

**SEATTLE PUBLIC UTILITIES  
SEPA ENVIRONMENTAL CHECKLIST**

This SEPA environmental review of Seattle Public Utilities' Venema Creek Natural Drainage System Project has been conducted in accord with the Washington State Environmental Policy Act (SEPA) (RCW 43.21C), State SEPA regulations [Washington Administrative Code (WAC) Chapter 197-11], and the City of Seattle SEPA ordinance [Seattle Municipal Code (SMC) Chapter 25.05].

**A. BACKGROUND**

**A1. Name of proposed project:**

Venema Creek Natural Drainage System (NDS) Project

**A2. Name of applicant:**

Seattle Public Utilities (SPU)

**A3. Address and phone number of applicant and contact person:**

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**A4. Date checklist prepared:**

March 6, 2014

**A5. Agency requesting checklist:**

Seattle Public Utilities (SPU)

**A6. Proposed timing or schedule (including phasing, if applicable):**

Construction is planned to begin in Summer 2014, with substantial completion in late 2015. The project is anticipated to require approximately 200 working days, and there will not be any contractually required phasing. The Contractor may propose phasing for SPU to review and approve.

**A7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.**

Regular operation and maintenance of the proposed facilities will include ongoing monitoring of surface water discharges to the planned underground injection control (UIC) wells for water quality and flow. No other future capital project additions related to this project are planned.

**A8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.**

Associated Earth Sciences, Inc. 2013 (March 14). Venema NDS Hydrogeologic Assessment Report for Deep UIC Wells.

Osborn Consulting, Inc. 2013 (November 27). Venema Natural Drainage System Stormwater Report 60% Submittal.

Perteet, Inc. 2013 (Dec 12). Parking Study Memorandum Updated Feb. 2014.

SPU Geotechnical Engineering. 2012 (March). Geotechnical Infiltration Report: Venema Natural Drainage Systems Project, Seattle Washington. Work Authorization No. C302317MG2.

Troost, K.G., D.B. Booth, A.P. Wisher, and S.A. Shimmel. 2005. Geologic map of Seattle. U.S. Geological Survey Open File Report 2005-1252. <http://pubs.usgs.gov/of/2005/1252/of2005-1252.pdf>

**A9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.**

There are no known applications pending for governmental approvals of other proposals directly affecting the property covered by this proposal.

The Broadview Sewer and Stormwater Improvement Project is a project SPU is pursuing in the same sewage and drainage basin as Venema Creek. SPU is developing and analyzing options and has not yet determined what approach to take.

**A10. List any government approvals or permits that will be needed for your proposal, if known.**

- City of Seattle, Department of Transportation (SDOT), Street Improvement Permit (Type 45, commercial or multi-use construction)
- SDOT, Street Use Permit (Type 31, construction staging use)
- Washington State Department of Ecology, National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit
- Washington State Governor's Executive Order 05-05 (Archaeological and Cultural Resource)

**A11. Give a brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)**

The Venema Creek NDS Project is designed to reduce peak flows, provide an enhanced baseline flow, and reduce water quality impacts to Venema Creek, a tributary to Piper's Creek in northwest Seattle. The project intends to achieve this by constructing a series of cascading raingardens (natural drainage swales) for biofiltration and bioretention along five blocks of residential streets. Treated runoff from the bioretention cells would be directed to UIC wells for infiltration into deep glacial outwash layers located approximately 30 feet below the ground surface. The bioretention cells would only provide water quality treatment of runoff and would not be designed to infiltrate all runoff. Runoff volumes that exceed the capacity of the bioretention cells and UIC wells would be returned to the constructed storm water

conveyance system that now discharges to Venema Creek. The project would treat a portion of storm water runoff from an 80 acre storm water catchment basin, which currently has no designed surface water drainage improvements.

The project would reconstruct 1,600 linear feet of five blocks of residential streets to accommodate the raingardens, while also rebuilding the right-of-way with new drainage and transportation infrastructure. The project includes the following major elements:

- Raingarden swales on one side of each block
- Conversion of two underground injection control wells (UICs), originally installed to assess the potential for this technology, from research status to permanent status for the discharge of treated, collected storm water
- Possible installation of a third UIC for the same purpose in a westerly portion of the public right-of-way of NW 122nd Street (exact location not yet determined). Each UIC is/would be approximately 80 feet deep
- New 6 foot wide concrete sidewalks on one side of each block
- Curb and gutter on both sides of NW 122nd Street and on the uphill side of NW 120th Street
- New landscape strip (planting strip) between sidewalk and curb with street trees as per SDOT requirements (one side of each street only)
- Removal of existing road surface and installation of newly aligned, asphalt roadway;
- Adjustment of underground utilities (e.g., potable water, storm drainage, natural gas, etc.) as required to accommodate proper depth clearances with swale construction and new roadway improvements
- Adjustments to other street infrastructure such as mailboxes, signage, etc., as needed
- Installation of approximately 750 feet of new storm water drainage pipe to connect the raingardens and provide a high-flow bypass route
- Repair of damaged culvert located under 3rd Avenue NW at NW 120th Street
- Construction of Americans with Disabilities Act (ADA)-compliant ramps at street intersections as per SDOT requirements
- Installation of battery-powered monitoring equipment within the UIC wells to capture data on discharge flows and water table elevations

**A12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.**

The project area is in the Broadview-Bitter Lake-Haller Lake neighborhoods of the City of Seattle, King County, Washington, and is located entirely within the following improved street rights-of-way:

- NW 120th Street, from 1st Avenue NW through 3rd Avenue NW
- NW 122nd Street from Palatine Avenue N through 3rd Avenue NW.

The project is located within Section 2, Township 25 N, Range 5 E (Attachment A). Attachment B depicts conceptual renderings of the project elements.

**B. ENVIRONMENTAL ELEMENTS**

**B1. Earth**

**a. General description of the site:** *[Check the applicable boxes]*

- Flat       Rolling       Hilly       Steep Slopes       Mountainous  
 Other: (identify)

**b. What is the steepest slope on the site (approximate percent slope)?**

The project area slopes from the northeast to the southwest. Most of the project area has gentle slopes in the 2 to 3% range, while the eastern ends of both streets approach the 5 to 6 % range. A portion of NW 122nd Street has the steepest slope of approximately 7.5%.

