



Perrinville Creek Stormwater Management Action Plan

City of Edmonds

Prepared for
City of Edmonds

Prepared by
Herrera Environmental Consultants, Inc.



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Prepared for
City of Edmonds
121 5th Avenue North
Edmonds, Washington 98020

Prepared by
Herrera Environmental Consultants, Inc.
2200 Sixth Avenue, Suite 1100
Seattle, Washington 98121
Telephone: 206-441-9080

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PURPOSE

The City of Edmonds (City) Perrinville Creek Watershed Stormwater Management Action Plan (SMAP) is prepared to meet the requirements of S5.C.1.d.iii of the 2019–2024 Western Washington Phase II National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater Permit (Phase II Permit) issued by the Washington State Department of Ecology (Ecology).

The SMAP is organized according to the permit language and identifies the following for the high priority catchment located in the Perrinville Creek watershed:

- A description of the stormwater facility retrofits needed for the area, including the best management practice (BMP) types and preferred locations.
- Land management/development strategies and/or actions identified for water quality management.
- Targeted, enhanced, or customized implementation of stormwater management actions related to Phase II Permit section S5, including:
 - Illicit discharge detection and elimination (IDDE) field screening,
 - Prioritization of source control inspections,
 - Operations and maintenance (O&M) inspections or enhanced maintenance, or
 - Public education and outreach behavior change programs.
- If applicable, identification of changes needed to local long-range plans, to address SMAP priorities.
- A proposed implementation schedule and budget sources for:
 - Short-term actions (i.e., actions to be accomplished within 6 years), and
 - Long-term actions (i.e., actions to be accomplished within 7 to 20 years).
- A process and schedule to provide future assessment and feedback to improve the planning process and implementation of procedures or projects.

BACKGROUND

The City completed the *City of Edmonds Receiving Water Conditions and Stormwater Management Influence Assessment* on March 21, 2022 with a supplemental short addendum on June 2022 (Herrera 2022a) and the *City of Edmonds Receiving Water Prioritization* on June 27, 2022 (Herrera 2022b). A [Stormwater Management Action Planning web page](#) and [StoryMap](#) were developed in January–February 2022 and updated in February 2023. This SMAP is developed based on the findings of the watershed inventory and prioritization process conducted in 2022 and public input received in 2023. The watershed data and analysis conducted to prepare this SMAP will serve to better understand stormwater pressures upon receiving waters.

WATERSHED PRIORITIZATION SUMMARY

Step 1 of the watershed assessment and prioritization process was to identify appropriately sized watersheds and then refine the list of candidate watersheds. The process started with nine watersheds which are depicted in Figure 1. Three watersheds (Deer Creek, Lund’s Gulch, and Southwest Edmonds) had 4 percent or less of their area under City jurisdiction and therefore these were removed from further consideration, leaving six candidate watersheds to evaluate in Step 2:

