Environmental impact assessment Fever Creek bridge replacement

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Environmental Impact Assessment
Fever Creek Bridge Replacement

ENVS 493, Fall 2016
Western Washington University

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Environmental Impact Assessment
Huxley College of the Environment

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Signature: Novella Randall
Signature: Shiloh Britt
Signature: Analissa Merrill
Signature: Kyle Easton
Signature: August Landefeld

Date: 12-08-2016
Dear Concerned Citizen,

The City of Bellingham is attaining permits to complete the Fever Creek bridge replacement. Previously, this pedestrian bridge connected Superior and Michigan streets, where E Illinois Street “T’s” into Michigan, by providing a safe and easy pathway to cross Fever Creek for residents of Alabama Hill and Roosevelt neighborhoods. This was an important route for school children getting to Roosevelt Elementary. Due to poor conditions the old bridge was deconstructed and the trail closed. The community will benefit from replacing the bridge. However, the project may involve negative impacts on the Fever Creek ecosystem and surrounding wetlands.

The following document includes an Environmental Impact Assessment (EIA) developed in accordance with the State Environmental Policy Act (SEPA, WAC-197-11) to assess the impacts associated with replacing the pedestrian bridge over Fever Creek. The EIA analysis will determine the significance of the project on the environment. A review of relevant literature and research will be conducted to look at current conditions and proposed impacts on the environment’s earth, air, water, flora and fauna, as well as transportation conditions and impacts. The proposed action, possible alternative options, and mitigation steps will be reviewed to evaluate and mitigate impacts. This information will be compiled into a decision matrix to make an educated decision on if, when, and how this project should be completed.

Sincerely,

Analissa Merrill, Gus Landefeld, Kyle Easton, Shiloh Britt, and Novella Randall
Proposed Fever Creek Bridge Replacement Environmental Impact Assessment

Environmental Impact Assessment, ENVS 493, Spring 2016

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**Disclaimer:**
This report represents a class project that was carried out by students of Western Washington University, Huxley College of the Environment. It has not been undertaken at the request of any persons representing local governments or private individuals, nor does it necessarily represent the opinion or position of individuals from government or the private sector.
Fact Sheet
Project Title:
Environmental Impact Assessment: Fever Creek Bridge Replacement

Proposed Action:
The City of Bellingham (COB) proposed action at the Fever Creek trail crossing site between Superior Street and Michigan Street is to replace the existing wooden bridge with a new, updated bridge in accordance with COB standards for all recreational foot path bridges. This action is proposed due to high deterioration of the existing wooden bridge.

Legal Description:
The Fever Creek bridge and trail are located between Michigan and Superior Streets, where E Illinois “T’s” into Michigan Street, in Bellingham, Washington.

Lead Agency:
City of Bellingham
210 Lottie Street
Bellingham, WA 98225

Proponents:
Gina Austin, P.E., M. ASCE
Bellingham Park & Recreation
3424 Meridian Street
Bellingham, WA 98225
(360) 778-7000
gaustin@cob.org

Licenses and Permits:
City Permits – Clearing; Grading; Critical Areas; Public Works Storm water; SEPA Determination
State Permits – Hydraulic Project Approval
Federal Permits – Nationwide permit; Water Quality Approval

Prepared by and Author Contributions:
Shiloh Britt – Scribe, Tables & Figures, Acronyms, Earth Soils, Glossary
Kyle Easton – Fact sheet, Background, Air Quality, Water Quality research
Gus Landefeld – Executive Summary, Flora and Fauna, Geographic Information Systems
Analissa Merrill – Background, Water Quality, Air Quality research, Conclusion
Novella Randall – Citizens Letter, Transportation, Formatting, and Primary Editor

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Dr. Tamara Laninga, WWU, Washington
Gina Austin, COB/Bellingham Parks & Recreation

Issue Date:
Tuesday December 6, 2016

Public Presentation:
Date – Thursday December 8, 2016 beginning at 2:30 pm
Location – City Hall Council Chambers, 210 Lottie Street, Bellingham, WA 98225
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Acronyms
AQI: Air Quality Index
CO: Carbon Monoxide
COB: City of Bellingham
CSBC: Crushed Surfacing Base Course
FAC: Facultative Wetland Indicator Rating
FACU: Facultative Upland Wetland Indicator Rating
FACW: Facultative Wetland Indicator Rating
ft, ft²: Feet, Square feet
IPCC: Intergovernmental Panel on Climate Change
L.E.G: Licensed Engineering Geologist
NAAQS: National Ambient Air Quality Standards
NOx: various Nitrogen Oxide compounds
NRCS: Natural Resources Conservation Service
NWCAA: Northwest Clean Air Agency
O3: Ozone
PAH: Polycyclic aromatic hydrocarbons
Pb: Lead
P.E: licensed civil engineer with geotechnical experience
ppm: parts per million
PM: Particulate Matter
Psf: Pound per square foot
ROW: Right of Way
SEPA: State Environmental Policy Act
SO2: Sulfur Oxide
WAC: Washington Administrative Code
WSDOT: Washington State Department of Transportation
WWU: Western Washington University
1.0 Executive Summary

1.1 Purpose

The purpose of replacing the Fever Creek pedestrian bridge is to provide a safe, reliable, and environmentally responsible bridge running east to west between Superior Street and Michigan Street. Currently there is no pedestrian bridge connecting the trail that comes from the E Illinois Street Right of Way (ROW) and crosses Fever Creek. The former bridge was removed primarily due to public safety concerns, as it saw heavy use by elementary school children who would walk from their homes in the Roosevelt and Alabama Hill neighborhoods. This document will examine the impacts of reconstructing the bridge and consider two different alternatives.

