resulting in the Creek dropping much of the sediment and debris it is carrying. Suspended fine particles of sediment then continue downstream to the Sumas River and can eventually

[1] Estimates vary from 30,000 cubic yards to up to 150,000 cubic yards per year, with the amount varying considerably during the year.

be carried by natural forces to the Canadian Border, some 10 river miles to the north. As further described in Section 4.1, for the purposes of this Draft Swift Creek Action Plan, the site definition under MTCA is limited to the areas within and proximate to the Swift Creek alluvial fan where the sediment will be managed through actions described herein

Sediments from the landslide are naturally enriched in chrysotile asbestos, chromium, cobalt, magnesium, nickel, and exhibit an elevated pH. It is thought that the primary source of these contaminants is the serpentinite bedrock within the slide, with these contaminants released through natural physical and chemical weathering processes.

Studies by EPA confirm that activities common in a rural community can result in the asbestos in the sediment becoming airborne when dry and posing a significant health risk to individuals exposed to the dust. The primary concern with the metals in the sediment is the impact to terrestrial plants and aquatic life. The part of Swift Creek impacted by the sediment is essentially devoid of aquatic life. Areas where the sediment has been piled due to dredging activity are barren of plant life. And agricultural fields where the sediment has been deposited by flooding have stunted vegetation for many years after a flood event. The impact on plants is thought to be due to the sediment being enriched in magnesium, resulting in an imbalance in the calcium to magnesium ratio.

Action Overview

Over the years, numerous studies have been conducted to evaluate options for stabilizing the landslide and managing the sediment that accumulates in Swift Creek. To date, the only practical alternative that has emerged is to capture the sediment in the upper reach of Swift Creek and manage it in a nearby repository that is covered with clean soil to prevent the sediment from re-entering the environment.

In addition, there are large piles of sediment along the creek between Goodwin and Oat Coles Roads that have accumulated as a result of historic dredging activity. This plan calls for stabilizing these sediments in place to create permanent levees to keep Swift Creek within its channel. Excess sediment not needed for levee construction would be hauled to the repository for long term management. These levees would be armored and encapsulated with clean soil to prevent erosion of the sediment back into Swift Creek and surrounding properties. In addition to stabilizing sediment in place, the elevated Swift Creek bed may also be stabilized in place and all or a portion of Swift Creek re-routed to establish lower bed elevations.

These actions, coupled with access restrictions, will permanently seal off the sediments, preventing the release of asbestos to the air.

These elements – levee construction and sediment capture and storage, along with other actions described in more detail this plan – constitute the proposed remedy under the Model Toxics Control Act. This remedy is intended to address hazardous substances that pose actual or potential threats to human health or the environment resulting from past releases and threatened releases caused by historical human activities to manage this naturally occurring sediment. The remedy is also intended to minimize

and address threats or potential threats with respect to any release or threatened release of hazardous substances caused by certain future human activities during management of this naturally occurring sediment.

1.0 INTRODUCTION

1.1 Purpose

This document is the Swift Creek Action Plan (SCAP) for the Swift Creek/Sumas Mountain site (Site) located near Everson, Washington. The general location of the Site is shown in Figures 1 and 2. An action plan is required as part of the site cleanup process under Chapter 173-340 WAC, the Model Toxics Control Act (MTCA). The purpose of the action plan is to identify the proposed action for the Site and to provide an explanatory document for public review. More specifically, this plan:

- Describes the Site;
- Summarizes current site conditions;
- Summarizes the action alternatives considered in the remedy selection process;
- Describes the selected action for the Site and the rationale for selecting this alternative;
- Identifies contaminants, points of compliance, and media of concern for the proposed action;
- Identifies applicable state and federal laws for the proposed action;
- Identifies environmental covenants and site use restrictions that are part of the proposed action;
- Discusses compliance monitoring requirements; and
- Presents the schedule for implementing the SCAP.

1.2 Previous Studies

This SCAP presents a brief description and history of the Swift Creek/Sumas Mountain Site. Over the years, numerous studies have been conducted to document current site conditions and to evaluate options for stabilizing the landslide and managing the sediment[2] that accumulates in Swift Creek (see Section 3.0). However, while much work has been done, none of the studies follow the format required under MTCA for a Remedial Investigation/Feasibility Study (RI/FS). Thus, this document provides more detail than a typical MTCA CAP, and pursuant to WAC 173-340-350(6), incorporates RI/FS requirements by reference by drawing relevant information from several of these documents.

[2] Except where noted, the term “sediment”, as used throughout this CAP is a general term intended to include both the material in the bed of Swift Creek and the soil-like material in the dredge piles along Swift Creek.

1.3 Regulatory Framework

The asbestos and metals that are present in the Swift Creek sediment are hazardous substances under MTCA and several studies have shown that they pose a threat to human health and the environment. Since they are naturally occurring and are transported and deposited in Swift Creek through water flowing down the creek, a natural phenomenon, there would normally not be any requirement to conduct a remedial action under MTCA. However, because these sediments have been actively dredged to manage flooding over the years, a "release" or "threatened release" of "hazardous substances", as those terms are defined or used in MTCA, has occurred at the Site. When compared with unabated natural processes and unmanaged human response, this SCAP will lead to more effective abatement of hazardous substances at the Site. In addition, this SCAP anticipates that active sediment dredging and management will be required into the future to reduce flood hazards. As such, this SCAP provides a plan for continuing that work in a manner that will abate threatened releases in compliance with MTCA.

EPA has been actively involved in this site and has conducted removal actions under the federal superfund law (CERCLA). However, the Swift Creek/Sumas Mountain site is not on the Federal National Priorities List as a federal superfund site. While there are many similarities between MTCA and CERCLA, this action plan is not intended to satisfy EPA's requirements for a federal record of decision under CERCLA.

In addition to the actions under MTCA proposed in this SCAP, there are several other actions that could be taken to reduce the long term operation and maintenance costs and risks posed by the landslide and flooding caused by sediment deposition. These actions are described in the 2013 Swift Creek Sediment Management Action Plan (SCSMAP) and associated Environmental Impact Statement. While all of these actions are not necessary to address the MTCA releases or threatened releases at this site and thus are not part of the action specified in this plan, for completeness a description of these actions has been included in this SCAP.

2.0 Site Description and History

This section summarizes existing site conditions as described in the reports listed in Section 3.0 of this Swift Creek Action Plan. This description, and the associated reports, fulfills the remedial investigation requirements under WAC 173-340-350(7).

Swift Creek is a small creek in the northeastern lowlands of Whatcom County. The general location of the Site is shown in Figures 1 and 2. An ongoing landslide on Sumas Mountain that is believed to have started in the late 1930's or early 1940's has resulted in a large load of naturally occurring asbestos and metal-contaminated sediment continuously filling up the creek bed. For several decades Swift Creek has been dredged and the sediment managed to limit downstream flooding (Figures 3 – 5).

The landslide on Sumas Mountain where the sediment in Swift Creek originates is massive. The active part of the slide is approximately one mile long by one-quarter mile wide and encompasses approximately 225 acres, with an estimated volume of 68 million cubic yards. This landslide is slowly moving down Sumas Mountain within a layer of slippery serpentinite bedrock. Precipitation that falls within the watershed encompassing this landslide gravitates to the toe of the slide, where the south fork of Swift Creek emerges.

As the water flows along the surface of the landslide and emerges from the toe of the landslide, it picks up large amounts of sediment and debris (e.g. boulders, trees) and carries it downstream[3]. Then as Swift Creek flows down slope onto its alluvial fan, the terrain and stream gradient flattens out, and the water velocity slows, resulting in the Creek dropping much of the sediment and debris it is carrying. Suspended fine particles of sediment then continue downstream to the Sumas River and can eventually be carried by natural forces to the Canadian Border, some 10 river miles to the north. As further described in Section 4.1, for the purposes of this Draft Swift Creek Action Plan, the site definition under MTCA is limited to the areas where the sediment has been actively managed within the Swift Creek alluvial fan.

Sediments from the landslide are naturally enriched in chrysotile asbestos, chromium, cobalt, magnesium, nickel, and exhibit an elevated pH. It is thought that the primary source of these contaminants is the serpentinite bedrock within the slide, with these contaminants released through natural physical and chemical weathering processes.

Table 1 provides a summary of asbestos and metals concentrations measured in the sediment relative to natural background and several regulatory values. While little sampling has been done outside of the sediment piles and areas with recent flood deposits, based on the limited sampling to date outside of these areas, it is likely that most soils within the Swift Creek alluvial fan and floodplains of Swift Creek and the Sumas River contain elevated asbestos and metals concentrations from historic flood events and natural changes in the location of the stream channel.

Studies by EPA confirm that activities common in a rural community can result in the asbestos in the sediment becoming airborne and posing a significant health risk to individuals exposed to the dust. Tables 2 and 3 summarize the results of these studies. All of these studies indicate that the asbestos typically found in the sediments from Swift Creek can cause potential cancer risks in individuals well in excess of the MTCA acceptable cancer risk (1X10-6 residential; 1X10-5 industrial worker)

The primary concerns with the metals in the sediment are the impacts to terrestrial plants and aquatic life (not human health). The part of Swift Creek impacted by the sediment is essentially devoid of aquatic life. Areas where the sediment has been piled due to dredging activity are barren of plant life. And agricultural fields where the sediment has been deposited by flooding have stunted vegetation for many years after a flood event.

[3] Estimates vary from 30,000 cubic yards to up to 150,000 cubic yards per year.