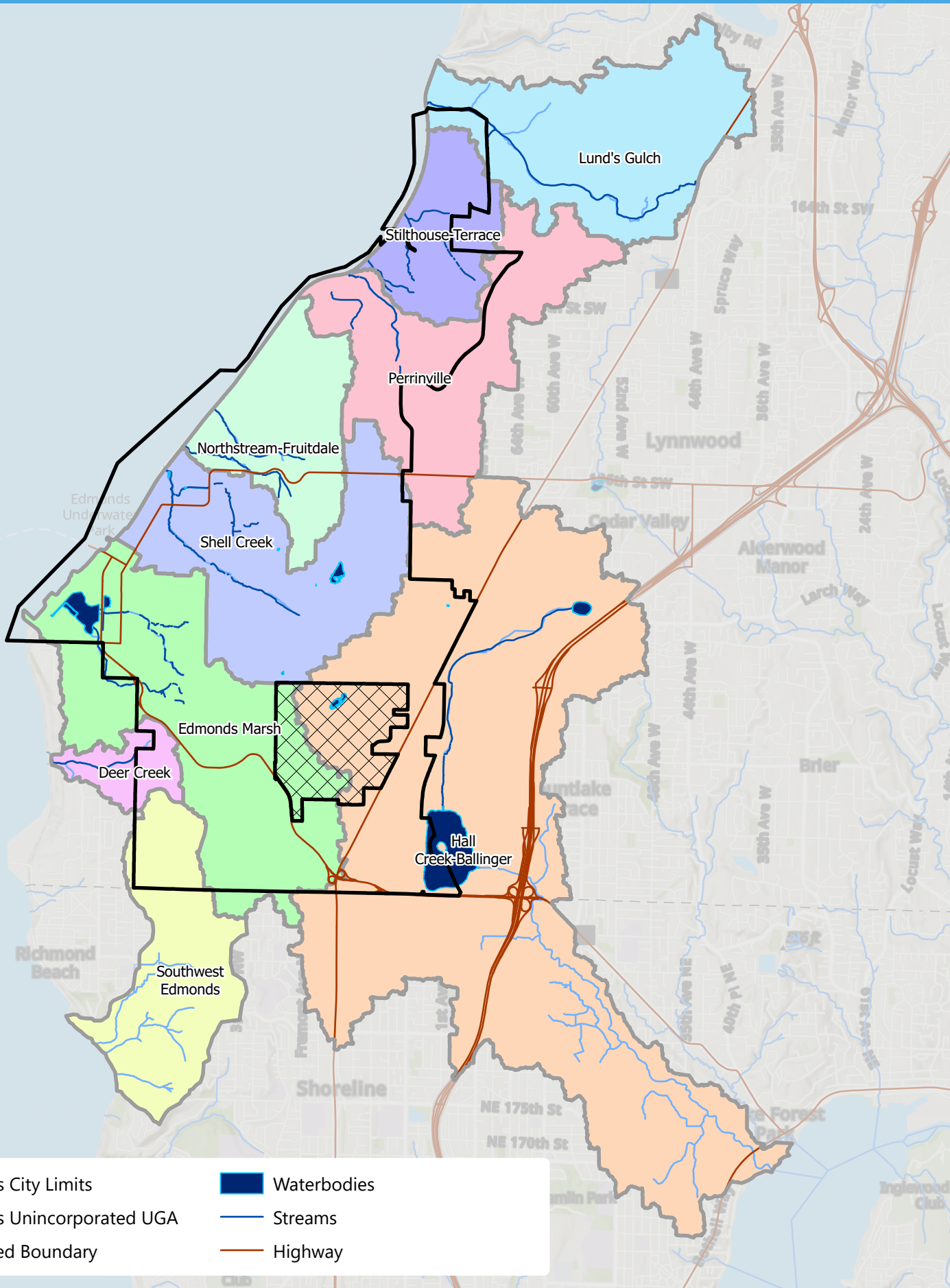
- Edmonds Marsh
- Hall Creek-Lake Ballinger
- Northstream-Fruitdale Creeks
- Perrinville Creek
- Shell Creek
- Stilthouse-Terrace Creeks

In Step 2, the remaining six candidate watersheds were evaluated using qualitative metrics from the receiving water assessment (Herrera 2022a). Metrics represented three categories: water use importance, development and future growth, and water and habitat conditions. Through the scoring process, four candidate watersheds emerged as higher priority, specifically for restoration, and were carried forward to Step 3:

- Edmonds Marsh
- Hall Creek-Lake Ballinger
- Perrinville Creek
- Shell Creek

Step 3 involved applying a second group of metrics to the four remaining candidate watersheds: public input, social equity, and support of existing plans and projects. As a result of this final step, the Perrinville Creek watershed was selected as the highest priority watershed for restoration.

Figure 1.
City of Edmonds Watersheds.