Figure 1: A network analysis for pedestrian detours during the closure of the Fever Creek pedestrian bridge. The network analysis was performed in ArcGIS and intended to provide a basis for pedestrian detours. To be noted is that there are no sidewalks present on the detour routes. (Created by Gus Landefeld 2016).

1.2 Site Description

The Fever Creek pedestrian bridge runs east to west along the E Illinois Street ROW between Superior Street and Michigan Street. Fever Creek itself is a narrow creek running north to south and feeding into Whatcom Creek as a tributary. Currently there is no pedestrian bridge in
place, forcing former users to walk on streets without the safety of sidewalks or to illegally cross the creek, which damages the fragile ecosystem.

1.3 Proposed Action and Alternatives

The following list of actions includes a proposed action, an alternative action, and a no action alternative. These are the options presented to the City of Bellingham in regards to what should be done with the Fever Creek pedestrian bridge.

1.3.1 Need for Action
Reconstruction of the Fever Creek pedestrian bridge is necessary because it provides a safe and reliable way for its primary user group of Roosevelt Elementary School students to walk to and from school. If the bridge is not replaced, then elementary school students do not have the option of walking to school on a path that is free from motorized vehicles and therefore less safe than the pedestrian bridge.

1.3.2 Proposed Action
The proposed action for the replacement of the Fever Creek pedestrian bridge is to install a temporary bridge that abides by the standards of the City of Bellingham as soon as possible prior to winter. Then to replace the temporary bridge with a permanent bridge at the beginning of the summer. Because students attending Roosevelt Elementary School are one of the largest user groups of the bridge, construction of a permanent bridge would occur after June 15, 2017 when students are out of school and use of the bridge drops. The COB would need to ensure that the wetland in the area surrounding the bridge is properly restored and the bridge is constructed with environmental mitigation in mind.

1.3.3 Alternative Action
An alternative action is to forego installing a temporary bridge for the winter months and install a permanent bridge immediately to reopen the trail. The overall objective of the alternative action would be the same as the proposed action with the only difference being in the time of year of construction and an increase in environmental mitigation efforts.

1.3.4 No Action
The no action alternative is to leave the Fever Creek bridge site unaltered.

1.4 Summary of Significant Impacts
Fever Creek flows south and feeds into Whatcom Creek and eventually into Bellingham Bay. Both Fever Creek and Whatcom Creek are designated as salmon bearing streams and
construction of a new pedestrian bridge near Roosevelt Elementary School has the potential to detrimentally impact the creek. This could come in the form of pollution from construction vehicles, debris being caught in the creek, and destruction of potential salmon habitats.

The primary potential environmental impacts would be positive because of necessary wetland restoration efforts. Little damage of the site would occur due to the relatively small size of the project. Most of the construction performed would require little to no vehicle assisted work, therefore reducing the amount of carbon dioxide and other noxious fumes emitted. The proposed action would only require a few environmental mitigation efforts to keep environmental impacts at minimum levels.

1.5 Impact Matrix

Table 1 shows the decision matrix, which outlines the significant impacts to environmental elements analyzed for the proposed, alternative, and no action alternatives.

**Table 1: Decision Matrix**

<table>
<thead>
<tr>
<th>SEPA Elements</th>
<th>Proposed Action</th>
<th>Alternative Action</th>
<th>No Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>Water</td>
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<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>Air</td>
<td>-1</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Flora &amp; Fauna</td>
<td>+2</td>
<td>+1</td>
<td>-2</td>
</tr>
<tr>
<td>Transportation</td>
<td>-1</td>
<td>+1</td>
<td>-2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>-1</td>
<td>-2</td>
<td>-6</td>
</tr>
</tbody>
</table>

1.6 Recommendations

We recommend that the proposed action is pursued as it would reduce environmental impacts when compared to the alternative and no action plans. Replacing the Fever Creek pedestrian bridge would help provide a safe path for elementary school students to commute on foot to and from school each day by minimizing time spent away from motorized traffic.
2.0 Background

2.1 Fever Creek

The purpose of replacing the Fever Creek pedestrian bridge is to provide a safe, reliable, and environmentally responsible bridge running east to west between Superior Street and Michigan Street. The bridge connects the Roosevelt neighborhood with Roosevelt Elementary School. The previous bridge was deemed unsafe due to age and structural damage. The only structure remaining are the support structures on the creek bank. Currently there is no pedestrian bridge connecting the trail that comes from the E Illinois Street Right of Way and crosses Fever Creek. Fever Creek’s head waters begin in Fever Creek Nature Area and flow through Roosevelt Nature Area and private residences before reaching the work site. Due to the proposed work site’s close location to private properties, a tributary to Whatcom Creek, and two large wetlands in the area, environmental impacts need addressing. The impacts this document considers include earth, water, air, flora and fauna, and transportation. Seasonal differences between the proposed and alternative actions in regards to construction of the bridge is under consideration. The proposed action puts construction of the bridge in summer when flow rates in the creek will be low. The alternative action puts construction of the bridge in winter when flow rates are higher. Pedestrians, particularly school children, continue to take this route to school, causing erosion problems and creating a further need for a timely solution.

2.2 Legal Context

The bridge location at Fever Creek and the accompanying trail do not have a standard legal description. There is no meets and bounds description of the property and although the area
may unofficially be designated as an easement belonging to the COB, there is no record of this in relation to the neighboring short plats. In 1889, East Illinois Street was dedicated to the public. The trail is described as that unopened portion of East Illinois Street lying between Michigan Street and Superior Street.