**c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.**

Surficial geologic conditions within the project area are classified as Vashon lodgement till [Qvt (glacial till), known to be approximately 30 feet deep] overlying Vashon advance outwash [Qva (advance outwash)] (Troost et al. 2005). The lodgement till has low-permeability that limits the potential for shallow storm water infiltration. However, the outwash includes unsaturated permeable sands and gravels that are able to transmit large volumes of ground water. Much or most of the project area has been developed into moderate- to high-density residential neighborhoods. As a result much of the project area has been disturbed by previous grading and filling associated with the construction of streets and buildings.

**d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe:**

There are no surface indications or history of unstable soils in the vicinity.

**e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate the source of fill.**

This project would disturb approximately 2.4 acres of land as a result of excavation, grading, and filling during clearing, grading, and construction of underground utilities, roadway improvements, and the new raingardens. Approximately 6,700 cubic yards (CY) of material would be excavated for roadway features, drainage structures and pipe, and raingarden swales. Approximately 3,700 CY of mineral aggregates, landscape soils, borrow materials, bioretention soils, and backfills for pipe and utilities would be imported as fill material.

Fill materials would be obtained from a commercial purveyor of such materials, licensed and permitted by the State of Washington. Excavated materials would be exported off the project and either reused on other projects or disposed of in an approved upland disposal location per the construction contract requirements.

**f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe:**

Erosion and sedimentation could occur as a result of this project, although the risk is very low because the project area is relatively flat. In addition, no filling would take place in or near watercourses or wetlands, and best management practices (BMPs) would be used to protect the storm water drainage system and to minimize off-site drainage. Also, all work would be required to be performed with an approved erosion and sedimentation control plan, while also meeting NPDES storm water permit requirements.

**g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?**

The project would construct approximately 1.32 acres of new and replaced impervious surface. Of that amount, 1.0 acre would be the pollution-generating portion of the impervious areas (subject to vehicular traffic). A detailed breakdown of pre-project and post-project areas is included in this table:

	Pre-Project	Post-Project
Impervious Surfaces	1.17 ac / 55%	1.32 ac / 62%
Pollution-Generating Portion of Impervious Surfaces	1.08 ac / 51%	1.00 / 47%
Pervious Surfaces	0.95 ac / 45%	0.80 ac / 38%

Overall, the project would increase total impervious surface by 0.15 ac (approximately 6,534 square feet) primarily because the project would build new sidewalk where none currently exists. However, the project would reduce pollution-generating impervious surfaces by about 3,400 square feet. Also, the project would meet the City of Seattle's water quality and retention requirements for any increase in impervious area.

**h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:**

The project would implement a Construction Erosion and Sedimentation Control (CESC) plan, with best management practices (BMPs) appropriate to the site, conditions, and activities. Work would be monitored, maintained, and adjusted as necessary to meet changing conditions and to meet requirements of the NPDES permit.

**B2. Air**

**a. What types of emissions to the air would result from the proposal [e.g., dust, automobile, odors, industrial wood smoke, greenhouse gases (GHG)] during construction and when the project is completed? If any, generally describe and give approximate quantities if known.**

Construction equipment could include hand-held power tools, gasoline and diesel-powered compressors and generators, and gasoline and diesel-powered vehicles to remove existing roadway infrastructure and build the new roadway improvements. These tools would generate greenhouse gas emissions (GHG) due to the combustion of gasoline and diesel fuels, such as oxides of nitrogen, carbon monoxide, particulate matter and smoke, uncombusted hydrocarbons, hydrogen sulfide, carbon dioxide, and water vapor. Other emissions during construction could include dust and exhaust from construction vehicles. These effects are expected to be localized, temporary and

minimized.

The project would produce GHGs in three ways: embodied in materials to be installed on the project; through construction activity (especially as described above); and within regular operation, maintenance, and monitoring activities throughout the life of the facility. The new raingardens are expected to capture and accumulate biomass (organic matter); however, the mass of carbon sequestered by the raingardens during their anticipated 20 year lifespan is not estimated for or otherwise considered in this environmental analysis.

Total GHG emissions for the project are estimated to be 3,082 metric tons of carbon dioxide emission (MTCO<sub>2</sub>e). The GHG emissions calculations are shown in Attachment C and summarized in the table below. One metric ton is equivalent to 2,205 pounds.

The project would demolish and remove existing asphalt and concrete surfaces; the estimated area of replacement is approximately 51,000 square feet, which is estimated to embody 2,550 MTCO<sub>2</sub>e.

The project would generate GHG emissions during the construction period through the operation of diesel- and gasoline-powered equipment, and in the transportation of materials, equipment and workers to and from the site. The estimates provided are based on assumptions for typical numbers of vehicle operations to execute the work, see Attachment C for more information. Construction activities would generate an estimated 513 MTCO<sub>2</sub>e.

The project would also generate GHG emissions through the operation, maintenance, and monitoring of the project. The expected life span of the swales is 20 – 50 years. The estimated emissions are based on an assumed life expectancy of 50 years. The estimated average annual GHG emissions generated from operations, maintenance, and monitoring is 19 MTCO<sub>2</sub>e.

#### Summary of Greenhouse Gas (GHG) Emissions

Activity/Emission Type	GHG Emissions (pounds of CO <sub>2</sub> e) <sup>1</sup>	GHG Emissions (metric tons of CO <sub>2</sub> e) <sup>1</sup>
Buildings	n/a	n/a
Paving	5,621,730	2,550
Construction Activities (Diesel)	1,005,608	456
Construction Activities (Gasoline)	126,360	57
Long-term Maintenance (Diesel)	22,302	10
Long-term Maintenance (Gasoline)	19,440	9
<b>Total GHG Emissions</b>	6,577,225	3,082

<sup>1</sup>Note: 1 metric ton = 2,204.6 pounds of CO<sub>2</sub>e. 1,000 pounds = 0.45359237 metric tons of CO<sub>2</sub>e

- b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.**

No off-site sources of emissions or odors are known. The neighborhood is fully developed as single family residential.