Figure 1: General Location of Swift Creek Site (Source: Whatcom County EIS)

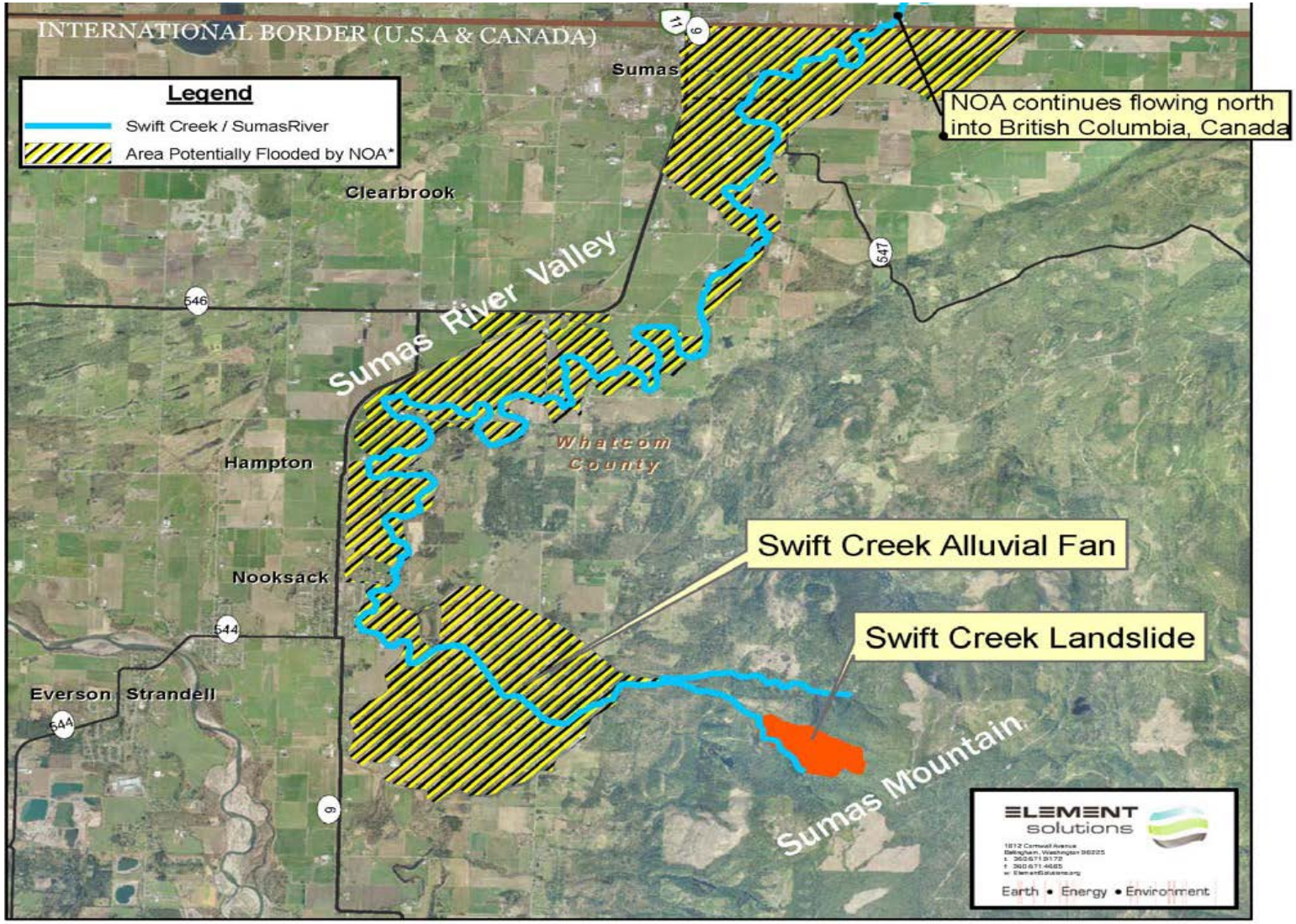

Figure 2: Swift Creek general vicinity map and areas at risk due to flooding and sediment deposition (Source: Whatcom County EIS)

Figure 3: Great Western Lumber gravel removal operation along upper Swift Creek, 2009 (Source: Whatcom County)

Figure 4: Swift Creek between Goodwin Road and Oat Coles Road, 2004 before dredging (Source: Whatcom County)

Figure 5: Swift Creek between Goodwin Road and Oat Coles Road, after dredging, 2006

As noted in Table 1, the concentrations of chromium, cobalt and especially nickel in the sediment are well in excess of potentially toxic screening level concentrations for upland plants. While it is possible bioassays could be used to more precisely determine non toxic concentrations of these metals in the sediment, for upland soils, the effect of these metals is secondary to the magnesium levels in the sediment. As discussed in several studies, the magnesium levels are so high that the calcium to magnesium ratio of the sediment is 1 to 2 orders of magnitude below that needed for plants to thrive (3:1), resulting in the sediment piles being essentially devoid of plant life. This effect is also evident in agricultural fields where the sediment has been deposited by flooding, stunting vegetation for many years after a flood event.

As the sediment moves down Swift Creek, the fine components of the sediment become suspended within the water, resulting in very high turbidity levels, severely impacting water quality. High turbidity levels can cause fish to stop feeding and seek cover, migrate to other areas, secrete excessive mucus, and suffocate. In addition, the turbidity and the substantial and constantly shifting bed load smothers aquatic life within the creek channel, adversely impacting food supply, cover, and spawning habitat. Furthermore, the concentrations of chromium and nickel in the sediment are well in excess of fresh water sediment screening level concentrations for aquatic life, indicating the sediment is likely toxic to aquatic life. The result is a creek that is essentially devoid of aquatic life throughout much of its length. Only the north fork of Swift Creek, which is unaffected by the slide, has been found to have a viable fish population. (2013 EIS)

During precipitation events the suspended sediment is flushed downstream, resulting in violations of chronic water quality criteria for nickel in both Swift Creek and the Sumas River. During dryer times of the year when flow in Swift Creek soaks into the ground and no longer reaches the Sumas River, the nickel concentrations in the river reduce to within acceptable levels. See Tables 4 through Table 7 for a summary of available surface water quality data and Appendix D of the Swift Creek Sediment Management Action Plan EIS for additional discussion of surface water quality within Swift Creek and the Sumas River.

Because the sediment contains asbestos and elevated concentrations of several metals, tests were conducted by the Whatcom County Health District and the USEPA to examine potential impacts to groundwater due to leaching of these substances. For metals, this included sediment analysis for a suite of targeted metals, and the use of two leaching tests - the Synthetic Precipitation Leaching Procedure (SPLP) and Toxicity Characteristic Leaching Procedure (TCLP) to examine the mobility of these metals. For both metals and asbestos, this included characterization of local groundwater through the installation and testing of three monitoring wells and testing of several private wells in the vicinity of the Creek.

The metals analyses found four metals (chromium, cobalt, nickel, and magnesium) to be elevated in the sediment at concentrations significantly greater than natural background levels found in other parts of Washington State. However, leach testing found these metals to be low in solubility, decreasing concern for effects to groundwater. And groundwater monitoring and water well test data did not find significant levels of either asbestos or these metals.

These data were also compared with primary and secondary drinking water MCLs and no exceedances were found, with most metals falling ten to one hundred times less than these standards. Based on data from both the Whatcom County Health tests and the USEPA testing, the USEPA concluded that leaching of metals from sediment and dredge material would not be expected to have significant impact on groundwater quality.[4]

The Washington State Department of Health in a more recent Draft Health Consultation,[5] agreed with EPA's analysis for asbestos, cobalt and nickel. In contrast, they noted that the reporting limit for arsenic used in the EPA leaching studies and water well tests, while at the drinking water standard, was above concentrations of potential health concern. However, arsenic within the sediment is at or below concentrations typically found in background, uncontaminated soils throughout Washington State and if found, would not be attributable to the Swift Creek sediment. In addition, groundwater tests within the Abbotsford-Sumas Aquifer in the late 1990's did not find elevated arsenic levels (USGS, 10997). Therefore, Ecology has concluded this is not a contaminant of concern at the site.

Furthermore, in this same Health Consultation, the Washington State Department of Health also noted that the chromium analyses were for total chromium but if the chromium is in the form of hexavalent chromium, there could be a health concern. However, there is no reason to expect the chromium at this site to be in the form of hexavalent chromium, as if it were, it would likely have been found in the water wells that were tested. So Ecology concludes it is unlikely this is a contaminant of concern at the site. Future monitoring will include speciation of the chromium in selected samples to confirm this.

Therefore, Ecology concludes it is unlikely that potential leaching of the contaminants of concern at this site (asbestos, chromium, cobalt, nickel, and magnesium) would affect groundwater quality to the degree that there would be adverse impacts human health or ecological receptors.

However, the studies do show that there could be a modest increase in the mineralization of groundwater, primarily due to leaching of magnesium. While not at levels that would be of human health or ecological concern, this could potentially increase the hardness of the groundwater, and thus affect the aesthetic qualities of the groundwater, if the sediment is deposited in an area outside the Swift Creek alluvial fan. Therefore, should this occur, additional work will be needed to address this potential concern.

[4] Engineering / Cost Analysis Sumas Mountain Asbestos Site, Appendix A; USEPA, July 2013

[5] DRAFT Health Consultation, Asbestos and Metals in Groundwater and Leachate, Swift Creek Site, Whatcom County, Washington, WA State Department of Health, March, 2015.