![Figure 3: Satellite image of Fever Creek Short Plat showing proposed action location (Courtesy of Chicago Title Company)](image)

### 2.3 Proposed Action Permits

This project will require 5 permits from the COB, this includes: a grading permit, a clearing permit, a critical areas permit, one for public works storm water, and a SEPA determination. The grading and clearing permits are necessary for any work that is done regarding the movement of soil (specifically excavation and soil fill) and vegetation clearing respectively for work in and around the proposed action site. The critical areas permit is designed to protect sensitive environmental areas and restore them as needed as best as possible to their original state after any project as been completed. Almost any project that involves the movement of soil will also require a storm water permit, along with any additional work that deals with impervious surfaces. Finally, this project will require a SEPA determination for reasons that will be described within this report.

In addition to city permits, this project will also require one Washington state permit. The hydraulic project approval permit, issued by the Department of Fish and Wildlife, is required for
any project that operations near any state waters. This requirement is specifically designed for protection of aquatic wildlife.

Finally, this project will require two federal level permits: the nationwide permit, and a water quality approval permit. The nationwide permit is enforced by the United States Army Corps of Engineers, and both permits deal with site water quality under the 1992 Clean Water Act.

### 3.0 Environmental Conditions

#### 3.1 Earth

**3.1.1 Existing Conditions**

On September 15, 2015, a Whatcom County Soil Survey was conducted at the proposed Fever Creek bridge replacement site. The survey revealed that one soil type existed near or within the proposed site parcel and was classified at Whatcom Silty Loam consisting of 3 to 8 percent slopes (Element Solutions et al., 2016).

Furthermore, the Elemental Solutions soil survey indicated that hydric soils are found throughout the parameters of the study site and are thought to be associated with the depressional features of the site. The textures of the soil were not discovered to be consistent with that of the online Natural Resource Conservation Service (NRCS) date, and the soils instead, which were generally disturbed, could be potentially classified as a combination soil type: Whatcom Silty Loam and Whatcom Sandy Loam.

Elemental Solutions observes soils to have hydric indicators. Multiple times of soils were found at the site including sandy loam, silty loam, and other loamy soils. Furthermore, Washington State Department of Natural Resources designated the soils as glaciomarine drift. (Element Solutions et al., 2016). Information on existing surface geologic conditions was compiled by the Washington State
Department of Natural Resources (WADNR). The current existing path leading to the former bridge consists of 4 to 6 inches in depth of crushed limestone base. Native sandy clay, which has been identified as glaciomarine drift and includes variable organics that reduce in continuation as depth increases, were also found. (Burwell, D., 2016)

The test pits, detailed in the Geotechnical report, indicated that the site is underlain by glaciomarine drift of varying densities (soft to very stiff), with a tendency to be medium-stiff to very stiff in the areas upland from surface to 10 feet to 1 foot below ground surface. The glaciomarine drift, itself, consists of varying amounts of sand, gravel, silt, and the occasional boulder cluster or standalone boulder. Observed variation of the glaciomarine stiffness can be attributed to the drying process of the surface. Groundwater elevations and soil saturation levels will vary with the season and precipitation events in addition to the proximity to the Fever Creek stream and adjacent wetlands (Burwell, D., 2016).

In the entirety of the proposed project, excavation to the subgrade will be mandatory and require the removal of existing native earth and fill composites. This will likely entail the use of heavy earth-moving machinery. (Burwell, D., 2016) When excavating earth for the retaining wall and bridge foundation, the excavation must occur deep enough to ensure that the existing native subgrade is consistent in composition of in-situ soils that are suitable. The in-situ soils must have a composition that will not allow for bearing on the soft layers or locations that lack shear strength. (Burwell, D., 2016)

Topsoil zones include bioturbated, which is a zone of weathered and/or organic topsoil. This zone has depths varying from 1.5 to 3.0 feet, which is dependent upon adjacent tree locations and previous construction activity. This topsoil may be later used for landscaping purposes.

Earth material or fill exposed at the base of excavation that is deemed unsuitable by the geotechnical standards (see geotechnical report) is to be over-excavated and replaced with crushed surfacing base course (CSBC) per the Washington State Department of Transportation (WSDOT) 2016 Specifications (Burwell, D., 2016).

As in relation to soils, footings for retaining walls and structures are to be placed directly on a 6-inch surface of unyielding and firm CSBC. Additionally, the chosen area must be free of all loose material. Subgrade below the CSBC, if native, should be comprised of stiff glaciomarine drift and free of organic materials. The footings for the structures, to provide protection from winter frost penetration, are to be at least 18 inches below ground surface. (Burwell, D., 2016).

The projected project does not have reason to excavate more than 3.5 feet to reach the foundation of the bridge abutment; however, this will nonetheless result in disruption of native subgrade. This will leave the Native subgrade will be susceptible to
degradation which will include the loss of shear strength if exposed to construction equipment and/or weather.

In the event of a precipitation event prior to subgrade improvements and the in-situ earth become saturated, the said native subgrade will likely become unsuitable for supporting a structural foundation. If native soil is highly moisture sensitive it will not effectively compact, and becomes even more so once disturbed. Should native soils being soft, there must be an additional 12-inch layer of quarry spalls added and compacted with the drift into the soft areas. This allows for an increase in shear strength. This composite must be allowed to set, protected from rain, for a period of 24-48 hours, this will allow the composite to “heal” and allow the pour water pressure to dissipate.

There exists a high level of variability for the drift and weather conditions depending on the time of year in which the construction takes place. It is for this reason that it is of the utmost importance that proper inspection of the native subgrade occurs (to be completed by a certified P.E or L.E.G) before any construction begin.