- c. Proposed measures to reduce or control emissions or other impacts to air, if any:**

During construction, impacts to air quality would be reduced and controlled through implementation of federal, state, and local emission control criteria and City of Seattle construction practices. These would include requiring contractors to use best management practices for construction methods, proper vehicle maintenance, and minimizing vehicle and equipment idling.

### **B3. Water**

- a. Surface:**

- (1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If so, describe type and provide names. If appropriate, state what stream or river or water body it flows into.**

There are no surface water bodies on or near this project location. Puget Sound is approximately 3,700 feet to the west. The downstream drainage course includes Venema Creek (a tributary of Piper's Creek), most of which is located within Carkeek Park. The headwaters of Venema Creek begin approximately 680 feet west of the project area from NW 120th Street at 3rd Avenue NW.

- (2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If so, please describe, and attach available plans.**

There are no surface water bodies adjacent to (or within 200 feet of) this project location.

- (3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands, and indicate the area of the site that would be affected. Indicate the source of fill material.**

No fill or dredge material would be placed in or removed from surface water or wetlands.

- (4) Will the proposal require surface water withdrawals or diversions? If so, give general description, purpose, and approximate quantities if known.**

Land use in the project drainage basin is predominantly residential, with some commercial land uses along Greenwood Avenue N, an arterial. No formal storm water drainage system currently exists in the project drainage basin. Storm runoff is currently conveyed via a combination of sheet flow at road edges, ditches, storm drains, and culverts. Direction of flows is generally southwest to the corner of 4th Avenue NW and NW 120th Street. From there, flow is conveyed by a pipe southwest to Venema Creek.

One of the overall project goals is to mimic natural pre-urbanization (that is, forested) hydrologic conditions as much as possible by infiltrating clean, treated surface waters (storm water) from the entire upstream basin into groundwater tables via UIC wells. Therefore, this project would not require surface water withdrawals or diversions in the traditional sense. The project's natural drainage system would treat storm water by removing sediment and pollutants. That treated storm water would then be directed to UIC wells, providing a system of recharging ground water which then re-supplies area creeks and streams. This form of deep-water recharging also allows flows to re-enter the creek system at a slower and steadier rate to the benefit of the creek's aquatic environment. Treated flows discharged to the UIC wells would equal up to 65% of the average annual volume (AAV) of the upstream 80 acre basin (two UIC wells) or up to 71% of the AAV for the entire upstream basin (three UIC wells). Therefore the actual amount of *surface water* discharged to Venema Creek would be reduced by these amounts. This volume would be directed to the aquifer system of the Vashon advance outwash and is expected to provide a clean source of additional groundwater that supports base-flows in creeks downstream of the project area. Flows higher than the capacities of the UIC wells would bypass the well system and be directed to the downstream flow path or a bypass system following the current storm water drainage patterns and therefore would not be considered diverted.

**(5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.**

The project does not lie within the 100-year floodplain.

**(6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.**

The project would not produce or discharge waste materials to surface waters.

**b. Ground:**

**(1) Will ground water be withdrawn, or will water be discharged to ground water? If so, give general description, purpose, and approximate quantities if known.**

Previous geotechnical investigations have noted that groundwater is generally not detected in shallow surficial geologic units in the project area. Groundwater has been detected at a depth of 110 feet below ground surface. Ground water will not be withdrawn as part of this project or its construction. However, the project would discharge surface water flows to ground water via the UIC wells (approximately 80 feet deep). Discharged water would be first treated by passing through the biofiltration media and plantings within the raingardens—which meets WDOE's requirements for such discharge methods. While the term "injection" is used, the UIC wells used in this project would discharge storm water by gravity only. The main purpose of using a gravity discharge is to replicate as closely as possible the natural groundwater hydrology of the area prior to urbanization, thus providing clean and steady base-flows to downstream creeks for purposes of sustaining aquatic environments.

As part of this project, two UIC wells would be converted from research to permanent status. The capacities of these UIC wells were determined by conducting flow tests. The flow test results are summarized in the Venema NDS Hydrogeologic Assessment Report – Deep UIC Wells report (March 14, 2013). If additional UIC flow capacity is necessary, a third UIC well will be installed.

- (2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (e.g., domestic sewage; industrial, containing the following chemicals...; agricultural, etc.). Describe the general size of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.**

No waste material would be discharged to ground water for this project.

**c. Water Runoff (including storm water):**

- (1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.**

Sources of storm water runoff include upstream neighborhood streets, sidewalks, driveways and impervious areas from privately owned rooftops and paved areas. The project includes new storm water facilities to intercept upstream flows to this area, and direct such flows through pipes, catch basins and culverts, to the raingarden systems for treatment, retention and discharge. The majority of the flow will continue to follow the current downstream flowpath off-site, with the water quality flows treated and discharged to the Vashon advance outwash via the UIC wells. No flows will discharge directly to any waters or body of waters, but will continue to flow downstream to Venema Creek and Piper's Creek.

- (2) Could waste materials enter ground or surface waters? If so, generally describe.**

During construction, it is possible that erosion from the construction site could enter surface waters. However, a CESC plan using appropriate BMPs would be implemented to avoid or minimize this risk. Additionally, portions of the raingarden system would be designed to remain off-line (that is, not connected to the UIC wells) until approximately one year after installation, to allow those features to vegetate and for the bioretention soils to fully release expected organics prior to discharging cleaned storm water to the UIC wells.

**d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:**

A key goal of this project is to provide water quality treatment in a highly developed, urbanized basin where no storm water drainage or treatment facilities currently exist. Typical construction methods are anticipated, and no adverse impacts to surface or ground waters are expected. BMPs, as identified in the City of Seattle's Stormwater Code SMC 22.800 – 22.808, Director's Rule: 2009-004 SPU/16-2009 DPD, and Volume 2 Construction Stormwater Technical Requirements Manual, would be used to control erosion and sedimentation during construction.