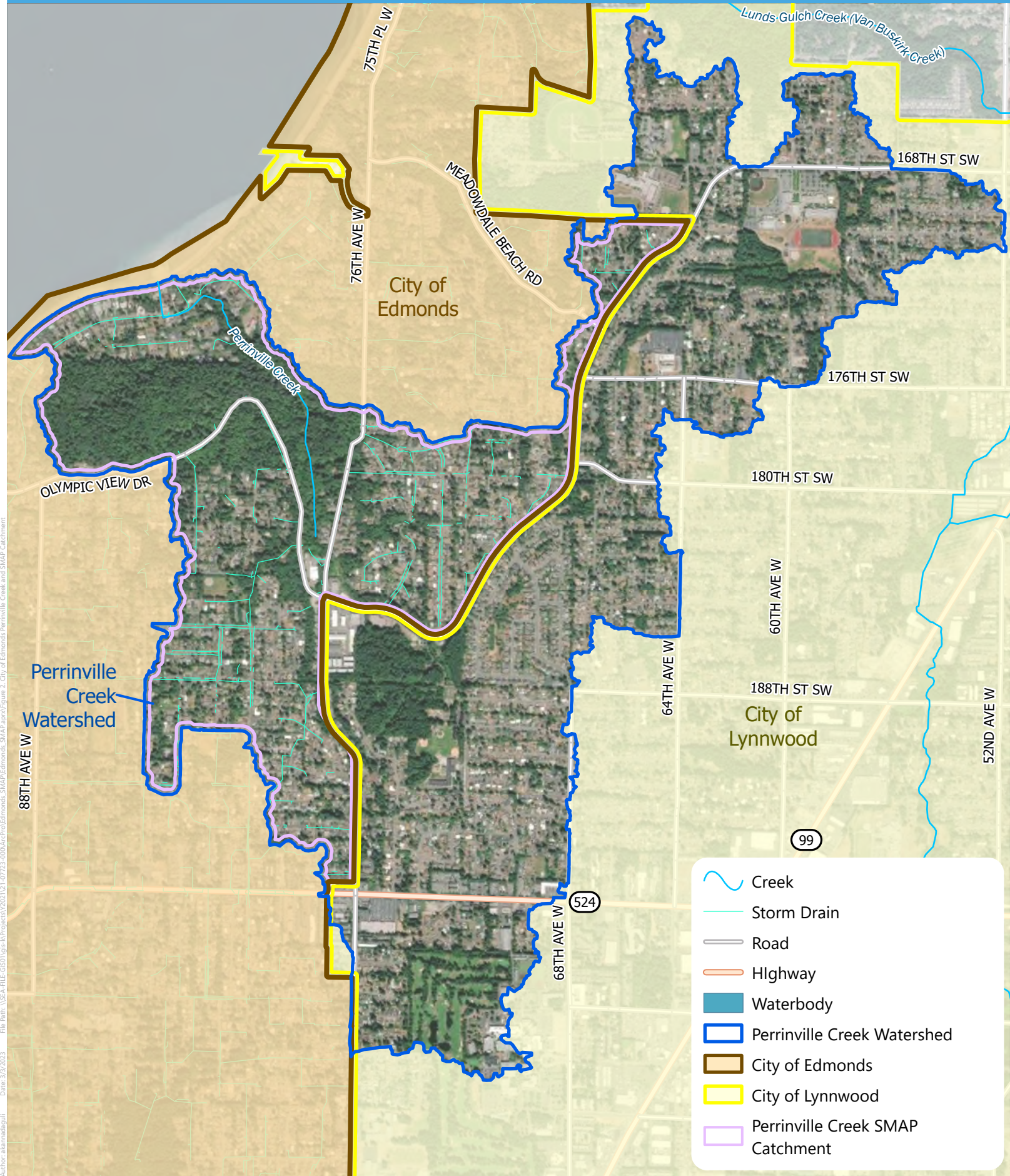
- Edmonds City Limits
- Edmonds Unincorporated UGA
- Watershed Boundary
- Waterbodies
- Streams
- Highway

The Perrinville Creek watershed was selected as the highest priority watershed based on the following characteristics:

- High water use importance:
 - Potential to support salmon species including coho and resident coastal cutthroat trout
 - Supports forage fish spawning areas at the Puget Sound nearshore
 - Provides a high level of public access to receiving waters
- Low level of existing and future development:
 - Low watershed impervious cover
 - Low percentage of development in the stream riparian buffer
 - Low expected population growth
- Good water and habitat condition
- Moderate jurisdictional control
- Support of social equity considerations
- Support existing stormwater retrofit projects
- High level of public support

The portion of the Perrinville Creek watershed that lies within the City limits is 541 acres, thus the full watershed within the city limits was selected as the catchment area for development of the SMAP since Ecology's guidance recommends a catchment that is approximately 400 to 600 acres (Ecology 2019). Figure 2 depicts the Perrinville Creek watershed and catchment that will be the focus of the SMAP.