In regards to bearing capacity and the strength of the earth, the glaciomarine drift with preparation can support evenly spread loads up to 3,000 pounds per square foot (PSF)-This allows for the net allowable weight bearing capacity. This capacity may be increased by one-third for short term wind or seismic events, thus allowing the new bearing capacity to be 4,000 PSF for a short amount of time. Again, footings should be a minimum of 18 inches wide to allow for an even spread load to the drift. (Burwell, D., 2016)

### 3.1.2 Proposed Action

**Impacts**

The temporary foot bridge is to be rooted as soon as possible, during the winter months. This will take place during the wet season during a time of peak, or near peak flows of Fever Creek; during this time frame soils, will be the most saturated. Because the soil is less saturated during the summer months, the ground will be better equipped to bear a load, especially during the construction phase. It is important to note that without soil bank supports implemented, the seasonably higher flows of Fever Creek will continue to wash away soils of the embankment which will lead to a loss of bank stability.

During the summer of 2017, a second construction event will occur wherein the temporary bridge will be removed, and a permanent bridge will be constructed in its place. This action is to be completed in the summer when Fever Creek’s flows are at their lowest and when there has historically been the least amount of soil saturation of the year. Because soils would be impacted when they were more arid, and therefore more dry, there would be the least amount of calculated impacts for a construction project to
occur. Because of the previous construction months before, the soil will be compromised and likely not structurally sound without added materials.

Mitigations
Once native soil is disturbed, it will not be fit to use as structural fill as the native soil will not compact effectively due to its high moisture sensitivity. Native soil is to be moved off site so as not to mix with the structurally-sound fill. Additionally, special measures may need to be taken to ensure the stability of the bank from further degradation.

Temporary foot bridge mitigations:
To accommodate for the wet season, during the project’s construction all working surfaces that undergo repeated or regular foot traffic should be covered with a geotechnical fabric. This is to ensure the separation of the drift and to aide in the assistance of spreading the new load out on the already present native soils. After the geotechnical fabric, has been placed, it is of the utmost importance that a CSBC layer be placed, this will allow for the protection of the native in-situ soils from becoming disturbed or loose from the commencing construction. (Burwell, D., 2016)

Commonly observed wet season practices in conjunction with the Best Management Practices should be implemented, these include construction and truck wash-down areas to reduce the amount of erosion and other off-site impacts. (Burwell, D., 2016)

Permanent replacement bridge Mitigations:
During the dry summer season Fever Creek flow rates, will be seasonally low and therefore the ground will be the least saturated and most stable. Despite this, wet season protocol should be followed during the dry season as well, however will likely not be as drastic. It is advised that a construction event occur during a time of no rain so that soils will be the least saturated and most stable to support construction equipment.

Prior to each construction event, a licensed P.E or L.E.G must evaluate the condition of the soils impacted and decide if the soils and surrounding earth are stable enough to support a construction event. Once approval is obtained, construction may begin with additional mitigations as assigned by the evaluating P.E. or L.E.G.

3.1.3 Alternative Action
Impacts completed in winter
Impacts will be the same as above for the wet season and the alternative action.
Mitigation
Mitigation measures will be the same as above for the wet season.
3.1.4 No Action Impacts

A no action decision would result in no additional net impacts to the earth and earth soils. These elements will continue to have a natural seasonal variability has they have done for centuries.

3.2 Water

3.2.1 Existing Conditions

The proposed site of the new pedestrian bridge has many concerns surrounding manipulation of existing water conditions, mainly surrounding Fever Creek, and wetlands. The April 2016 wetland delineation survey highlighted two distinct wetlands, Wetland A and B as shown in Figure 5 from Element Solution, in the area proposed for the new bridge. The wetlands are classified as category II and III, and both get their water from puddling rain water and are dry in summer. The total area that the wetland covers is over 4,550 ft², which is most the site. The direction of the water flow is from the wetlands on site into Fever Creek. Wetlands are not expected to be influenced directly by the riverine system. (Element Solutions et al., 2016) Fever Creek is a first order stream and one of the tributaries to Whatcom Creek. The headwaters start in Fever Creek Nature Area and flow through Roosevelt Nature Area and private residences before it reaches the proposed site. Water quality due to increased urbanization is impaired, including high levels of turbidity, fecal coliform, etc. (Shannahan, J., LaCroix, R., Cusimano, B., & Hood, S., 2004). Streamflow in the winter is higher than in the summer, due to the seasonal nature of the wetlands from which the water flows (Element Solutions et. al, 2016).

Bellingham Habitat Restoration review the restoration of the wetlands along Fever Creek were considered a high priority, while Fever Creek itself has a low priority for restoration due to its very low existing habitat functions (La Croix, R., 2015).

Another water source is the storm water drain coming from Roosevelt Elementary School. The location that the elementary school was previously a wetland. The water...
draining from that old wetland flows through the storm water pipes under the proposed site and into the creek. (Element Solutions et al., 2016)

3.2.2 Proposed Action

Impacts
The temporary foot bridge will be installed in the winter when the peak flow season begins. This will most likely affect the sediment release into the stream, as well as possible fish habitat disruption (M.J Robertson, D.A. Scruton, R.S. Gregory, and Keith D. Clarke, 2006).

During the summer months, both wetlands on the site would be seasonally dry, and surface water in the wetland area is dry. Subsurface/Groundwater flow into the stream would be at its minimum, and thus would cause Fever Creek to be at its lowest flow of the year (Element Solutions et al., 2016). Therefore, during construction, the water in Fever Creek would be minimally impacted from increased turbidity from the increase of erosion of the river banks. There is also minimal risk of Polyaromatic hydrocarbons (PAH) from the heavy machinery used entering the water table now due to no surface flow.