**B4. Plants**

**a. Types of vegetation found on the site:** *[check the applicable boxes]*

<input checked="" type="checkbox"/> Deciduous trees:	<input type="checkbox"/> Alder	<input checked="" type="checkbox"/> Maple	<input type="checkbox"/> Aspen	<input checked="" type="checkbox"/> Other: (ornamental cherry, peach)
<input checked="" type="checkbox"/> Evergreen trees:	<input checked="" type="checkbox"/> Fir	<input checked="" type="checkbox"/> Cedar	<input type="checkbox"/> Pine	<input checked="" type="checkbox"/> Other: (black pine)
<input checked="" type="checkbox"/> Shrubs (mugo pine, laurel, bamboo, sumac)				
<input checked="" type="checkbox"/> Grass				
<input type="checkbox"/> Pasture				
<input type="checkbox"/> Crop or grain				
<input type="checkbox"/> Wet soil plants:	<input type="checkbox"/> Cattail	<input type="checkbox"/> Buttercup	<input type="checkbox"/> Bulrush	<input type="checkbox"/> Skunk cabbage
<input type="checkbox"/> Other: (identify)				
<input type="checkbox"/> Water plants:	<input type="checkbox"/> water lily	<input type="checkbox"/> eelgrass	<input type="checkbox"/> milfoil	<input type="checkbox"/> Other: (identify)
<input type="checkbox"/> Other types of vegetation: (identify)				

**b. What kind and amount of vegetation will be removed or altered?**

Most of the existing grass, vegetation, plantings, and trees within the City of Seattle right-of-way would be removed to allow for grading, construction of the new roadway section, natural drainage system swales and underground storm water conveyance system infrastructure. Most of the vegetation to be removed is mown turf, but also includes bamboo, English laurel (*Prunus laurocerasus*) hedges, and various other non-native ornamental shrubs and herbaceous plants, all of which are located within the right-of-way.

The following six street trees would be removed with this project, none of which meets the definition of an exceptional tree as defined by SMC Chapter 25.11 and DPD Director’s Rule 16-2008:

- Three 4-inch diameter Maples (south side of NW 120th east of 2nd Avenue NW)
- One 9-inch diameter Cherry (ornamental, non-fruiting; south side of NW 122nd west of 2nd Avenue NW)
- One 8-inch diameter Cherry (ornamental, non-fruiting; south side of NW 122nd east of 1st Avenue NW)
- One 18-inch diameter Cherry (ornamental, non-fruiting; south side of NW 122nd east of 1st Avenue NW)

**c. List threatened or endangered species known to be on or near the site.**

According to a review of the Washington Department of Natural Resources (WDNR) Natural Heritage Program’s document called “Sections that Contain Natural Heritage Features, Current as of March 1, 2013” (accessed at [www.dnr.wa.gov](http://www.dnr.wa.gov)), there are no documented occurrences of sensitive, threatened, or endangered plant species in this Section. No federally-listed endangered or threatened plant species or State-listed sensitive plant species are known to occur within the municipal limits of the City of Seattle. The project location has been intensively disturbed by development and redevelopment over the last 80 years. The project area has been extensively excavated, filled, paved, or occupied by street and other built structures. There is no habitat for

threatened or endangered plants.

**d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:**

The project would limit plant removal, pruning, and other disturbance to that required for project construction. Construction limits would be clearly and physically delineated by protective construction fencing to prevent unauthorized trespass and collateral damage to nearby vegetation. The project would also replant the right-of-way both within the raingardens and the planting strip between the sidewalk and curb. In general, the areas for planting run the full length of the five blocks to be reconstructed.

Because up to six significant trees are expected to be removed, replacement trees may be required by City of Seattle Tree Protection provisions, including Executive Order 03-05 (2005; Clerk File #307611) directing City departments to replace every tree removed from City property with two new trees. The proposed number of new street trees is estimated at 79.

The raingarden swales will also contain a variety of small trees and low-growing species of grasses, shrubs, bulbs, and perennials to perform the bioretention and water quality treatment functions. Landscape plant selections for both raingarden swales and planting strips were made using templates from the Green Stormwater Infrastructure (GSI) program and lists of permissible trees and plantings allowed in the right-of-way by SDOT. Plant selections were subsequently amended using input from members of the public living adjacent to the project.

**B5. Animals**

**a. Birds and animals that have been observed on or near the site or are known to be on or near the site: [check the applicable boxes]**

<b>Birds:</b>	<input type="checkbox"/> Hawk	<input type="checkbox"/> Heron	<input type="checkbox"/> Eagle	<input checked="" type="checkbox"/> Songbirds
<input checked="" type="checkbox"/> Other:	crow, pigeon			
<b>Mammals:</b>	<input type="checkbox"/> Deer	<input type="checkbox"/> Bear	<input type="checkbox"/> Elk	<input type="checkbox"/> Beaver
<input checked="" type="checkbox"/> Other:(identify):	possum, raccoon, squirrel			
<b>Fish:</b>	<input type="checkbox"/> Bass	<input type="checkbox"/> Salmon	<input type="checkbox"/> Trout	<input type="checkbox"/> Herring
<input type="checkbox"/> Shellfish	<input type="checkbox"/> Other: (identify)			

**b. List any threatened or endangered species known to be on or near the site:**

No such species are known to be present on or near the project site.

The project is located in the headwaters of Venema Creek, a tributary of Piper’s Creek, which is a Puget Sound tributary. Endangered Species Act listed species known to use Piper’s Creek and Puget Sound (PS) are Chinook salmon (*Oncorhynchus tshawytscha*, Threatened PS) although such usage is probably rare given the habitat preferences for Chinook salmon. Also, no Chinook salmon have been observed in Piper’s Creek for more than 17 years. Downstream of the project site, both Venema and Piper’s creeks are spawning grounds for chum (*O. keta*) and coho salmon (*O. kisutch*). The Carkeek Watershed Community Action Project operates a rearing facility for juvenile chum

salmon during the spring every year and releases those fry into Piper's Creek.

A check of the Washington Department of Fish and Wildlife's "Priority Habitat Species on the Web" database on February 18, 2014 indicates the project location is habitat for chum and coho salmon. That database also indicates that most of the publicly owned area of the Venema and Piper's Creek watersheds is identified as a Biodiversity Area. The project location is known to be (but not mapped as being) within the habitat of bald eagle (*Haliaeetus leucocephalus*) and great blue heron (*Ardea herodias*)—priority species in Washington.