Figure 2.
City of Edmonds Perrinville Creek and SMAP Catchment.



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 Date: 3/2/2023
 Author: alamedadgull

STORMWATER MANAGEMENT ACTIONS

Process to Identify Stormwater Management Actions

Stormwater management actions considered by the project team included projects, policies or programs to enhance infiltration, improve control of erosive flows, reduce excess flooding, reduce excess sediment transport and reduce bacterial pollution. City staff were actively involved in action identification, prioritization, implementation schedule, and identifying funding sources through meetings and field evaluation. The project [StoryMap](#) was updated, a public survey posted, and two public workshops were held in February 2023 (see the Summary of Public Input section of this SMAP for additional detail). Public input was solicited for prioritizing land management actions and program enhancements, identifying additional actions, and identifying areas with uncontrolled stormwater to inform future projects in the watershed.

Stormwater management actions were identified in three categories:

- **Strategic stormwater retrofit projects (RP):** These projects typically involve design and construction of a new stormwater facility or expansion/upgrade of an existing facility, to address existing development. Projects encourage infiltration or flow control and may include a water quality treatment component.
- **Land management strategies (LM):** Programs, policies or studies targeting methods to improve or protect lands that are of high value or lands that can be converted to improve water quality or encourage infiltration or flow control.
- **Stormwater management program enhancements (SE):** Actions integrated with existing Phase II Permit programs that supplement permit requirements to reduce pollutants, encourage infiltration and reduce erosive flows.

Strategic Stormwater Retrofit Projects

Two retrofit projects were identified in the Perrinville Creek watershed:

- RP-1. Perrinville 1 Neighborhood Scale Retrofit Feasibility Analysis and Community Outreach
- RP-2. Perrinville 2 Neighborhood Scale Retrofit Feasibility Analysis and Community Outreach

The project locations are depicted in Figure 3. The project name, description and BMP type are shown in Table 1. Detailed project summary sheets are in found Appendix A.

Table 1. City of Edmonds Perrinville Creek Watershed Stormwater Retrofit Projects.

Project	Description	BMP Type
RP-1. Perrinville 1 Neighborhood Retrofit Feasibility Analysis	Conduct community outreach, hydrologic investigation, feasibility evaluation and concept development for bioretention facilities at 179th St., Olympic View Dr., Ridge Way and 72nd Ave.	Bioretention
RP-2. Perrinville 2 Neighborhood Retrofit Feasibility Analysis	Conduct community outreach, hydrologic investigation, feasibility evaluation and concept development for bioretention facilities at 188th St., 196th St., and 76th Ave.	Bioretention