Mitigation
To further minimize erosion and increased turbidity during the replacement bridge construction, the COB Parks Department has a procedure that is used in all small bridge replacements. This procedure includes using dams and pumps to divert the water around the construction site, then placing mesh catch screen to reduce erosion within the work area. If any fish were to be near the work area, they would be transferred up or down stream of the work area by trained biologists (Gina Austin).

Impacts to the wetland must be mitigated at a rate of three to one for total impacted area. They must improve the other existing wetlands along the site, and surrounding area (WSDOT, 2008).

3.2.3 Alternative Action

Impacts
During the winter months, both wetlands at the site will be wet, and surface water is expected. Subsurface and groundwater flow into the stream is expected to be at maximum flow rates, and thus Fever Creek would be high along its banks (Element Solutions et al., 2016). The risk of sediments entering the water would be high. There is a high potential for chemicals such as PAH’s from heavy machinery that would be washed into the stream or pool in the wetland due to high surface flow.
Mitigation
Small bridge replacement mitigation procedures outlined by the City of Bellingham Parks Department will be the same as above, however more difficult to implement during the winter due to the increased stream flow through the area. Mitigation for the area of the wetlands impacted by the bridge location moving are the same as above.

3.2.4 No Action
Impact
Not replacing or placing a temporary bridge will cause more foot traffic through Fever Creek and Wetland A, eroding the banks further and harming the wetland. Fish habitat such as pebble count and sedimentation may be impacted. Fecal coliform levels could also increase if the temporary foot bridge is not installed (Element Solution et al., 2016).

Mitigation
Recommended wetland restoration (La Croix R., 2015), and closure of the walkway is suggested.

3.3 Air
3.3.1 Existing Conditions
Air pollutants of concern as expressed by federal agencies such as the Environmental Protection Agency (EPA, 2015) are described below. These coincide with those prioritized by local departments such as the Northwest Clean Air Agency (NWCAA) (NWCAA, 2016) and organizations like the American Lung Association (American Lung Association et al., 2016); and so are the focus of air quality concerns of a variety of project types. Monitored pollutants are: Lead (Pb), Carbon Monoxide (CO), various Nitrogen Oxides (generalized to the formula NO_x), Sulfur Dioxide (SO_2), Ozone (O_3), and Particulate Matter 10 (PM_{10}) and Particulate Matter 2.5 (PM_{2.5}) which refer to a particle size of 10 microns (micrometers) and 2.5 microns respectively. The NWCAA oversees a handful of air quality monitoring stations throughout Whatcom County, including one located in Bellingham that monitors some of these different pollutants (Department of Ecology, 2016).

Lead
Lead is a naturally occurring metal and has been deemed toxic by the scientific community. Since the elimination of lead from gasoline, paints, and many other products, lead is generally not monitored from ambient air unless industrial processes that utilize this material make it necessary to do so (NWCAA, 2016). Lead as a pollutant is not regularly monitored within the city of Bellingham or Whatcom County and thus no data is available for existing air lead levels (Port of Bellingham, 2010 July; EPA, 2015).
**Carbon Monoxide**
The biggest source of CO is usually vehicles and other combustion processes (e.g., heating and industrial processes). The only contributing factors of CO emissions within the proposed project area are those due to local traffic from the streets of Superior, Michigan, East Illinois, and New Haven Place. Due to the low traffic levels in this residential area and the lack of through streets, CO emissions are low and are therefore not monitored at this location or within the city of Bellingham (Port of Bellingham, 2010 July; EPA, 2015).

**Nitrogen Oxides**
Nitrogen Oxides are very reactive and tend to have a very high global warming potential, along with potential adverse health effects, for instance forming hazardous compounds such as peroxyacyl nitrates (O’Neil, G., 2016 October). Nitrous Oxide (N₂O) is a product of reactions with NOₓ compounds that, per the Intergovernmental Panel on Climate Change (IPCC), has a roughly 300x global warming potential to that of carbon dioxide (IPCC, 2007). Due to a lack of industrial sources in the Bellingham area, there are no NOₓ monitoring stations and thus a lack of data for creating a baseline of NOₓ pollutants (EPA, 2015). However, per an EIS completed by the Port of Bellingham in regards to the old Georgia Pacific site and waterfront district, Bellingham currently meets local and federal standards on NOₓ emissions (Port of Bellingham, 2010 July).

**Sulfur Dioxide**
Similar to NOₓ’s, SO₂ comes from various forms of Sulfur Oxides (SOₓ), most of which come from electric generating facilities that burn fuels with higher sulfur contents (typically coal). SO₂ is a major contributor to acid rain due to its ability to dissolve in water. There is one SO₂ monitoring facility in Whatcom County, but no station located within the city of Bellingham (NWCAA, 2016). As of 2015 the EPA reported no available data for measuring SO₂ levels in Bellingham (EPA, 2015).

**Ozone**
Of the selected air pollutants, ozone is a more regionally based and widespread type as opposed to a point source emission. Bellingham contains a monitoring station capable of measuring this pollutant, and per 2015 EPA data the highest reached level of ozone was 0.048 ppm for an 8-hour concentration reading (EPA, 2015). This falls below the current U.S. National Ambient Air Quality Standards (NAAQS) of 0.070 ppm (EPA, 2016 September 16).