Table 1: Soil/Sediment Sample Results for Selected Substances (all values mg/kg except asbestos)

	Asbestos (%)	Calcium	Chromium	Cobalt	Magnesium	Nickel	Ca:Mg Ratio
EPA 2006 [a] (6 samples)							
Average	1.9	4,340	245	71	167,667	1,593	0.026
Median	1.6	4,250	233	70	169,000	1,585	0.027
EPA 2009 [b] (29 samples)							
Average	12.3	2,547	291	74	203,862	1,614	0.026
Median	11.0	2,230	305	75	195,000	1,660	0.012
WCH 2009 [c] (6 samples)							
Average			209	67	138,110		
Median			204	68	136,462		
EPA 2010 [d] (14 samples)							
Average	11.1	3,338	230	68	143,667	1,302	0.061
Median	12.5	3,315	272	78	169,500	1,530	0.019
EPA 2013 [e] (5 samples)							
Average	3.2	4,852	224	58	113,550	1,139	0.132
Median	2.7	4,615	263	73	143,000	1,415	0.032
EE/CA 2013 [f] (4 samples)							
Average		1,803	302	81	104,150	1,808	0.027
Median		1,875	298	81	97,600	1,825	0.016
Reference Values							
Statewide Background [g]		5,493	42	11	298	38	18.4
Method B Direct Contact [h]			120,000			1,600	
TEE Table 749-3 [i]			42	20		2	
Freshwater Sediment [j]			72 88			26 110	

a. Swift Creek Asbestos Integrated Assessment Final Report; TDD Number 06-03-0020; Region 10 START; November 2006. A total of 48 samples were analyzed; this is just the 6 samples with both asbestos and metals data. The average asbestos content for all 12 grab samples was 1.9% and the 36 composite samples was 1.6%.

b. Soil, Sediment and Surface Water Sampling; Sumas Mountain Naturally Occurring Asbestos Site, Whatcom County Washington, EPA Region 10, October 13, 2009.

c. Whatcom County Health Department sediment samples, 2009.

d. Environmental Monitoring for Asbestos: Sumas Mountain Asbestos Site Selected Residential Properties, August 23-26, 2010, Julie Wroble, EPA Region 10.

e. Soil Sampling Sumas Mountain Asbestos Site, Whatcom County, Washington, USEPA Region 10, November 19, 2013.

f. Draft Engineering Evaluation/Cost Analysis Sumas Mountain Asbestos (aka Swift Creek) Site, Whatcom County, Washington; TDD: 12-02-0006, 2013.

g. 90th Percentile values from: Natural Background Soil Metals Concentrations in Washington State, Ecology Publication 94-115, 1994. NOTE: Background values for calcium, cobalt and magnesium are from soils in the Spokane area since limited statewide data were available. No background data for asbestos in soil is available.

h. Calculated using Equation 740-2 in WAC 173-340-740. Value for chromium is trivalent chrome.

i. From Table 749-3 in WAC 173-340-900 - terrestrial ecological evaluation indicator values for plants in sensitive ecological locations.

j. From Table VI in WAC 173-204-563 – freshwater sediment cleanup objective values (top) and cleanup screening levels (bottom value) for protection of aquatic life.

Table 2: Estimated excess lifetime cancer risks for various exposure scenarios using asbestos dust concentrations generated in August 2006 EPA activity based sampling study. (EPA, 2007)

Activity				
Loading/Hauling	**Asbestos PCME (s/cc)**	**Dredge/Haul for 25 years**	**Dredge/Haul for 1 year**	**Farm/Soil Work**
Max Value	0.2076	5x10-4	2x10-5	3x10-4
Mean Value	0.078	2x10-4	7x10-6	1x10-4
Shoveling/Raking		**Gardening**	**Child Play**	
Max Value	0.0403	2x10-4	1x10-4	
Mean Value	0.018	1x10-4	5x10-5	
Walking/Biking		**Walking**	**Cross Country Biking**	
Max Value	0.09342	2x10-4	4x10-6	
Mean Value	0.029	5x10-5	1x10-6	

PCME = Phase contrast microscopy equivalent asbestos concentration; s/cc = structures per cubic centimeter

Table 3: Estimated excess lifetime cancer risks for various exposure scenarios using asbestos dust concentrations generated in August 2010 EPA activity based sampling study. (EPA, 2011)

Location & Activity	**Asbestos PCME (s/cc)**		**Gardening**	**Walking**	**Farming**	**Child Play**
1, walking in field with dry sediment	Max Mean	0.10296 0.09		1.1X10-4 to 9.6X10-5		8.0X10-5 to 6.4X10-4
1, Loading, raking, spreading dry sediment	Max Mean	2.2876 1.22	8.4X10-4 to 7.8X10-3		1.5X10-3 to 1.2X10-2	1.1X10-3 to 1.4X10-2
2, Raking & mowing dry sediment near house	Max Mean	0.00728 0.004	2.7X10-6 to 2.5X10-5			3.6X10-6 to 4.5X10-5
2, Raking & mowing dry sediment near shed	Max Mean	0.02448 0.009	6.2X10-5 to 8.4X10-5			8.0X10-6 to 1.5X10-4
2, walking in corn field with dry sediment	Max Mean	0.0432 0.028		3.0X10-5 to 4.6X10-5	3.5X10-6 to 2.2C10-4	
3, raking along river – (Rained-wet sediment)	Max Mean	0.01672 0.0079	1.1X10-5 to 5.7X10-5	1.8X10-5 to 8.4X10-6	9.7X10-6 to 2.1X10-5	7.0X10-6 to 1.0X10-4

PCME = Phase contrast microscopy equivalent asbestos concentration; s/cc = structures per cubic centimeter

Table 4: Surface Water Asbestos & Metals Analyses from Swift Creek and Sumas River

Location	Asbestos MFL > 10 um		Chromium ug/L		Nickel ug/L	
	EPA 2009 (a)	**EPA 2010 (b)**	**EPA 2009 (a)**	**EPA 2010 (b)**	**EPA 2009 (a)**	**EPA 2010 (b)**
Swift Creek						
• 2 Goodwin Bridge	**1241**		**113**		**673**	
• 3/4 Oat Coles Bridge	**923**		**180/197**		**1070/1160**	
Sumas River						
• 1 Massey Road (bkgd)	0.19 U	1.0 U	0.34 J	10 U	3.9 J	3.4 J
• 5 South Pass Bridge	**63**	3.1	62.1	1.3 J	**369**	11.6 J
• 6 Nooksack City Park	**293**		65.3		**385**	
• 7 Telegraph Road	**879**	**8.5**	76.8	2 J	**467**	19.3 J
• Gillies Road Farm Bridge		6.1		1.4 J		18.6 J
• 9 Gillies Road Bridge	**300**	2.4	76.8/79.9	0.92 J / 1.1 J	**466/465**	15.5 J / 15.1 J
• 10 Alm Road	**544**		75.3		**454**	
• 11 Lindsay Road	**530**		**122**		**736**	
• 12 N. Telegraph Road	**321**	4.4	**150**	1.8 J	**880**	22.4 J
• 13 N. Telegraph Road 2	**265**	4.1	86.1	1.2 J	**488**	24.7 J
• 14 Front St./Rock Road	**213**		31.9		**193**	
• Jones Road/Canadian Border	**168**	1.7	19.9	10 U	**117**	14.8 J
Surface Water Quality Standards (c)						
Based on Swift Creek Hardness of 501 mg/L in 2009	Acute Chronic		2,054 666		5,533 615	
Based on Sumas River Hardness of 299 in 2009 and 168 in 2010	Acute Chronic		1,346 437	839 272	3,575 397	2195 244
Human Health (d)	7 MFL > 10 um		100 ug/L		100 ug/L	

a. Soil, Sediment and Surface Water Sampling; Sumas Mountain Naturally Occurring Asbestos Site, Whatcom County Washington, USEPA Region 10, October 13, 2009. Highly turbid water in both Swift Creek & Sumas River.

b. Environmental Monitoring for Asbestos: Sumas Mountain Asbestos Site Selected Residential Properties, August 23-26, 2010, Julie Wroble, USEPA Region 10. Very little turbidity in Sumas River, Swift Creek dry at sampling locations.

c. Trivalent chromium acute WQ Standard = ≤ (0.316)(e(0.8190[ln(hardness)] + 3.688)) With a 1-hour average concentration not to be exceeded more than once every three years on the average.

c. Trivalent chromium chronic WQ Standard = ≤ (0.860)(e(0.8190[ln(hardness)] + 1.561)) With a 4-day average concentration not to be exceeded more than once every three years on the average.

c. Nickel acute WQ Standard = ≤(0.998)(e(0.8460[ln(hardness)] + 3.3612)) With a 1-hour average concentration not to be exceeded more than once every three years on the average.

c. Nickel chronic WQ Standard = ≤ (0.997)(e(0.8460[ln(hardness)] + 1.1645)) With a 4-day average concentration not to be exceeded more than once every three years on the average.

d. Human Health based on Department of Health drinking water standards (WAC 246-290-310).

Values exceeding either surface water quality or drinking water standards are **bolded**.