RP = retrofit project, BMP = best management practice

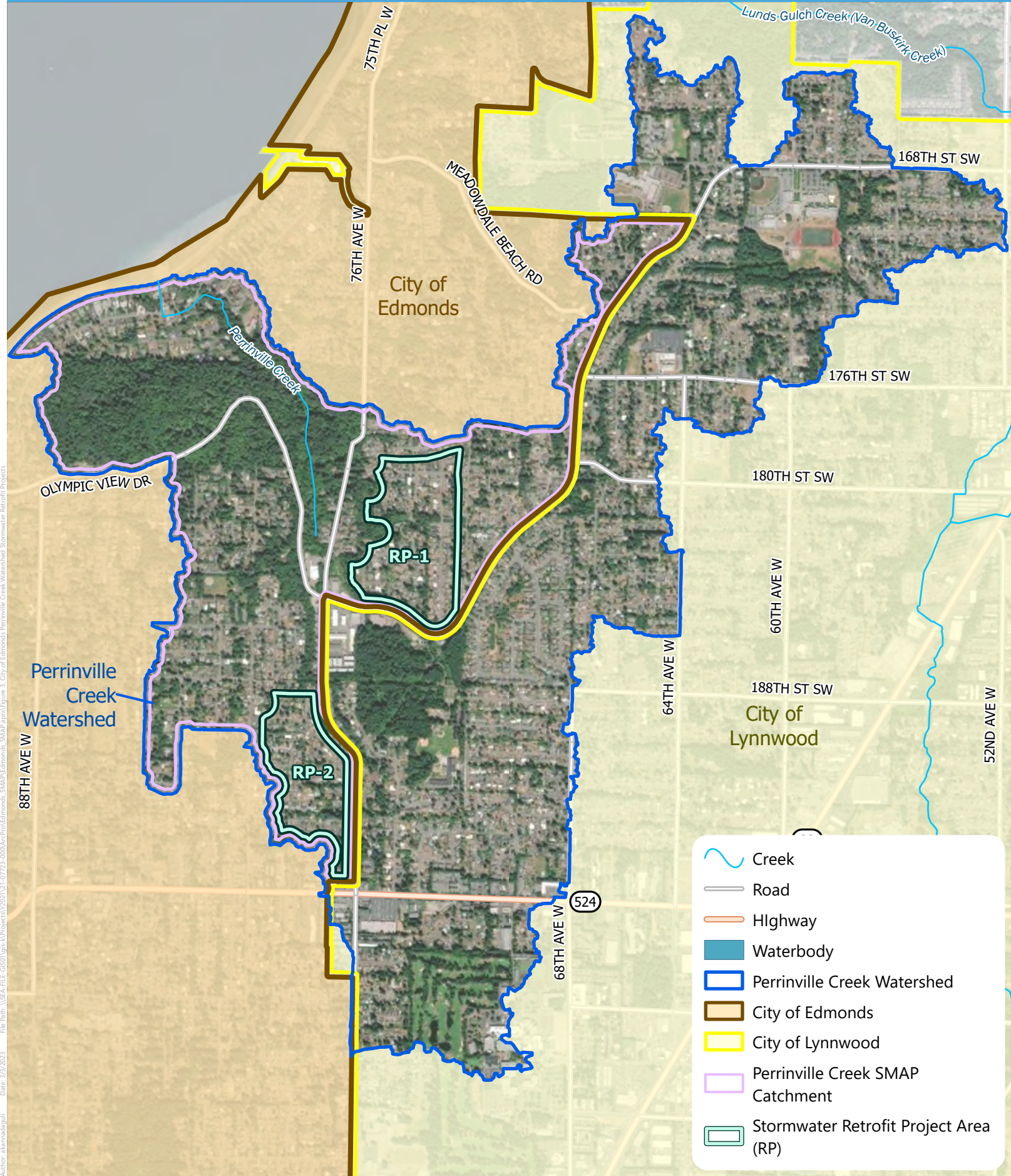
Land Management Strategies

Land management strategies were identified and prioritized based upon implementation feasibility and their potential to improve receiving water condition.

Four land management strategies were identified in the Perrinville Creek watershed:

- LM-1. Strengthen stormwater design requirements for redevelopment
- LM-2. Work with the City of Lynnwood to find ways to control runoff from existing development in Lynnwood’s portion of the watershed
- LM-3. Identify hard surface areas (such as sections of parking lots or other paved areas) that are no longer of service to the property owner where pavement could be removed
- LM-4. Provide technical assistance to streamside landowners regarding improving streams and/or runoff on their property

Table 2 presents each land management strategy and a detailed description.



- Creek
- Road
- Highway
- Waterbody
- Perrinville Creek Watershed
- City of Edmonds
- City of Lynnwood
- Perrinville Creek SMAP Catchment
- Stormwater Retrofit Project Area (RP)

File Path: \\SEA-FILE-60501\gis-k\Projects\2021\21-07723-000\ArcPro\Edmonds_SMAP.aprx | Figure 3. City of Edmonds Perrinville Creek Watershed Stormwater Retrofit Projects
 Date: 3/2/2023
 Author: alamadagull

Table 2. City of Edmonds Perrinville Creek Watershed Land Management Strategies.