**PM₂.₅ and PM₁₀**
Along with ozone, Bellingham also has an air monitoring station operated by the NWCAA for particulate matter. This station is located on Yew Street near the intersection of Yew Street and Alabama Street, very close to the proposed action site (Department of Ecology, 2016). As of 2015 the EPA listed Bellingham as having insufficient data to decide on ambient air particulate matter levels (EPA, 2015); however, in the 2008 Port of Bellingham EIS they report both PM₂.₅ and PM₁₀ levels for
the 2005 year. Both were measured in 24-hour ranges, with PM$_{2.5}$ levels reaching a maximum of 21 micrograms per cubic meter while the concentration of PM$_{10}$ reached a maximum of 26 micrograms per cubic meter (Port of Bellingham, 2010 July). Both of these fall within acceptable levels according to the U.S. NAAQS (EPA, 2016 September 16).

According to the data collected by the EPA using air monitoring stations within Bellingham and located through Whatcom County, the air quality is determined on a scale known as the Air Quality Index (AQI). For both ozone and short term PM$_{2.5}$ Bellingham ranks as one of only 8 cities that maintained a standing of "good" on the AQI for the year 2015. This is the highest air quality rating available and indicates that the region never experienced any days of unhealthy air quality (American Lung Association et al., 2016). This standing meets and exceeds both federal and local regulations for ambient air quality. The acceptable levels according to the NAAQS for each previously discussed pollutant roughly correspond to a numerical value of 100 on the AQI (Air Quality Index, n.d.).

**Table 3. The EPA's Air Quality Index.** Numerical values are a standardization based on actual concentrations and are applied to each air hazard individually (Air Now, n.d.).

<table>
<thead>
<tr>
<th>Air Quality Index Levels of Health Concern</th>
<th>Numerical Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>0 to 50</td>
<td>Air quality is considered satisfactory, and air pollution poses little or no risk.</td>
</tr>
<tr>
<td>Moderate</td>
<td>51 to 100</td>
<td>Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.</td>
</tr>
<tr>
<td>Unhealthy for Sensitive Groups</td>
<td>101 to 150</td>
<td>Members of sensitive groups may experience health effects. The general public is not likely to be affected.</td>
</tr>
<tr>
<td>Unhealthy</td>
<td>151 to 200</td>
<td>Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.</td>
</tr>
<tr>
<td>Very Unhealthy</td>
<td>201 to 300</td>
<td>Health alert: everyone may experience more serious health effects.</td>
</tr>
<tr>
<td>Hazardous</td>
<td>301 to 500</td>
<td>Health warnings of emergency conditions. The entire population is more likely to be affected.</td>
</tr>
</tbody>
</table>

### 3.3.2 Proposed Action

**Impacts**

Depending on the construction methods used to install the permanent bridge replacement, air quality impacts may vary. A dry summer season will mean stagnant air and less rain. Dust from trail maintenance and removal of existing footings will be of greatest concern. This may lead to reduced air quality in the immediate area because of increased particulate matter. Additionally, wind patterns during the project time frame
may have an impact on the location of dust and particulate matter accumulation. Exact estimates are problematic to determine quantitatively however because of difficulties with long term weather predictability. Long distances of particulate distribution are unlikely as the proximity of natural and man-made barriers (e.g. trees and houses) prevent this.

The foundations of the new permanent bridge will be of concrete (Austin, G., 2016 October) and it is well established that the cement manufacture industry releases a lot of air pollutants; however, these are associated with cement production which will happen off site. The curing of the cement at the proposed action site will not contribute to any air quality issues (Wilson, A., 1993 March/April).

**Table 4. Engine emission levels for various compounds.** *HC indication total hydrocarbons. Table derived from original source (Helmer, K., et al., n.d.).*

<table>
<thead>
<tr>
<th>Engine Model</th>
<th>horsepower (hp)</th>
<th>Emissions Levels (g/hp-hr)</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yanmar 2TNE68</td>
<td>14</td>
<td>0.328-0.534</td>
<td>2.878-5.648</td>
<td>825-843</td>
<td>4.167-4.320</td>
<td>0.460-0.929</td>
</tr>
<tr>
<td>Lombardini LDW903</td>
<td>20</td>
<td>0.242-0.619</td>
<td>2.766-3.072</td>
<td>767-798</td>
<td>3.004-3.355</td>
<td>0.609-0.636</td>
</tr>
<tr>
<td>Kubota V2203B</td>
<td>49</td>
<td>0.075-0.090</td>
<td>1.053-1.234</td>
<td>668-671</td>
<td>4.253-4.272</td>
<td>0.600-0.615</td>
</tr>
<tr>
<td>Hatz 1B30</td>
<td>7</td>
<td>0.628-0.633</td>
<td>4.025-4.220</td>
<td>758-783</td>
<td>5.126-5.347</td>
<td>0.510-0.523</td>
</tr>
</tbody>
</table>

Other air pollutants will be dependent on whether heavy machinery is used for the proposed action. Without any machinery (excavators or diggers), dust will be the primary air hazard. No other emissions as referred to above will be of concern (Section 3.3.1). Combustion emissions are measured based on engine type and size. If an excavator is used it will be small, because the installation is not complex, and it's occurring in a confined right-of-way. For the purposes of this EIA it is assumed any engine would be less than 50 horsepower. Table 4 shows five different engines tested for a variety of emissions (Helmer, K., et al., n.d.). These are provided on a gram of pollutant per horsepower per hour of usage (g/hp-hr). Depending on the length of time of use and size of the engine, total emissions for construction can be estimated given this base line data. This can then be extrapolated to overall site air quality using the parameters within the AQI and size of the proposed site.