Table 5: Calcium and Magnesium Analyses from Swift Creek and Sumas River and hardness calculation

Location	Calcium (ug/L)		Magnesium (ug/L)	
	EPA 2009 (a)	**EPA 2010 (b)**	**EPA 2009 (a)**	**EPA 2010 (b)**
Swift Creek				
• 2 Goodwin Bridge	5,280		81,400	
• 3/4 Oat Coles Bridge	5,410/5,410		132,000/143,000	
Average	**5,367**		**118,800**	
Hardness Equivalent (c)	**13.5**		**488**	
Total Hardness Equivalent	**13.5 + 488 = 501 mg/L $CaCO_3$ (2009 samples)**			
Sumas River				
• 1 Massey Road (bkgd)	15,900	18,900	15,900	17,400
• 5 South Pass Bridge	11,200	16,500	60,000	30,900
• 6 Nooksack City Park	11,000		61,700	
• 7 Telegraph Road	8,900	16,200	67,900	31,500
• Gillies Road Farm Bridge		17,100		32,600
• 9 Gillies Road Bridge	9,310/9,040	17,600/17,400	68,100/70,100	33,000/33,200
• 10 Alm Road	9,190		68,000	
• 11 Lindsay Road	9,730		101,000	
• 12 N. Telegraph Road	10,400	19,300	122,000	32,800
• 13 N. Telegraph Road 2	11,200	20,200	79,000	31,900
• 14 Front St./Rock Road	11,900		43,300	
• 15 Jones Road / Canadian Border	17,600	27,200	35,500	20,900
Average	**11,281**	**18,933**	**66,042**	**29,356**
Hardness Equivalent (c)	**28.3**	**47.3**	**271**	**119**
Total Hardness Equivalent	**28.3 + 271 = 299 mg/L $CaCO_3$ (2009 samples)** **47.3 + 119 = 168 mg/L $CaCO_3$ (2010 samples)**			

a. Soil, Sediment and Surface Water Sampling; Sumas Mountain Naturally Occurring Asbestos Site, Whatcom County Washington, EPA Region 10, October 13, 2009. Highly turbid water in both Swift Creek & Sumas River.
b. Environmental Monitoring for Asbestos: Sumas Mountain Asbestos Site Selected Residential Properties, August 23-26, 2010, Julie Wroble, EPA Region 10. Very little turbidity in Sumas River, Swift Creek dry at sampling locations.
c. Hardness equivalent in ppm $CaCO_3$. Hardness is needed to calculate surface water standards for chromium and nickel. The following criteria have been used to classify water hardness for domestic water use. For reference, based on these criteria, Swift Creek water would be considered very hard and the Sumas River hard to very hard:

USEPA, 1976 (a)	Briggs, J.C., and Ficke, J.F., 1977 (b)
0-75 mg/L $CaCO_3$ = soft	0-60 mg/L $CaCO_3$ = soft
75-150 mg/L $CaCO_3$ = moderately hard	61-120 mg/L $CaCO_3$ = moderately hard
150-300 mg/L $CaCO_3$ = hard	121-180 mg/L $CaCO_3$ = hard
$\geq$300 mg/L $CaCO_3$ = very hard	$\geq$181 mg/L $CaCO_3$ = very hard

$CaCO_3$ = calcium carbonate
(a) Quality Criteria for Water, USEPA, 1976;
(b) Quality of Rivers of the United States, 1975 Water Year, U.S. Geological Survey Open-File Report 78-200.[6]

[6] http://pubs.er.usgs.gov/usgspubs/ofr/ofr78200

Table 6: Swift Creek water quality data collected 2003-2006, and 2011-2013 (various locations) (from EIS, Appendix D).

Parameter	# Samples	WQ Criteria (a)	Average	Maximum	Minimum
pH	21	6.5-8.5	8.1	8.8	7.5
Temperature (°C)	22	<18	8.4 (b)	20.1	0.1
Dissolved Oxygen (mg/L)	11	>8	10.2	14.3	4.5
Turbidity (NTU)	>18,000 (c)	(d)	243	>3,000 (e)	0

a. WAC 173-201A.

b. Sampling occurred more frequently during the winter so the average temperature value is likely underestimated.

c. Includes data recorded continuously every 15 minutes from October 2011 to April 2012 (PSE 2012).

d. 5 NTU over background when the background is 50 NTU or less; 10% above background when background is greater than 50 NTU.

e. Sensor limit for turbidity was 3,000 NTU but values in excess of this occurred on at least 14 different occasions.

mg/L = milligrams per liter

NTU = nephelometric turbidity units

Table 7: Sumas River water quality data collected 2003-2006, and 2011-2013 (various locations) (from EIS Appendix D).

Parameter	# Samples	WQ Criteria (a)	Average	Maximum	Minimum
pH	41	6.5 – 8.5	7.3	8.1	6.6
Temperature (°C)	41	<18	8.9	15.7	3.9
Dissolved Oxygen (mg/L)	33	>8.0	7.2	12.3	2.7
Turbidity (NTU)	>50,000 (b)	(c)	68.7	1,910	1.1

a. WAC 173-201A.

b. Includes data recorded continuously every 15 minutes from October 2011 to April 2012 (PSE 2012).

c. 5 NTU NTU over background when the background is 50 NTU or less; 10% above background when background is greater than 50 NTU.

3.0 Action Alternatives and Analysis

Over the years several engineering studies have been completed to evaluate alternatives for controlling the sediment transported down Swift Creek. This document incorporates those studies by reference to fulfill RI/FS requirements under WAC 173-340-350(6). These studies include:

1976, Final Geotechnical Report, Swift Creek Tributaries, Swift Creek Watershed, Whatcom County, Washington. Prepared for Soil Conservations Service by Converse Davis Dixon Associates, Inc., Contract AG53-scs-00041, January 15, 1976.

2005, Swift Creek Management Plan Final Report. Prepared by Kerr Wood Leidal for Whatcom County Flood Control Zone District, March, 2005.

2007, Swift Creek Repository Basic Design and Cost Estimate, Prepared for USEPA Region 10 by Ecology and Environment, March, 2007

2008, Swift Creek Background and Management Alternatives Final Report. Prepared by Kerr Wood Leidal for Whatcom County Flood Control Zone District, January, 2008.

2008, Planning Level Cost Estimate for Swift Creek Asbestos Site. Prepared by Hart Crowser for Department of Ecology, May, 2008.

2008 Swift Creek Short to Mid-Term Sediment Management Alternatives Assessment. Prepared jointly by Whatcom County Public Works, Ecology, and EPA, October, 2008.

2010, Sumas Mountain Naturally Occurring Asbestos Interim Alternatives Analysis. Prepared by Pacific Surveying and Engineering for Whatcom County Public Works, April 27, 2010.

2011, Swift Creek Sediment Management Plan Proposed Design. Prepared by Pacific Surveying and Engineering for Whatcom County Public Works, March 30, 2011.

2012 Swift Creek Sediment Management Action Plan, Phase 1 Project Plan, Phase 1 Implementation Plan, Prepared by Whatcom County Public Works for Whatcom County Flood Control Zone District, December, 2012.

2013, Swift Creek Sediment Management Action Plan and Phase 1 Project Plan Draft EIS. Prepared by Whatcom County Public Works for Whatcom County Flood Control Zone District, February, 2013.

2013, Swift Creek Sediment Management Action Plan and Phase 1 Project Plan Final EIS. Prepared by Whatcom County Public Works for Whatcom County Flood Control Zone District, February, 2013.

2013, Region 10 Start 3, Draft Engineering Evaluation / Cost Analysis, Sumas Mountain Asbestos (aka Swift Creek) Site, Whatcom County, Washington. TDD 12-02-0006. Prepared for USEPA Region 10 by Ecology and Environment, July 2013.

This SCAP incorporates several of the alternatives from these reports to fulfill FS requirements under WAC 173-340-350(8). In general, the range of alternatives evaluated in these reports encompasses the following categories of actions:

- Stabilizing the slide by controlling infiltration or constructing a toe buttress.
- Annual dredging of Swift Creek and managing the sediment.
- Capturing the sediment using a series of check dams and sedimentation ponds and managing the captured sediment either in the ponds or in a nearby repository.
- Constructing levees at strategic locations to keep Swift Creek within its channel.
- Rerouting the clean water in the north branch of Swift Creek to separate it from the south branch to reduce flow and downstream sediment movement.
- Infrastructure revisions such as removing or widening bridges and raising the elevation of roads within the Swift Creek alluvial fan.
- Letting Swift Creek flow naturally and limiting exposure through restrictions/limitations on access and development within vulnerable areas along Swift Creek and the Sumas River.

Sediment management options evaluated include:

- Depositing dredged/captured sediment in a repository within the Swift Creek alluvial fan.
- Hauling the dredged/captured sediment to a repository outside the Swift Creek alluvial fan, generally to a nearby gravel pit.
- Using the sediment, or the gravel component of the sediment, for controlled fill in construction projects in the area.
- Treating the sediment to render the asbestos innocuous.