**c. Is the site part of a migration route? If so, explain.**

Seattle is located within the migratory route of many birds and other animal species and is part of the Pacific Flyway, a major north-south route of travel for migratory birds in the Americas extending from Alaska to Patagonia. The project location is more than 3,700 feet east of Puget Sound, another important water migration route for many animal species.

**d. Proposed measures to preserve or enhance wildlife, if any:**

The project would increase the number, diversity, and character of plantings within the public right-of-way, both within the raingardens and planting strips. Additional plantings of low-growing plants, shrubs, small trees, and public street trees are anticipated to increase habitat available for wildlife, providing refuge as well as new food sources.

The project would also minimize disturbance areas and use BMPs identified in the City of Seattle's Stormwater Code (SMC 22.800 through 22.808 and Director's Rule 2009-004 SPU/16-2009 DPD) and Construction Stormwater Control Technical Requirements Manual (Volume 2) to generally protect fish and wildlife and manage storm water. For example, equipment to be used for construction activity would be cleaned and inspected before it arrives at the project location to avoid and minimize potential for fuel or lubricant leaks.

**B6 Energy and Natural Resources**

**a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.**

The completed project would not require any grid-based electrical energy to operate because the project includes only gravity-operated pipes, swales, and discharges. Monitoring equipment placed within the UIC wells to capture data on discharge flows and water table elevations would be battery-powered.

**b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.**

The proposed project does not involve building structures or planting vegetation that would block access to the sun for adjacent properties. SPU has coordinated the project's landscape design with individual property owners in order to avoid and minimize impacts

to solar energy reaching possibly affected residences.

- c. **What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:**

There are no conservation features or proposed measures to reduce or control energy impacts because there would be no such impacts.

**B7. Environmental Health**

- a. **Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe:**

Small amounts of materials likely to be present during construction include gasoline and diesel fuels, hydraulic fluids, oils, lubricants, solvents, paints, and other chemical products. A spill of one of these chemicals could potentially occur during construction as a result of either equipment failure or worker error. Though highly unlikely and not expected at this location, contaminated soils, sediments, or groundwater could also be exposed during excavation. If disturbed, contaminated substances could expose construction workers and potentially other individuals in the vicinity through blowing dust, stormwater runoff, or vapors.

The project's raingardens would provide water quality treatment and bioretention for urban stormwater runoff. Roadway contaminants found in runoff could be expected to accumulate within raingarden soils, although recent scientific studies have asserted that many contaminants actually bind with organic matter within the amended biofiltration soil and plant material and undergo transformation. While any contaminants or their concentrations are not expected to be significant health hazards, the raingardens are designed to discourage recreational use. Additionally, soils in the raingarden swales are expected to be removed and replaced at the end of their life span (estimated at 20 to 50 years, depending on actual flow and pollutant accumulations).

Completed raingardens could also attract mosquitoes and water-loving insects. However, the raingardens are designed to minimize this in two ways: 1) swales are designed to have flowing water, which does not support mosquito breeding; and 2) after storm events, the swales are designed to drain within 24 hours, substantially less than the 72 hours required for mosquito larvae development.

- (1) Describe special emergency services that might be required.**

Possible fire or medic services could be required during project construction, as well as possibly during maintenance of the completed project. However, the completed project would not demand higher levels of special emergency services than already exist at the project location. Typical emergency services required for medical emergencies are provided by the Seattle Fire Department. Typical security services are provided by the Seattle Police Department and SPU (and SPU's contractor during project construction).

**(2) Proposed measures to reduce or control environmental health hazards, if any:**

The construction contractor would be required to develop and implement a spill control plan to control and manage spills during construction. During construction, the contractor would use standard operating procedures (SOPs) and BMPs, as identified in the City of Seattle's Stormwater Code SMC 22.800-22.808, Director's Rule: 2009-004 SPU/16-2009 DPD, and Volume 2 Construction Stormwater Control Technical Requirements Manual, to reduce or control any possible environmental health hazards. Any soils contaminated by spills would be excavated and disposed of in a manner consistent with the level and type of contamination, in accordance with federal, state and local regulations.

As required by the Washington Department of Labor and Industries (WAC 296-843), a Health and Safety Plan would be prepared by SPU or SPU's contractor prior to work commencing. The plan would address proper employee training, use of protective equipment, contingency planning, and secondary containment of hazardous materials.

The project would mitigate any future accumulation of contaminants from urban stormwater runoff by periodically renovating the raingarden swales. Based on monitoring of the swales' function and efficacy, swale vegetation and soils would be excavated and disposed of in a landfill licensed to receive such wastes. New soils and vegetation would then be reinstalled. Anticipated replacement intervals are dependent on multiple factors but are estimated to occur at 20 to 50 year intervals or as otherwise needed.

**b. Noise**

**(1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?**

Noises that exist in the area would not affect the project.

**(2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.**

Noise levels in the vicinity of construction would temporarily increase during construction activities. Short-term noise from construction equipment would be limited to the allowable maximum levels of City of Seattle's Noise Control Ordinance (SMC Chapter 25.08). Within the allowable maximum levels, SMC 25.08 permits noise from construction equipment between the hours of 7 a.m. and 7 p.m. weekdays, and 9 a.m. and 7 p.m. weekends and legal holidays; however, it is expected that the majority of construction would take place from 7 a.m. to 6 p.m. on weekdays. After completion of the project, occasional noise from equipment used for operation, maintenance, and monitoring would occur periodically, but would be limited to the hours allowed by the City of Seattle's Noise Control Ordinance.

**(3) Proposed measures to reduce or control noise impacts, if any:**

Construction equipment would be muffled in accordance with the applicable laws. SMC Chapter 25.08, which prescribes limits to noise and construction activities, would be enforced while the project is under construction.

**B8. Land and Shoreline Use**

**a. What is the current use of the site and adjacent properties?**

The proposed project is located in improved public rights-of-way used for vehicle and pedestrian travel, and parking. Adjacent property uses are entirely single-family residential, some of which may contain home-based occupations.

**b. Has the site been used for agriculture? If so, describe.**

The project site has not been used for agricultural purposes.

**c. Describe any structures on the site.**

No houses or buildings are located on the project site, which is fully within the right-of-way. There are some privately-owned fences and gates encroaching on the public right-of-way; project staff members have coordinated with individual property owners for the removal and/or relocation of these items.