In addition to the above-mentioned emissions, PAH's are released as part of diesel engine combustion and are directly related to particulate matter (specifically PM_{2.5}).
levels. It can be difficult to determine exact PAH emission rates as PAH concentrations are due to diesel fuel type and aromatic hydrocarbon content. It has been determined though that PAH content in diesel emissions is no greater than 1% of the PM mass of diesel engine exhaust (NCEA, 2002 May). More specifically, only PAH compounds composed of 3-5 aromatic hydrocarbon rings have the appropriate vapor pressure to volatize and remain in the ambient air (NCEA, 2002 May).

Methods of installation of a temporary pedestrian bridge may add additional impacts to air quality at the proposed action site. If no temporary bridge is to be added or no machinery is to be used, then no additional air quality impacts exist for the proposed action. If machinery is used in its installation and/or removal, then additional emissions will be accrued per the data in Table 4. The aspect of a temporary bridge existing over Fever Creek will not in itself cause any additional air quality issues.

**Mitigation**
If heavy machinery is to be used for the proposed action, generally there is no standard method to minimize exhaust emissions and particulates other than the standard components that already exist installed. However it may be possible to choose a specific machine with a smaller engine or a better emissions profile. This will be determined or hindered by the exact type and/or severity of ground work necessary.

With respect to dust from physical construction and/or wind there are several mitigation techniques that can be employed. Layering material over the soil of the work site will alleviate dust uplift into the air. Gravel, mulch, straw, or physically spraying water can be used. Minimizing the area of vegetation clearing and utilizing time of operations after vegetation clearing also act to decrease PM (dust) release (DOE, 2016 July).

**3.3.3 Alternative Action**

**Impacts**
Emissions from construction equipment for the alternative action will mirror that of the proposed action (Section 3.3.2.1). The time of year will have no effect on type of emissions that are released at the site from operating machinery. Depending on weather and how this affects the scheduled length of construction, emission totals may change if operating times increase. These will still be established from base line factors from Table 4.

Depending on weather patterns, air quality from dust may vary from that of the proposed action. Increased wind during the winter season may help to remove dust from the site, however this presents the implication of moving this PM into adjacent residential areas, affecting those closest to the site. Similarly, an increase in rain will help to reduce dust accumulation in the air altogether during construction.
Mitigation
Since the impacts for the alternative action are the same as that of the proposed action, the mitigations for the alternative action remain the same as well (Section 3.3.2.2). However, typical winter weather patterns lead to increased rain within the alternative action time frame, thus keeping the ground and soils in and around the proposed action site wetted via physical means will not be necessary.

3.3.4 No Action
Impacts
Having no future action with the site will result in no changes to the current air quality at the current proposed action location. Foot traffic will remain as is, but will still be lower than it was when a bridge was in place. Any dust uplifted by foot traffic crossing Fever Creek will be of equal or lower value than when a bridge was on this location. If no bridge replacement should occur, it is likely that vehicle traffic will increase due to some children being driven to and from school which will increase air pollutants. These pollutants are not however contained within the immediate location of the proposed action site and it is difficult to conclude a direct correlation between air quality of the site and increased vehicular traffic.

3.4 Flora & Fauna
3.4.1 Existing Environment
The flora and fauna present at the site of the Fever Creek pedestrian bridge is composed of a mixture of native and invasive species.

Common flora that is present includes Douglas-fir, Western hemlock, and vine maple, all of which are native to the region (Washington Native Plant Society 2006). Some of these species are considered obligate wetland species, meaning they are only found in wetlands, and thus help wetland delineation in the area. The primary concern for flora in the area is the abundance of invasive species, and detrimental effects to wetland flora. The reigning invasive species are Himalayan blackberry and English ivy. Fever Creek is not listed as a project restoration site for 2017 by the COB (COB 2017), but a replacement of the pedestrian bridge would prompt removal of invasive species and a reintroduction of native species.

The primary fauna that visit the area are local black-tailed deer and raccoons passing through and eating some of the flora (Relyea 2007). Fever Creek is a tributary of Whatcom Creek, which is a fish bearing and spawning stream, but Fever Creek is not a stream that hosts salmon spawning or other fish populations (NSEA 2016). Despite the lack of presence of fish in the creek, there is potential for salmon and other fish populations to swim upstream during peak flows, making it an area of concern. Taking this into account, reconstruction of the pedestrian bridge would need to ensure that potential fish habitat is not degraded.
3.4.2 Proposed Action

Impacts
Impacts on flora and fauna by pursuing the proposed action of would be largely beneficial because installing a temporary bridge immediately would decrease the number of people who continue to cross the bridge illegally. Flora would see less foot traffic, therefore promoting growth and fauna habitat would no longer see degradation from the foot traffic it experiences without a bridge. Limited flows would insure less sediment entering the stream affecting salmon and fish population further downstream.

Mitigations
The COB Parks and Recreation Department would be responsible for removing and managing invasive species in the area, in accordance with the three to one mitigation required by Bellingham’s City Comprehensive Plan. Invasive species such as Himalayan blackberry and English ivy are currently overwhelming native species would need to be taken out. This management could come in the form of a partnership with Roosevelt Elementary School in efforts to involve students and spread awareness of local ecosystems.

3.4.3 Alternative Action

Impacts
Impacts on flora and fauna would be like those described in section 3.4.2.1, but there is more of a potential for habitat destruction as construction would commence as soon as possible. Potential habitat destruction would be accelerated by erosion spurred by high amounts of water present in the forms of stream flow and precipitation. Peak flows with erosion would cause increased impact downstream to fish populations in Whatcom Creek.