Of these alternatives, the following have been eliminated in various reports as infeasible:

- **Construction of a toe buttress.** Converse et. al. (1976) estimated 13 million cubic yards of fill would be necessary to create a toe buttress with enough mass to counteract the slide force. At a modest $5 per cubic yard, the cost of this enormous structure would be $65 million just for the fill. This does not include access, drainage, or foundation preparation work which would likely be millions more. There is also some concern that if water built up behind this structure, it could lubricate and destabilize the slide. The total cost to stabilize a similar sized slide in Utah was $200 million in 1983. (Kerr, Wood Leidal Associates, 2005)
- **Annual dredging of Swift Creek and depositing the sediment in a nearby repository.** $1.9 million/year; $15.7 million over 10 years, assuming repository haul distance is 5 miles. (July 2013 EE/CA)

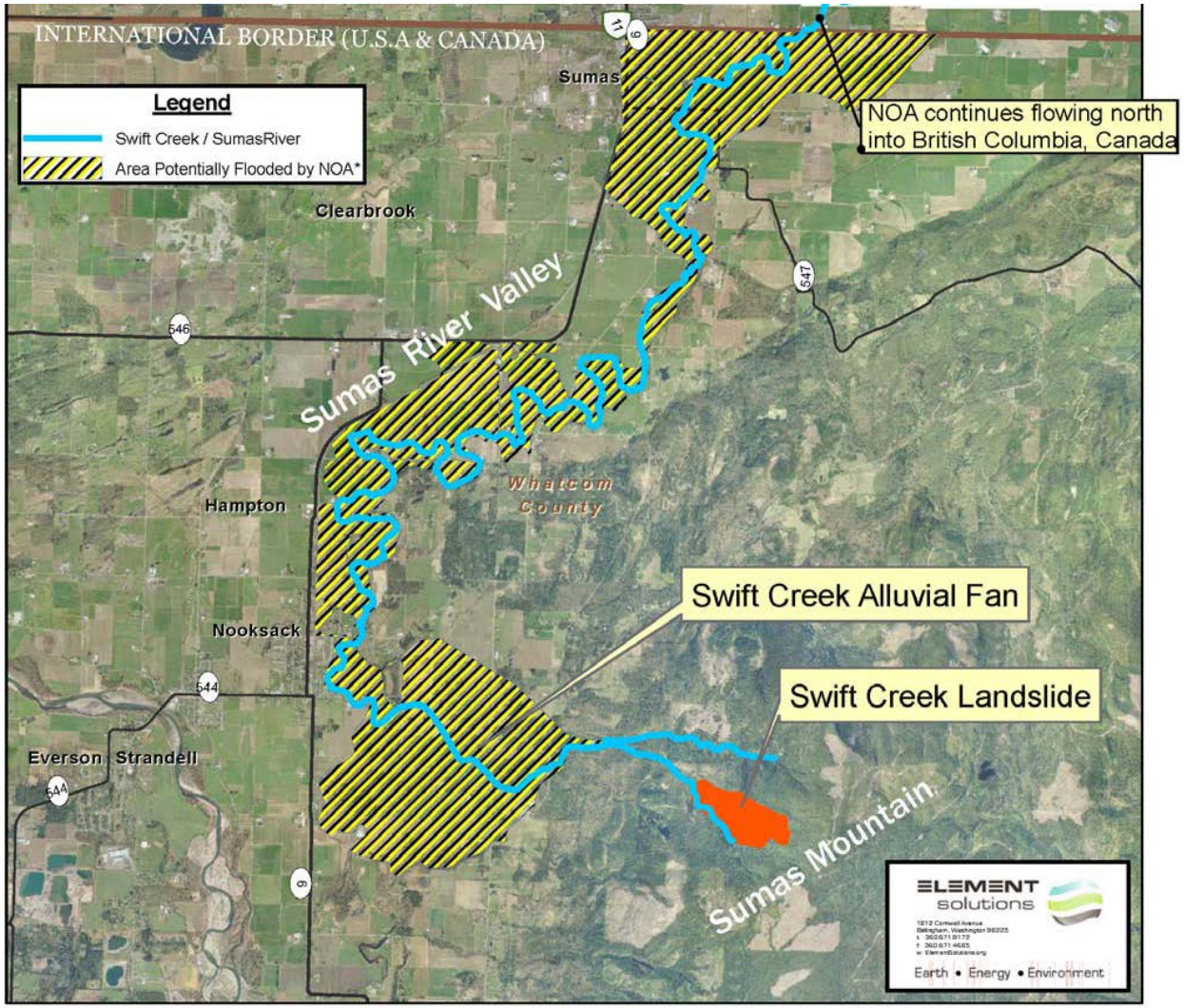

Figure 6: Area potentially impacted by flooding by Swift Creek and Sumas River that could be subject to acquisition of development rights under natural flow alternative.

- **Letting Swift Creek flow naturally and acquiring development rights/land within the Swift Creek alluvial fan and Sumas River floodplain (Figure 6).** It would cost an estimated $190 million just to acquire all properties within the 100 year floodplain of Swift Creek and the Sumas River. (Whatcom County personal communication) If just the Swift Creek alluvial fan was acquired, the cost is estimated at up to $44 million. (2008 multiagency report) These cost estimates do not include the costs of demolition of structures on the acquired properties and infrastructure revisions to either remove or raise key roads and bridges in the affected area to prevent them from being buried by accumulated sediment.
- **Using the sediment, or the gravel component of the sediment, for controlled fill in construction projects in the area.** While a cost estimate for this hasn't been prepared, the Port of Bellingham evaluated and ultimately rejected this option in 1990. While potentially feasible with the right partners, the challenge with the use of Swift Creek material is that it has higher handling costs to limit asbestos exposure during placement. Also, any location where it is used needs to be: capped with clean soils; have groundwater monitoring; permanent land use restrictions on the property deed to prevent disturbance of the material; and, regular inspections conducted to confirm the material remains undisturbed. This results in the material having a "stigma" that would likely make its use infeasible for most projects. Also, given the abundance of cheap fill material available in Whatcom County, it is unlikely this would be competitive with other sources of clean fill material without a substantial subsidy.
- **Treating the sediment to render the asbestos innocuous.** In 2009, ABCOV, a private company working with EPA, evaluated a proprietary process where the sediment was pulverized and treated with acid to breakdown the asbestos fibers. This was found to be unsuccessful in part because much of the aggregate within the sediment could not be sufficiently pulverized to enable treatment.

In all likelihood, it will take a combination of the remaining alternatives to manage sediment in Swift Creek in the future. The Swift Creek Sediment Management Action Plan and Phase 1 Project Plan Final EIS (2013) provide a comprehensive discussion of recommended actions and an analysis of those actions. Rather than repeat that analysis here, the reader should refer to that document. A list of those actions is provided in Table 8.

Table 8: Comprehensive List of Recommended Actions from the Swift Creek Sediment Management Action Plan and Phase 1 Project Plan Final EIS (2013)

Landslide Stabilization

- Landslide Monitoring
- Landslide Toe Stabilization [7]
- Surface Drainage

North Fork Reroute

Levee Construction and Protection

- Upper Goodwin Reach Deflection Levee
- Goodwin to Sumas Levees

Sediment Capture and Management

- Canyon Reach Sediment Traps
- Sediment Basins
- South Pass Setback Levee and Sediment Trap
- Sediment Management in a Nearby Repository

Annual Maintenance and Repair

- Annual Inspections and Small Scale Repairs
- Large Scale Maintenance and Repairs
- Swift Creek Channel Conveyance Dredging and Maintenance

Infrastructure Revisions

- Remove Oat Coles Road Bridge
- Raise South Pass Road Elevation

Flood Hazard Management Planning

- Watershed-Wide Flood Hazard Management Plan
- Technical Flood Hazard Identification
- Flood Education and Outreach
- Flood Warning and Emergency Response

Development Controls

- Comprehensive Plan and Zoning Revisions
- Purchase of Development Rights/Land Acquisition
- Limitations on Logging within the Swift Creek Watershed

Compliance Monitoring

Institutional Controls

Education and Outreach

[7] While deemed infeasible by Converse, et. al. (1976), it is possible landslide toe stabilization could be cost effective over the very long term. Therefore, it has been kept on the list as an action that may be further evaluated in the future.

4.0 Proposed Selected Action and Analysis of Compliance with MTCA

As noted earlier, the dredging and management of the sediment has created liability under the Model Toxics Control Act. This Swift Creek Action Plan is intended to address those aspects of this site related to this historic liability and prospective liability for managing these sediments in the future.

4.1 Definition of "Site"

For the purposes of this Swift Creek Action Plan, the MTCA "site" is defined as the locations within and proximate to the Swift Creek alluvial fan where sediment from Swift Creek will be managed through actions described in this SCAP. For the most part, this consists of construction and operation of deflection levees, in-stream sediment traps, sediment piles, channel conveyance improvements, berms, levees, and similar structures. Sediments deposited beyond these locations, either naturally during flood events, or through transport outside these areas by individuals for use as fill (or for other uses), are not included as part of the "Site" addressed in this SCAP. "Site" also includes the location of any approved repositories that will be used in the future to manage the sediment.

4.2 Description of Selected Action (Remedy)

While, as identified in Table 8, there is a longer list of actions needed for flood management purposes, only a subset of these elements serves as a remedy that addresses MTCA liability for historic and future management of naturally occurring sediment. The remedy is intended to address the hazardous substances that pose actual or potential threats to human health or the environment resulting from past releases and threatened releases caused by human activities to manage sediment. The remedy is also intended to minimize and address threats or potential threats with respect to any release or threatened release of hazardous substances caused by certain future human activities during management of the sediment. In general, the selected MTCA remedy consists of:

Actions to address <u>historical</u> dredging:

- Removal of part of the sediment that has accumulated in the sediment piles so they can be stabilized
- Stabilization and capping of the existing levees with riprap and clean soil
- Controlling future use and access to the levees to prevent disturbance of, and exposure to, the sediment and airborne asbestos. This will require fencing off these areas to control access, imposing legal restrictions on future use of the properties (institutional controls), and frequent inspections to ensure compliance. It may also require acquisition of additional property or easements.
- Monitoring of air and surface water during construction and groundwater after stabilization

Actions to abate threatened future releases, including those associated with future sediment management:

- Dredging and levee repairs as necessary before remedy is implemented
- Use of existing sediment piles and deposits in construction of a repository and new levees
- Deposition of current excess sediment (sediment beyond that needed for levee and repository construction) in a dedicated repository where it will be covered with clean soil
- Capturing new sediment in a series of traps and sedimentation ponds
- Management of future accumulated sediment in the traps and ponds by periodic removal and deposition in the repository or, if needed, additional repository(s)
- Regular inspections and repairs of facilities as needed
- Periodic dredging of Swift Creek as necessary and depositing this sediment in the repository(s)
- Controlling future use and access to the levees, sediment capture facilities and repository(s) to prevent disturbance of, and exposure to, the sediment and airborne asbestos. This will require fencing off all of these areas to control access, imposing legal restrictions on future use of the properties (institutional controls), and frequent inspections to ensure compliance. It may also require acquisition of additional property or easements.
- Monitoring of air and surface water during active management of the sediments and long term groundwater and sediment quality

The construction and operation elements of these actions are described in detail in the 2012 Swift Creek Sediment Management Action Plan (SCSMAP), 2012 Phase 1 Project Plan, and Phase I Implementation Plan and EIS. Figure 7 conceptually illustrates the facilities that would be constructed to implement this remedy. This figure does not show a repository outside of the area of the sedimentation ponds. There will be a need for one or more additional repositories; these repositories will be reviewed in a future supplemental EIS. The SCSMAP will be amended to include an implementation plan for repository development prior to initiation of the supplemental EIS process. If additional strategies are identified to implement the SCSMAP, specific strategy implementation plans will be prepared and incorporated into the SCSMAP, in conjunction with appropriate environmental review processes.