**d. Will any structures be demolished? If so, what?**

Fences and gates encroaching into the right-of-way not cleared by their private owners prior to construction would be removed by the project.

**e. What is the current zoning classification of the site?**

The project would be located in improved street rights-of-way. The immediately surrounding area is designated SF 7200 (single-family).

**f. What is the current comprehensive plan designation of the site?**

The current comprehensive plan designation for the project area is single family residential.

**g. If applicable, what is the current shoreline master program designation of the site?**

The project area has no Shorelines of the State that are regulated under the City of Seattle's Shoreline Master Program.

**h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.**

No part of the project location has been classified as environmentally sensitive.

**i. Approximately how many people would reside or work in the completed project?**

None.

**j. Approximately how many people would the completed project displace?**

No one would be displaced by the project.

**k. Proposed measures to avoid or reduce displacement impacts, if any:**

No mitigation measures are proposed because there are no adverse impacts related to displacement.

**l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:**

Public roadway improvements including underground utilities, raingardens, and public pedestrian improvements are all compatible and supportive of the adjacent, urban residential land use.

**B9. Housing**

**a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.**

The proposed project would not construct any housing units.

**b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.**

The proposed project would not remove any housing units.

**c. Proposed measures to reduce or control housing impacts, if any:**

No measures are proposed because there would be no housing impacts.

**B10. Aesthetics**

**a. What is the tallest height of any proposed structure(s), not including antennas? What is the principal exterior building material(s) proposed?**

No such structures are proposed or included in the project.

**b. What views in the immediate vicinity would be altered or obstructed?**

No views in the immediate vicinity would be altered or obstructed. Street trees planted within the right-of-way could partially obscure neighborhood and territorial views when they attain full height and maturity. To the maximum extent practicable, precise siting of proposed street trees has been coordinated with adjacent property owners who voiced concerns over view prisms and solar access in an attempt to adjust locations of replacement trees.

**c. Proposed measures to reduce or control aesthetic impacts, if any:**

The project's proactive involvement plan with the community and adjacent property

owners has included open houses and one-on-one meetings to encourage public input in landscape plant and tree selection, as well as the overall planting plan.

**B11. Light and Glare**

**a. What type of light or glare will the proposal produce? What time of day would it mainly occur?**

The constructed project will not produce light or glare. No new street lights are proposed or required. During construction, if an emergency situation calls for after-dark work, the construction contractor may deploy portable lights that temporarily produce light and glare.

**b. Could light or glare from the finished project be a safety hazard or interfere with views?**

The project would not create light or glare.

**c. What existing off-site sources of light or glare may affect your proposal?**

There are no existing off-site sources of light and glare that would affect the proposal.

**d. Proposed measures to reduce or control light and glare impacts, if any:**

No measures are needed to reduce or control light and glare impacts because no impacts would occur. If an emergency requires after-dark work during construction, portable lighting would be adjusted as feasible to minimize glare.

**B12. Recreation**

**a. What designated and informal recreational opportunities are in the immediate vicinity?**

Bonnie View Park is a natural open space area located on NW 120th Street about three blocks west of the project. Carkeek Park is located further to the southwest, approximately six blocks away and provides open space, hiking, play and picnic areas, picnic shelters, an environmental learning center, public art, access to the railway right-of-way, and views of Puget Sound. Carkeek Park is a local asset for neighborhood users as well as a regional park destination.

Informal recreational activities through the project area and neighborhood include residential activities of dog-walking, walking, jogging, and bicycling – all within the public right-of-way.

**b. Would the proposed project displace any existing recreational uses? If so, describe.**

The proposed project would not permanently displace any existing recreational uses. Access to the streets affected by project construction will be less desirable, but the project contractor would be required to maintain safe pedestrian and vehicle access at all times. Temporary closures or detours affecting vehicle and pedestrian routes/access may be required. Upon completion, new sidewalk facilities will provide a safe, designated location for pedestrians.

**c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:**

Project notifications through web-site updates, e-mails, and mailings would provide local residents with limited advance notice regarding temporary street and sidewalk closures and detours. Temporary closures or detours affecting vehicle and pedestrian

routes/access may be required. The project would attempt to make those closures and detours as brief as possible.

**B13. Historic and Cultural Preservation**

**a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.**

SPU requested that the King County Historical Preservation Program conduct a basic cultural resources review of the project area. Their review found no known cultural resource in the project area.

There are no places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site. To determine if National Register or Washington Heritage properties are located in or adjacent to the project area, the project location was checked against the following registers on February 14, 2014.

- City of Seattle Landmarks  
[http://www.cityofseattle.net/neighborhoods/preservation/landmarks\\_listing.htm](http://www.cityofseattle.net/neighborhoods/preservation/landmarks_listing.htm)
  
- Washington Heritage Register and National Register of Historic Places  
<http://www.dahp.wa.gov/historic-register> (general site on historic registers),  
<http://www.dahp.wa.gov/washington-heritage-register> (a site specific to the Washington Heritage Register) and the WISAARD database  
<http://www.dahp.wa.gov/learn-and-research/find-a-historic-place>

While the WISAARD database indicates numerous historic properties reports have been submitted for various structures near the project location, none of these registers recorded any places or objects formally listed on, or proposed for, national, state, or local preservation registers on or adjacent to the project location.

**b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.**

The cultural resources review for this project and database checks described in Section B13a identified no such resources. Much of the project location consists of previously disturbed land associated residential development, improved street rights-of-way, and other disturbances. The project's location in street right of way and the likelihood that project activities would be within the extent of ground disturbance associated with previous road construction and utility installation combine to make this a project with little chance of encountering undisturbed archaeological materials.

**c. Proposed measures to reduce or control impacts, if any:**

No buildings or known cultural resources will be affected by this project. Only existing street infrastructure and utilities within public rights-of-way will be affected. None of the existing infrastructure is considered to be of historic or cultural importance.