Mitigation
Mitigation efforts would be like those described in section 2.4.2.2. Removal of invasive species and a reintroduction of native flora by the COB Parks and Recreation Department would enhance the habitat for fauna. With construction of the new pedestrian bridge taking place during the wet season, any efforts to remove invasive species would be postponed until later in the dry season to minimize erosion caused by higher stream flow rates.

3.4.4 No Action

Impacts
Taking no action and leaving the Fever Creek pedestrian bridge site as is would allow invasive species to grow unregulated and would detract from native species’ abilities to thrive. Illegal crossing of the stream that occurs has potential to degrade potential habitats for flora and fauna alike.
4.0 Built Environment Element

4.1 Transportation

4.1.1 Existing Conditions

The Fever Creek pedestrian and bike bridge is a high-volume bridge. Number of people passing over the bridge average around one hundred and fifty. Trends show higher usage in spring and winter and lower usage in winter and the lowest in summer (City of Bellingham, 2015). Even after the bridge removed the site still looks used. The site has trampled vegetation and human garbage. Soil disturbances looked like people had been crossing through the stream. There was a makeshift bridge built. The City of Bellingham’s recommended alternative of waiting till summer to start construction leaves the creek vulnerable for an extended period of times. Safety is a concern as flow rates rise with children trying to pass through the creek, and alternative routes lacking sidewalks.

![Figure 6. Fever Creek Pedestrian Counts- Graph displays number of pedestrian passing over the Fever Creek Bridge during the seasons of the year. Trends show that spring have the highest crossing counts while summer has the lowest crossing counts (City of Bellingham, 2015; Created by Novella Randall).](image)
4.1.2 Proposed Action

Impacts
The proposed action would leave the creek vulnerable to human intrusion for multiple months before summer 2017. Human traffic through the stream will cause erosion, vegetation disturbance, and possible stream contamination. Effects of this will be adverse.

Mitigations
A temporary bridge could alleviate some of the issues and keep people on the path. Another option could be better barricades to keep the public from crossing the stream. These efforts would alleviate negative interactions between the public and the creek.

4.1.3 Alternative Action

Impacts
Fever Creek would benefit from having construction start as soon as possible. With a crew on the site, the trail would be closed off more officially and the movement of pedestrians and bikers would stop, thus reducing the impact on the surrounding environment.

Mitigations
No mitigation steps would be needed because of a neutral effect of not having people pass through the site.

4.1.4 No Action

Impacts
Impacts of no action would be like those discussed in 6.1.1, but indefinitely. School children and those using the bridge would intrude through the creek causing adverse effects.
5.0 Impact Matrix

Table 5 shows the decision matrix, which outlines the significant impacts to environmental elements analyzed for the proposed, alternative, and no action alternatives.

**Table 5: Decision Matrix**

<table>
<thead>
<tr>
<th>SEPA Elements</th>
<th>Proposed Action</th>
<th>Alternative Action</th>
<th>No Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>Water</td>
<td>+1</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>Air</td>
<td>-1</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Flora &amp; Fauna</td>
<td>+2</td>
<td>+1</td>
<td>-2</td>
</tr>
<tr>
<td>Transportation</td>
<td>-1</td>
<td>+1</td>
<td>-2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>-1</strong></td>
<td><strong>-2</strong></td>
<td><strong>-6</strong></td>
</tr>
</tbody>
</table>

**Table 6: Decision Matrix Key**

<table>
<thead>
<tr>
<th>Score</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>+1 to +2</td>
<td>Positive Impact (2 being significant)</td>
</tr>
<tr>
<td>-1 to -2</td>
<td>Negative Impact (2 being significant)</td>
</tr>
<tr>
<td>0</td>
<td>Zero Impact</td>
</tr>
</tbody>
</table>

**1.6 Recommendations**

We recommend that the proposed action is pursued as it would reduce environmental impacts when compared to the alternative and no action plans. Replacing the Fever Creek pedestrian bridge would help provide a safe path for elementary school students to commute on foot to and from school each day by minimizing time spent away from motorized traffic.

6.0 Conclusion and Recommendation

Replacement of Fever Creek pedestrian bridge is important for the community to provide a safe, reliable, and environmentally responsible bridge running east to west between Superior Street and Michigan Street. The former bridge was removed primarily due to public safety concerns. Through replacing the bridge, we hope to preserve former methods of travel within the Roosevelt neighborhood, especially for students of Roosevelt Elementary School. A primary
concern for replacement is children forced to walk to Roosevelt Elementary School and share streets with motorized traffic without sidewalks.

We outlined three actions for this site: proposed action, alternative action, and no action. The proposed action is putting a temporary bridge according to standards of the COB Parks and Recreation Department immediately upon approval, and the construction of a permanent bridge based off of COB design standards following the end of the academic year starting June 16, 2016. The alternative action is to install a permanent bridge immediately, but mitigate for environmental conditions present during the winter. The last option, no action, is to leave the site of Fever Creek pedestrian bridge as it is in its current state.

After looking at environmental elements including earth, water, air, flora and fauna, and transportation, we determined the proposed action to be the best option for this location. We conclude that a temporary bridge should be placed immediately in the site, then install a permanent bridge in June.
7.0 Glossary

Hydric- characterized by, relating to, or requiring an abundance of moisture
In-situ- in the natural or original position or place
Noxious- physically harmful or destructive to living beings
Loam- a soil consisting of a friable mixture of varying proportions of clay, silt, and sand
Silt Loam- soil containing not less than 70 percent silt and clay and not less than 20 percent sand
Subgrade- a surface of earth or rock leveled off to receive a foundation (as of a road)
Wetland- land or areas (as marshes or swamps) that are covered often intermittently with shallow water or have soil saturated with moisture
8.0 References