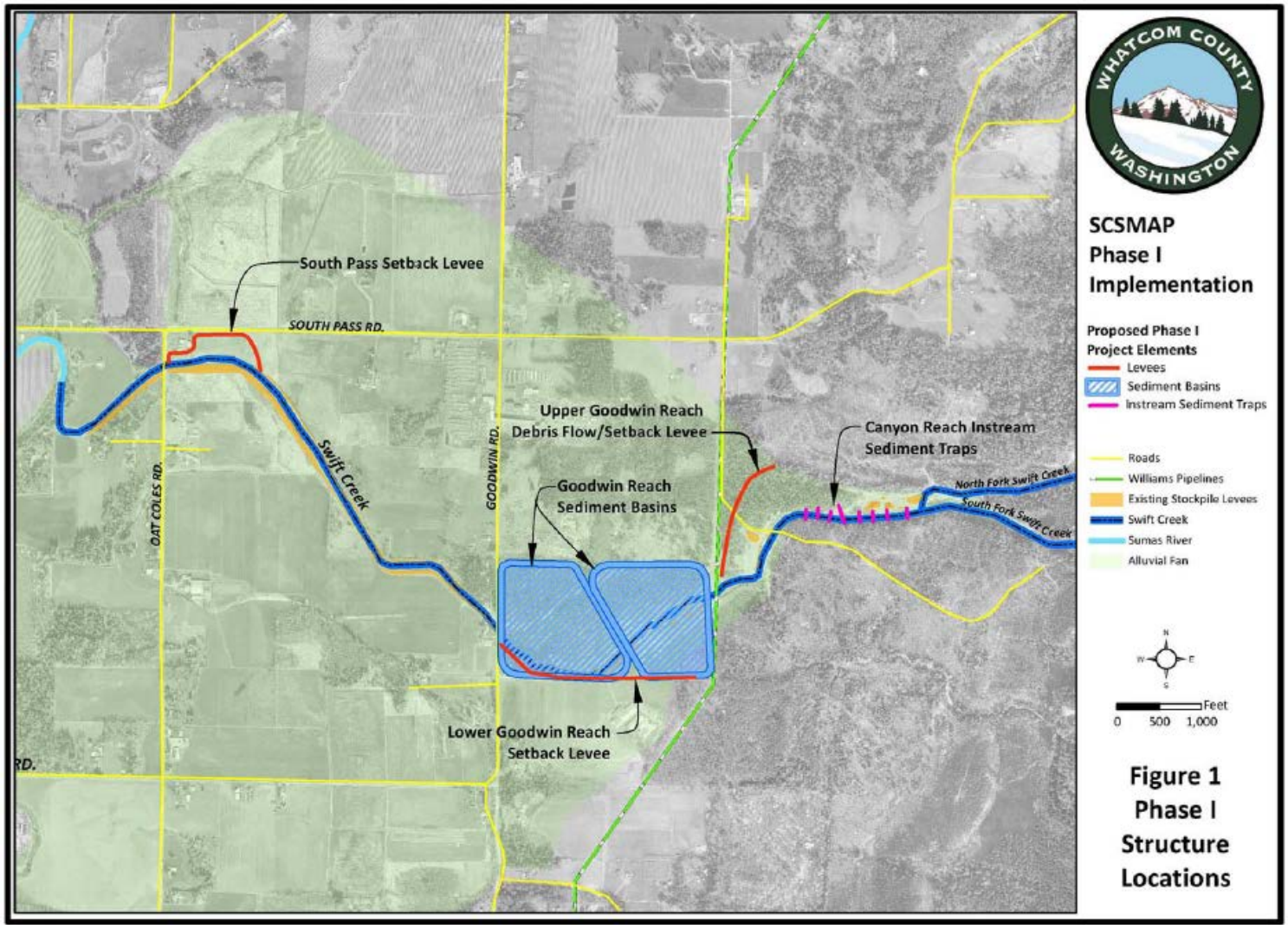

Figure 7: Conceptual Layout of MTCA Selected Action (supplemental repository not shown)

4.3 Analysis of Selected Remedy for Compliance with MTCA

Remedies selected under MTCA must meet the requirements for cleanup actions in WAC 173-340-360. A discussion of how this selected remedy meets those requirements follows:

360(2)(a)(i) Protect Human Health and the Environment

The selected remedy involves stabilization and capping of the existing levees, consolidation of existing sediment piles and excess sediment, and future capture and removal of sediment and subsequent deposition in a dedicated repository. Handling of sediment will be done in a manner to minimize dust generation, and all structures will have access restricted and final covers consisting of asbestos-free materials. The water quality in Swift Creek and the Sumas River downstream of the sediment management structures is expected to improve except perhaps during extreme flood events. And based on current groundwater monitoring data, significant groundwater impacts are not anticipated. As such, this remedy will be protective of human health and the environment.

360(2)(a)(ii) Comply with Cleanup Standards

The selected remedy will comply with the performance goals summarized in Table 9. Groundwater monitoring has similarly shown that the above activities will not cause exceedances of groundwater cleanup levels. Previous construction experience and observations and monitoring data show that suspended sediment quickly settles out. Thus, the water quality in Swift Creek and the Sumas River downstream of the sediment management structures is expected to improve except perhaps during extreme flood events. Sediment contaminated with levels of asbestos and metals reported in Table 1 will remain on site but will be capped, protected with institutional controls, and monitored. The biggest challenge will be compliance with air standards for asbestos. Monitoring during past construction has shown that using standard dust control measures (minimizing areas of disturbance, wet handling of material) results in very low asbestos air concentrations during construction. Limiting access to the site should provide further protection for the general public. Ultimately, areas of permanent sediment deposition will be covered with clean soil and revegetated, eliminating airborne asbestos.

360(2)(a)(iii) Compliance with applicable state and federal laws

Levee and repository construction and operation and maintenance will require compliance with several local, state and federal laws. The most significant current known laws are summarized in Section 6. It is anticipated this list will be updated through consultation with permitting agencies during the design process.

360(2)(a)(iv) Provide for compliance monitoring

The proposed remedy includes monitoring of the air, surface water and groundwater for compliance. The locations and monitoring schedule will be determined in final design.

360(2)(b)(i) Use permanent solutions to the maximum extent practicable

The selected remedy is permanent to the maximum extent practicable, as demonstrated by the discussion of the criteria in WAC 173-340-360(3)(f) as follows:

Protectiveness. As discussed above, the selected remedy will be protective of human health and the environment. It will significantly reduce human health risks by reducing exposures and will improve water quality downstream of the sediment capture facilities. Covering the levees and repository with clean soil will enable restoration of vegetation and wildlife habitat.

Permanence. The selected remedy will not reduce the toxicity or volume of contaminants in the sediment. As was noted earlier, an experimental process for treatment of the sediment to destroy the asbestos was tried in 2009 and found to be unsuccessful. However, the levees and sediment capture facilities will be designed with a significant factor of safety to withstand flood events. While it is possible that an extreme flood or debris flow event could overwhelm these facilities, it is unlikely this will happen. If so, the inspection and maintenance elements of the selected remedy should result in quick repairs. The option of stabilizing the slide through construction of a toe buttress would be a more permanent solution but the enormous cost of this makes it disproportionate to the added benefit.

Cost. The cost of the selected remedy of $16.5 million in capital cost and $1.3 million average annual operating cost, while substantial, is significantly less than alternatives such as construction of a toe buttress to stabilize the slide or letting the sediment accumulate unimpeded and purchasing the impacted lands and facilities.

Effectiveness over the long term. The selected remedy will be effective over the long term. The primary limitations are the lack of availability of suitable land for future sediment repository capacity and funding to construct and operate future facilities.

Management of short term risks. Short term risks associated with implementation of the remedy include risk to the workers and nearby public during grading, excavation and hauling of sediment, primarily due to potential for exposure to asbestos dust. These risks can be controlled through proper construction and maintenance techniques to minimize dust generation.

Technical and administrative implementability. There are no technical constraints to implementation of the selected remedy. From an administrative perspective the biggest challenges will be acquisition of land for construction of the repository and controlling unauthorized public access to these facilities.

Public concerns. All of the elements of the selected remedy, with the exception of the repositories, have been subject to public review and comment through Whatcom County's EIS process on the Swift Creek Sediment Management Plan. A supplemental EIS for the repositories will be prepared by Whatcom County prior to implementation. If additional strategies are identified to implement the SCSMAP, specific strategy implementation plans will be prepared and incorporated into the SCSMAP, in conjunction with appropriate environmental review

processes. An additional opportunity for public review and comment will be provided before this plan is finalized.