The project's location in street right of way and the likelihood that project activities

would be within the extent of ground disturbance associated with previous road construction and utility installation combine to make this a project with little chance of encountering undisturbed archaeological materials. However, workers would be trained to recognize materials of cultural significance should they be found. Should evidence of cultural artifacts or human remains become evident during excavation, either historic or prehistoric, work in that immediate area would be suspended and the find would be examined and documented by a professional archaeologist. Decisions regarding appropriate mitigation and further action would be made at that time.

**B14. Transportation**

- a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.**

The project would occur entirely within existing, improved street rights-of-way for NW 122nd Street and NW 120th Street. These streets provide access to and connect with major arterials, including 3rd Avenue NW and NW 125th Street.

- b. Is the site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?**

King County Metro bus stops for Route 28 are located immediately adjacent to the project area on both sides of 3rd Avenue NW at NW 120th Street.

- c. How many parking spaces would be unavailable during project construction? How many spaces would the completed project have? How many would the project eliminate?**

The project's parking impacts study (Perteet 2013) collected field data and assessed impacts on parking supply and demand. The study area was identified to include the blocks between the streets directly impacted by construction as well as a half block north and south of these streets. The study determined that parking supply in the project vicinity currently exceeds demand.

That study determined there are 59 legal parking spaces on both streets directly affected by construction (NW 120th and NW 122nd Streets). When the project is complete, that number will decrease by 16 to a total of 47 legal parking spaces. The overall existing parking supply within the study area is 303 spaces, with current peak demand at 79, providing an existing surplus of 224 spaces.

During construction, it is anticipated that the 59 legal parking spaces on NW 120th and 122nd Streets would not be available. Thus, motorists normally seeking parking in the project area would be reasonably expected to seek parking in immediately adjacent unaffected streets (i.e., from among the 224 existing surplus spaces). Thus, while motorists may be required to park slightly more distantly than normal, there would appear to a more-than-sufficient number of parking spaces to accommodate that temporary demand. Following project construction, 47 parking spaces would be available on the affected streets and any motorists seeking additional parking would continue to be able to seek parking in immediately adjacent unaffected streets (i.e., from among the 224 existing surplus spaces).

- d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).**

The project includes rebuilding the street and public rights-of-way along five blocks of NW 120th and NW 122nd Streets. No additional new roads or streets are necessary or will be improved as part of this project. .

- e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.**

The project would not use or occur in the vicinity of water, rail or air transportation.

- f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.**

The completed project would not generate any additional vehicle trips. Project construction would require a total of approximately 5,200 round-trips (estimated using Attachment C) due to workers and materials being transported to and from the project location during the 200 work day construction period. This includes an estimated total of 1,200 round-trips for removal of excavated material and import of material by truck. Generally, trips would occur between the hours of 7 am and 7 pm weekdays, and 9 am and 7 pm weekends and legal holidays. Specific timing of peak volumes is not known. The completed project is expected to generate approximately 4,000 round trips to support the monitoring and operation and maintenance of the completed project for its anticipated 50-year life span.

- g. Proposed measures to reduce or control transportation impacts, if any:**

During construction, the contractor would be required to deploy a traffic control plan approved by SDOT. Project construction would comply with SDOT policies regarding temporary lane and sidewalk closures. The construction contractor would be encouraged to use carpooling for its employees.

The completed project would feature new delineation of street edges, new curb and gutter, landscaped planting strips, and planted raingarden swales. All of these features are expected to assist in traffic calming, especially for non-local access traffic attempting to use residential streets as cut-through routes to arterials.

**B15. Public Services**

- a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.**

The proposed project would not create increased need for public services.

- b. Proposed measures to reduce or control direct impacts on public services, if any.**

No mitigation is being proposed because there would be no impacts on public services.

**B16. Utilities**

a. Check utilities available at the site, if any: [check the applicable boxes]

- None  
 Electricity     Natural gas     Water     Refuse service  
 Telephone     Sanitary sewer     Septic system (unknown, but not suspected).  
 Other (cable TV)

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

None

This completed project would not require utility services for normal operation. The project would not install any new utilities.

During construction, the project is expected to relocate or reconstruct an undetermined number of existing utilities when conflicts with the project design are present. The project anticipates minimal interruptions in service during those utility relocations. However, if more than a short service disruption would occur during relocation, then temporary connections to businesses and residences would be provided. Inadvertent damage to underground utilities could also occur during construction. While such incidents do not occur frequently, they could temporarily affect services to customers served by the affected utility while emergency repairs are made. In addition, some residents may need to place their curbside garbage and recycling containers in front of an adjacent neighbor's house on garbage pick-up days. No other interruptions to regular utility services are expected during construction.

**C. SIGNATURE**

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature:  \_\_\_\_\_  
Don Anderson, P.E.  
Project Manager

Date: 3/6/2014



Attachment B – Conceptual Renderings

120th Conceptual Street Perspective



- 1 Approximately 1600 feet of new sidewalk
- 2 Plants and trees within the natural drainage system will improve air and water quality. Residents will have the opportunity to provide input on plant selections.
- 3 SPU will maintain the landscaping in the natural drainage system to ensure proper storm drainage function
- 4 Defined roadway will calm traffic
- 5 On-street parking will be provided on one side of the street

\* Trees and plantings are shown at approximately one-year from planting.



122nd Conceptual Street Perspective



- 1 Approximately 1600 feet of new sidewalk
- 2 Plants and trees within the natural drainage system will improve air and water quality. Residents will have the opportunity to provide input on plant selections.
- 3 SPU will maintain the landscaping in the natural drainage system to ensure proper storm drainage function
- 4 Defined roadway will calm traffic
- 5 On-street parking will be provided on one side of the street

\* Trees and plantings are shown at approximately one-year from planting.