360(2)(b)(ii) Provide for a reasonable restoration timeframe

The selected remedy provides for a reasonable restoration timeframe.

During 2014, Whatcom County conducted emergency levee stabilization work and dredging in response to flooding in March, 2014 that caused a Swift Creek avulsion at Goodwin Road and nearly breaching of the levee between Goodwin and Oat Coles Road. The selected remedy anticipates additional similar work may need to be conducted in response to future flood events until the sediment ponds are constructed.

Construction of the sediment traps and upper Goodwin reach deflection levee is anticipated to occur in the 2019-21 biennium, provided Ecology's budget request is passed by the legislature.

Construction of the sediment basin(s) and development of repositories is anticipated to occur in the 2021-23 biennium, again subject to approval of legislative appropriation.

Permanent stabilization and covering of the levees between Goodwin and Oat Coles Road, removal of excess sediment and construction of the sediment pond(s) is anticipated to occur in the 2023-25 biennium, again subject to approval of legislative appropriation.

360(2)(b)(iii) Consider public concerns

All of the elements of the proposed remedy, with the exception of the repositories, have been subject to public review and comment through Whatcom County's EIS process on the Swift Creek Sediment Management Action Plan. The development of repositories will be made subject to public review and comment through a future supplement to the existing EIS. If additional strategies are identified to implement the SCSMAP, specific strategy implementation plans will be prepared and incorporated into the SCSMAP, in conjunction with appropriate environmental review processes. Additionally, in compliance with MTCA, a public notice of the availability of this SCAP will be issued and an opportunity provided for additional comment. Comments received will be responded to in a responsiveness summary and adjustments made to the final action plan, if deemed appropriate.

360(2)(c) Groundwater cleanup actions

Groundwater cleanup actions that do not achieve cleanup levels throughout the site must take some minimal steps to treat or remove the source and contain the residual contamination. Since groundwater is not contaminated at this site, or anticipated in the future, this provision is not applicable.

360(2)(d) Soils in residential areas and at schools and child care centers

The site as defined in this SCAP (active sediment management area) currently contains no residential structures, schools or child care facilities. Land use restrictions will prevent the location of such facilities within these areas in the future. Thus, this provision is complied with.

360(2)(e) Institutional controls

Sites that use institutional controls are required to meet certain minimum requirements under this provision. This includes compliance with WAC 173-340-440, that they must demonstrably reduce risk, and that they cannot be used where it is technically possible to implement a more permanent cleanup action for all or a portion of the site. All of these requirements will be complied with in the selected remedy.

360(2)(f) Releases and migration

This provision requires the selected remedy to minimize present and future releases and migration of hazardous substances. By containing the sediment in controlled, facilities covered with clean soil ("capped") or otherwise stabilized, the selected remedy complies with this provision.

360(2)(g) Dilution and dispersion

Remedies that rely primarily on dilution and dispersion have an additional level of demonstration that must be met. The proposed remedy does not rely primarily on dilution and dispersion and thus this requirement is met.

360(2)(h) Remediation levels

Remedies that use remediation levels have an additional level of demonstration that must be met. The proposed remedy does not rely on remediation levels and thus this requirement is met.

5.0 Environmental Standards

The goal of this SCAP is to improve the existing water quality and to reduce environmental and human health risks. A pilot study will be conducted to determine the feasible contaminant removal efficiencies. Metrics for performance are listed in Table 9. For these metrics, the point of measurement is throughout the site except for ambient asbestos, this will be taken at the fence line where public access is controlled.

Table 9: Performance Goals

Media	Parameter	Improvement Goal	Notes	Point of Measurement
Ambient Air	Asbestos	0.0001 f/cc	Based on PQL. Equals 1 X 10-5 risk for a 30 year residential exposure.	During construction, at fence line; after construction, throughout the site.
Groundwater	Asbestos Chromium Nickel	7 MFL > 10 um 100 ug/L 100 ug/L	All based on drinking water standards WAC 246-290-310	Throughout the site.
Surface Water	pH Turbidity	6.5 – 8.5 (a)	WAC 173-201A constituents known to be elevated in water exposed to Swift Creek sediment.	A discharge permit with numeric limits should not be needed for the project as described in this SCAP. These criteria have been included as performance goals for design purposes or should the remedy change during the design process.
	Asbestos	(a)	Based on improvements to pre-action water quality (see table 4)	
	Chromium Nickel	Hardness dependent goal based on (a)	See Table 4 concentrations using current hardness data	
Soil [1]	Even though two activity-based sampling events have been conducted by EPA at this site, it isn't possible to correlate soil asbestos concentrations with corresponding air concentrations, which is the primary exposure pathway of concern. However, it is likely that any areas where Swift Creek sediment is located contain significant levels of asbestos and heavy metals. Rather than set a specific numeric limit, this plan requires any areas within the footprint of the levees, former Swift Creek sediment piles and repository(s) not protected by rip rap to be covered by a sufficient thickness of clean soil to establish and maintain vegetative growth that will prevent erosion of the cover. Final specifications for cover thickness, quality and vegetative cover will be developed in the final design and permitting process.			Areas to be determined from historic photos and documentation and physical observations.
Sediment	No sediment cleanup level has been established. While sediment metal concentrations are elevated above trivalent chromium and nickel freshwater sediment screening levels, these are naturally occurring concentrations, and not considered part of a "release" under MTCA. As such, no cleanup of sediment within the creek bed is required by the selected action and thus no sediment cleanup standard has been established for the selected remedy.			Not applicable.

As *used* in this Table, the term "soil" is intended to include the sediment that has been dredged from the creek and deposited upland

A pilot study will be conducted to determine feasible sediment removal efficiencies

6.0 Applicable Local, State and Federal Laws

There are multiple federal, state and local laws that will need to be complied with during implementation of this remedy. Some laws require a permit or compliance with specific requirements. Under MTCA, these are called "legally applicable requirements". Other laws may have technical provisions that make sense to apply to the remedy but may not be a legal requirement. Under MTCA, these are called "relevant and appropriate requirements". Both of these together are typically referred to as "applicable, relevant and appropriate requirements" or "ARARs" that must be complied with, in addition to the other requirements in MTCA.

In addition, under RCW 70.105D.090, cleanup actions conducted by Ecology, or by a potentially liable person under a MTCA order or consent decree, and requiring a state or local permit under RCW 70.94 (air), RCW 70.95 (solid waste), 70.105 (hazardous waste), RCW 77.55 (hydraulic permit), RCW 90.48 (water quality), RCW 90.58 (shoreline management act) are exempt from having to obtain these permits and comply with procedural requirements under these statutes. Under this same statute (70.105D.090), such cleanups are also exempt from all local permits and procedural requirements. However, this statute does not exempt cleanups from federal permits, or state or local permits that implement federal laws. And any substantive requirements in these laws, whether or not exempt, must still be complied with. Ecology will work closely with permitting agencies to identify any substantive requirements that this remedy needs to comply with.

Comprehensive lists of potential ARARs were identified in the Draft EIS (2013) and Draft Engineering Evaluation / Cost Analysis (2013). This list may be supplemented by additional ARARs during the design and permitting process. The most significant ARARs relating to proposed remedy are:

Federal Clean Water Act, Sections 404 & 401

As with past dredging of Swift Creek, remedial actions requiring dredging, filling, diversion and/or construction within Swift Creek will require a 404 Permit from the Corps of Engineers and Ecology to certify the work complies with state water quality law under Section 401. It is presumed this will include construction, operation and maintenance of the check dams, sedimentation ponds and levees. Repository construction should not require a 404 permit unless the repository requires diverting Swift Creek or filling in wetlands. This is a federal law and is not exempt under MTCA.

Federal Clean Water Act, Section 402 (NPDES), implemented under RCW 90.48

A National Pollution Discharge Elimination System NPDES permit is unlikely to be required for the discharge from the sedimentation ponds. However, a stormwater permit will be required for stormwater runoff from any other areas where the ground has been disturbed. The need for a discharge permit, if any, and a stormwater permit is required under federal law and is not exempt under MTCA, even though Ecology implements this federal law under RCW 90.48.

State Dam Safety Permit under RCW 90.03.350

Any impoundment capable of storing more than ten acre-feet of water must obtain a Dam Safety Permit from Ecology. It is presumed the sedimentation ponds will exceed this threshold and require a permit under this law. This is a state law but not exempt under MTCA.

State Shoreline Management Act under RCW 90.58, Implemented under WCC Title 23

This act requires any substantial development within 200 feet of the high water mark of certain specified shorelines must obtain a shoreline permit. While Swift Creek does not fall within the jurisdiction of this law, the Sumas River does. As such, any work in Swift Creek that could impact the Sumas River will need to consider shoreline impacts on the Sumas River. Whatcom County implements this law under Whatcom County Code Title 23. The proposed remedy is expected to fall within the permit exemption for RCW 90.58 and local laws under MTCA. As such, this work would be exempt from having to obtain a shoreline permit and the associated procedural requirements will not need to be complied with. However, Ecology will work with the permitting agency (Whatcom County) to identify and require compliance with any substantive requirements under this law.

Washington State Hydraulic Code, RCW 77.55

Any construction or performance of work that will use, divert, obstruct, or change the natural flow or bed of any of the salt or freshwaters of the state requires a hydraulic permit. It is presumed the construction of the check dams, sedimentation ponds and levees will fall within the jurisdiction of this law. The proposed remedy is expected to fall within the permit exemption for RCW 77.55 under MTCA. As such, this work would be exempt from having to obtain a hydraulic permit and the associated procedural requirements will not need to be complied with. However, Ecology will work with the permitting agency (WA State Fish and Wildlife) to identify and require compliance with any substantive requirements under this law.

Federal Clean Air Act (implemented under RCW 70.94, RCW 49.26, and NWCAA rules)

Construction of the proposed remedy has the potential to generate dust. Furthermore, Swift Creek sediment has been found to be above the 1% threshold for asbestos containing material. Thus, the proposed remedy will fall within the jurisdiction of the Northwest Clean Air Agency (NWCAA). With proper handling techniques, it is expected dust generation will be minimal and not trigger a federal permit requirement. However, there are specific worker protection requirements for handling asbestos contaminated material enforced by the Washington Department of Labor and Industries that will need to be complied with during construction.

Federal Safe Drinking Water Act (implemented under RCW 43.20)

Based on information in the EIS, it is not expected any public water systems regulated under the Federal and State Safe Drinking Water Acts will be impacted by the proposed remedy. However, public water

system drinking water standards are identified as an applicable requirement under MTCA for groundwater impacted by a cleanup site.

State Solid Waste Handling Standards (WAC 173-350)

Dredge material that is the subject of a Corps 404 permit is exempt from the solid waste regulations. Furthermore, asbestos containing material is not a hazardous waste and TCLP leaching tests on the sediment pass the metals screening criteria. As such, the facilities for managing the sediment under this remedy, including the sediment repository, do not need to obtain a hazardous waste or solid waste permit. However, there are several relevant and appropriate design and operating criteria in WAC 173-350-400 for limited purpose landfills that will be applied to this remedy. The specific criteria will be identified during the design and permitting process. Note that the cost estimate provided in this plan assumes sediment berms and repositories will be capped with 6 inches of clean topsoil. While this should be sufficient to establish a grass cover and prevent the airborne asbestos if the cap is not disturbed, it would not be adequate for deep rooted vegetation like trees or for farming crops that require plowing. If a thicker cover or use of lower permeable capping materials is necessary, costs will need to be adjusted upward accordingly.

7.0 Institutional Controls and Site Use Restrictions

The selected remedy will permanently leave contaminated sediment in check dams, sedimentation basins, several levees, and one or more repositories. Historically, sediment piles have been an attraction for horse riders and all terrain vehicles. The selected remedy includes restricting access to these facilities through the installation of fencing and locked gates to minimize disturbance of sediments. An environmental covenant will be recorded on the impacted parcels providing a permanent record of the location of these deposits and limiting future land uses that would result in disturbance of exposed sediments and capped areas. Regular inspections will be required to ensure these restrictions are complied with.

8.0 Compliance Monitoring Requirements

The selected remedy includes monitoring of the air, surface water, groundwater and sediment quality. The exact monitoring locations and frequency will be determined during the final design and permitting process.

9.0 Schedule for Implementing the Swift Creek Action Plan

The project implementation rate for the implementation of the SCAP depends on several factors, some of which include extent and severity of flood events, rate of sediment deposition, available funding, and property acquisition or cooperation from private landowners.

The following is the anticipated schedule for implementing the selected remedy:

Construction of the sediment traps and upper Goodwin reach deflection levee is anticipated to occur in the 2019-21 biennium, provided Ecology's budget request is passed by the legislature.

Construction of the sediment basin(s) and development of repositories is anticipated to occur in the 2021-23 biennium, again subject to approval of legislative appropriation.

Stabilization and covering of the levees between Goodwin and Oat Coles Road, removal of excess sediment and construction of the sediment pond(s) is anticipated to occur in the 2023-25 biennium, again subject to approval of legislative appropriation.

Channel maintenance and dredging is expected to be ongoing until the SCAP is fully implemented. Emergency work as a response to flood or debris flow events will be necessary into the future.

10.0 State Environmental Policy Act Compliance

In 2010 the Department of Ecology and Whatcom County determined the SEPA lead agency for this action to be Whatcom County, in accordance with WAC 197-11-253 and WAC 197-11-926. In 2013, Whatcom County prepared an environmental impact statement (EIS) on the Swift Creek Sediment Management Action Plan (SCSMAP). The draft EIS was released for public comment on February 15, 2013 and the final EIS was issued on June 23, 2013. The SCSMAP was approved by the Whatcom County Council on July 23, 2013.

The remedial actions and associated impacts, with the exception of the repositories, described in this Swift Creek Action Plan were analyzed in the EIS published by Whatcom County. For any future environmental review processes, including the planned supplemental EIS for repositories, the County will send Ecology a preliminary document prior to issuing it to the public in accordance with WAC 197-11-253(5).

References and Technical Investigations

Converse Davis Dixon Associates, Inc., 1976. Final Geotechnical Report, Swift Creek Tributaries, Swift Creek Watershed, Whatcom County, Washington. Prepared for Soil Conservations Service by Converse Davis Dixon Associates, Inc., Contract AG53-scs-00041, January 15, 1976.

Washington State Department of Ecology, 1994. Natural Background Soil Metals Concentrations in Washington State, Department of Ecology Publication # 94-115. October, 1994.

Ecology and Environment, 2007. Summary Report of EPA Activities, Swift Creek Asbestos Site, Whatcom County, Washington. Prepared for USEPA Region 10 by Ecology and Environment, February, 2007.

Ecology and Environment, 2007. Swift Creek Repository Basic Design and Cost Estimate, Prepared for USEPA Region 10 by Ecology and Environment, March, 2007.

Ecology and Environment, 2013. Region 10 Start 3, Draft Engineering Evaluation / Cost Analysis, Sumas Mountain Asbestos (aka Swift Creek) Site, Whatcom County, Washington. TDD 12-02-0006. Prepared for USEPA Region 10 by Ecology and Environment, July 2013.

Hart Crowser, 2008. Planning Level Cost Estimate for Swift Creek Asbestos Site. Prepared by Hart Crowser for Department of Ecology, May, 2008.

Joint Agency Report, 2008. Swift Creek Short to Mid-Term Sediment Management Alternatives Assessment. Prepared jointly by Whatcom County Public Works, Ecology, and EPA, October, 2008.

Kerr Wood Leidal, 2005. Swift Creek Management Plan Final Report. Prepared by Kerr Wood Leidal for Whatcom County Flood Control Zone District, March, 2005.

Kerr Wood Leidal, 2008. Swift Creek Background and Management Alternatives Final Report. Prepared by Kerr Wood Leidal for Whatcom County Flood Control Zone District, January, 2008.

Pacific Surveying and Engineering, 2010. Sumas Mountain Naturally Occurring Asbestos Interim Alternatives Analysis. Prepared by Pacific Surveying and Engineering for Whatcom County Public Works, April 27, 2010.

Pacific Surveying and Engineering, 2011. Swift Creek Sediment Management Plan Proposed Design. Prepared by Pacific Surveying and Engineering for Whatcom County Public Works, March 30, 2011.

USEPA Region 10 Superfund Technical Assessment and Response Team, 2006. Swift Creek Asbestos Integrated Assessment Final Report, Everson Washington, TDD Number 06-03-0020, November, 2006.

USEPA, Region 10, 2009. Soil, Sediment and Surface Water Sampling, Sumas Mountain Naturally-Occurring Asbestos Site, Whatcom County, Washington, October 13, 2009.

USEPA, Region 10, 2013. Soil Sampling, Sumas Mountain Asbestos Site, Whatcom County, Washington, November 19, 2013.

USEPA, Region 10, Washington State Department of Ecology, and Whatcom County Flood Control Zone District, 2014. Joint Agency Agreement Sumas Mountain/Swift Creek Sediment Management Project, March, 2014.

USGS, 1997. Groundwater Quality Data from the Abbotsford-Sumas Aquifer of Southwestern British Columbia and Northwestern Washington State, February 1997.

Washington State Department of Health, 2015. DRAFT Health Consultation, Asbestos and Metals in Groundwater and Leachate, Swift Creek Site, Whatcom County, Washington, WA, March, 2015.

Whatcom County Health Department, 2009. Swift Creek Naturally Occurring Asbestos Ecology Facility Site I.D. Number 5797429, Sampling and Analysis Report, June 16, 2009.

Whatcom County Public Works, 2012. Swift Creek Sediment Management Action Plan, Phase 1 Project Plan, Phase 1 Implementation Plan, Prepared by Whatcom County Public Works for Whatcom County Flood Control Zone District, December, 2012.

Whatcom County Public Works, 2013. Swift Creek Sediment Management Action Plan and Phase 1 Project Plan Draft EIS. Prepared by Whatcom County Public Works for Whatcom County Flood Control Zone District, February, 2013.

Whatcom County Public Works, 2013. Swift Creek Sediment Management Action Plan and Phase 1 Project Plan Final EIS. Prepared by Whatcom County Public Works for Whatcom County Flood Control Zone District, February, 2013.

Wroble, Julie, 2010. Environmental Monitoring for Asbestos: Sumas Mountain Asbestos Site, Selected Residential Properties, Whatcom County, Washington, August 23-26, 2010.

Wroble, Julie, 2011. Risk Evaluation for Activity-Based Sampling Results, Sumas Mountain Asbestos Site, Whatcom County, Washington. March 24, 2011 memorandum from Julie Wroble, Region 10 Toxicologist to Elly Hale, Remedial Project Manager.

Appendix A

PUBLIC COMMENT AND RESPONSES

(To be completed after public notice and comment period)