Attachment C – Greenhouse Gas Emissions Worksheet

Section I: Buildings						
			Emissions Per Unit or Per Thousand Square Feet (MTCO <sub>2</sub> e)			
Type (Residential) or Principal Activity (Commercial)	# Units	Square Feet (in thousands of square feet)	Embodied	Energy	Transportation	Lifespan Emissions (MTCO <sub>2</sub> e)
Single-Family Home	0		98	672	792	0
Multi-Family Unit in Large Building	0		33	357	766	0
Multi-Family Unit in Small Building	0		54	681	766	0
Mobile Home	0		41	475	709	0
Education		0.0	39	646	361	0
Food Sales		0.0	39	1,541	282	0
Food Service		0.0	39	1,994	561	0
Health Care Inpatient		0.0	39	1,938	582	0
Health Care Outpatient		0.0	39	737	571	0
Lodging		0.0	39	777	117	0
Retail (Other than Mall)		0.0	39	577	247	0
Office		0.0	39	723	588	0
Public Assembly		0.0	39	733	150	0
Public Order and Safety		0.0	39	899	374	0
Religious Worship		0.0	39	339	129	0
Service		0.0	39	599	266	0
Warehouse and Storage		0.0	39	352	181	0
Other		0.0	39	1,278	257	0
Vacant		0.0	39	162	47	0
<b>TOTAL Section I Buildings</b>						<b>0</b>

Section II: Pavement						
						Emissions (MTCO <sub>2</sub> e)
Pavement (sidewalk, asphalt patch)		51,000 (SF)				2,550
Concrete Pad (50 MTCO <sub>2</sub> e/1,000 sq. ft. of pavement at a depth of 6 inches)		0				0
<b>TOTAL Section II Pavement</b>						

Section III: Construction						
						Emissions (MTCO <sub>2</sub> e)
(See detailed calculations below)						
<b>TOTAL Section III Construction</b>						<b>513</b>

Section IV: Operations and Maintenance						
						Emissions (MTCO <sub>2</sub> e)
(See detailed calculations below)						
<b>TOTAL Section IV Operations and Maintenance</b>						<b>19</b>

<b>TOTAL GREENHOUSE GAS (GHG) EMISSIONS FOR PROJECT (MTCO<sub>2</sub>e)</b>						<b>3,082</b>
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Attachment C – Greenhouse Gas Emissions Worksheet, continued

Section III: Construction Details		
Construction: Diesel		
Equipment	Diesel (gallons)	Assumptions
Backhoe/Excavator	21,100	1055 hours x 20 gallons/hour (345 hp engine)
Front-end Loader	595	85 hours x 7 gallons/hour (345 hp engine)
Vibratory Roller	80	100 hours x 0.8 gallons/hour (185 hp engine)
Asphalt Paver	225	50 hours x 4.5 gallons/hour (80 hp engine)
Asphalt Truck	296	37 round trips x 40 miles/round trip ÷ 5 mpg
Flat-bed Truck	5060	253 round trips x 100 miles/round trip ÷ 5 mpg
Dump Truck and Pup (17 cubic yard/load)	9344	584 round trips x 80 miles/round trip ÷ 5mpg
Concrete truck (10 cubic yard capacity)	1032	129 round trips x 40 miles/round trip ÷ 5mpg
Street Sweeper	144	180 hours x 0.8 gallons/hour (185 hp engine)
<b>Subtotal Diesel Gallons</b>	<b>37,876</b>	
<b>GHG Emissions in lbs CO<sub>2</sub>e</b>	<b>1,005,608</b>	26.55 lbs CO <sub>2</sub> e per gallon of diesel
<b>GHG Emissions in metric tons CO<sub>2</sub>e</b>	<b>456</b>	1,000 lbs = 0.45359237 metric tons

Construction: Gasoline		
Equipment	Gasoline (gallons)	Assumptions
Pick-up Trucks or Crew Vans	4,000	200 workdays x 10 trucks x 1 round-trip/day x 40 miles/round-trip ÷ 20 mpg
Misc Hand equipment	1,200	200 workdays x 10 hours x 2 pieces of equipment x 0.3 gal/hour
<b>Subtotal Gasoline Gallons</b>	<b>5,200</b>	
<b>GHG Emissions in lbs CO<sub>2</sub>e</b>	<b>126,360</b>	24.3 lbs CO <sub>2</sub> e per gallon of gasoline
<b>GHG Emissions in metric tons CO<sub>2</sub>e</b>	<b>57</b>	1,000 lbs = 0.45359237 metric tons

Construction Summary		
Activity	CO <sub>2</sub> e in pounds	CO <sub>2</sub> e in metric tons
Diesel	1,005,608	456
Gasoline	126,360	57
<b>Total for Construction</b>	<b>1,131,968</b>	<b>513</b>

Section IV: Long-Term Operations and Maintenance Details		
Operations and Maintenance:		
Diesel		
Equipment	Diesel (gallons)	Assumptions

**Venema Creek Natural Drainage System  
SEPA Environmental Checklist**

Emergency Operation	40	10 events (every 5 years for 50 years) x 1 round-trip/event x 20 miles/round-trip ÷ 5 mpg
Maintenance Operation	800	200 events (four times annually for 50 years) x 1 round-trip/event x 20 miles/round-trip ÷ 5 mpg
<b>Subtotal Diesel Gallons</b>	<b>840</b>	
<b>GHG Emissions in lbs CO<sub>2</sub>e</b>	<b>22,302</b>	26.55 lbs CO <sub>2</sub> e per gallon of diesel
<b>GHG Emissions in metric tons CO<sub>2</sub>e</b>	<b>10</b>	1,000 lbs = 0.45359237 metric tons

<b>Operations and Maintenance: Gasoline</b>		
<b>Equipment</b>	<b>Gasoline (gallons)</b>	<b>Assumptions</b>
Pick-up Trucks or Crew Vans	800	200 events (four times annually for 50 years) x 1 round-trip/event x 20 miles/round-trip ÷ 5 mpg
<b>Subtotal Gasoline Gallons</b>	<b>800</b>	
<b>GHG Emissions in lbs CO<sub>2</sub>e</b>	<b>19,440</b>	24.3 lbs CO <sub>2</sub> e per gallon of gasoline
<b>GHG Emissions in metric tons CO<sub>2</sub>e</b>	<b>9</b>	1,000 lbs = 0.45359237 metric tons

<b>Operations and Maintenance Summary</b>			
<b>Activity</b>		<b>CO<sub>2</sub>e in pounds</b>	<b>CO<sub>2</sub>e in metric tons</b>
Diesel		<b>22,302</b>	<b>10</b>
Gasoline		<b>19,440</b>	<b>9</b>
<b>Total for Operations and Maintenance</b>		<b>41,742</b>	<b>19</b>