Strategy	Description
LM-1. Strengthen stormwater design requirements for redevelopment	Current City code requires 50% retrofit on “remaining” hard surfaces during redevelopment. Consider revising code to increase this retrofit requirement to 75%. Consider stricter flow control standards than what is in the current code for new and redevelopment projects.
LM-2. Work with the City of Lynnwood to find ways to control runoff from existing development in Lynnwood’s portion of the watershed	Excluding areas that infiltrate or drain directly to Puget Sound, over 70% of the area draining to Perrinville Creek is located in the City of Lynnwood. Identify opportunities to build support for increased coordination to address flow control in the upper Perrinville Creek watershed.
LM-3. Identify hard surface areas (such as sections of parking lots or other paved areas) that are no longer of service to the property owner where pavement could be removed	Conduct evaluation of locations and high-level feasibility of areas as candidates for pavement removal and replacement with pervious surfaces and/or techniques to encourage infiltration. Identify potential cooperative projects and initiate discussion with landowners.
LM-4. Provide technical assistance to streamside landowners regarding improving streams and/or runoff on their property	Create a 3-year pilot program to develop educational resources, conduct outreach, and implement “boots on the ground” technical assistance to support streamside private property landowners with managing their land for the benefit of the stream.

LM = Land Management Strategy

Stormwater Program Enhancements

The City conducts a number of activities for compliance with the Phase II Permit. These include activities associated with IDDE, Source Control, Operations and Maintenance, and Public Education and Outreach. This section describes enhancements related to two permit sections: operations and maintenance (S5.C7) and public education and outreach (S5.C.2) for the Perrinville Creek watershed. No actions related to IDDE or source control programs were identified.

Operations and Maintenance

The Phase II Permit requires the City to inspect all City-owned or operated catch basins and inlets every two years and clean if inspection indicates that cleaning is needed. Additional provisions exist for reduced cleaning based upon inspection. In the Perrinville Creek watershed, the City identified the following action:

- SE-1. Continue to train City staff on green stormwater facility maintenance practices

Public Education and Outreach

The Phase II Permit requires the City to implement public education and outreach programs in order to build awareness, foster behavior change, and provide stewardship opportunities related to water resource protection. In the Perrinville Creek watershed, the City identified the following actions:

- SE-2. Provide workshops and technical assistance for constructing rain gardens
- SE-3. Conduct annual public rain barrel event
- SE-4. Implement a social media campaign to promote pet waste pickup
- SE-5. Develop and implement a natural yard care program

Table 3 summarizes the Phase II Permit section reference, identified action, and description.

Table 3. City of Edmonds Perrinville Creek Watershed Stormwater Program Enhancements.		
Permit Section	Action	Description
Operations and Maintenance (S5.C.7)	SE-1. Continue to train City staff on green stormwater facility maintenance practices	Maintained green stormwater facilities will result in optimum water quality treatment and flow control of the designed system.
Public Education and Outreach (S5.C.2)	SE-2. Provide workshops and technical assistance for constructing rain gardens	Work with property owners of developed lots to encourage rain gardens or other infiltration methods to reduce runoff. Partner with the Snohomish Conservation District to implement.
	SE-3. Conduct annual public rain barrel event	This event provides an opportunity for community members to purchase a low-cost rain barrel and learn about conserving water resources and stormwater runoff. Partner with the Snohomish Conservation District to implement.
	SE-4. Implement a social media campaign to promote pet waste pickup	Conduct messaging encouraging pet waste pick up for clean water and clean shoes.
	SE-5. Develop and implement a natural yard care program	Promote natural yard care through social media and other educational materials encouraging less use of fertilizers and chemicals.

SP = Stormwater Management Program Enhancement

CHANGES TO LONG RANGE PLANS

Identified actions will be considered for incorporation into the 2023-2024 stormwater comprehensive plan update and the City 2024 Comprehensive Plan periodic update based upon public input, future anticipated 2024-2029 Phase II Permit requirements, and City Council decisions.

SUMMARY OF PUBLIC INPUT

The City conducted outreach to inform and solicit input using a [Stormwater Management Action Planning web page](#) and several workshops. The project web page and StoryMap summarize the permit requirements, provide access to project documents, summarize the prioritization process, and highlight the identified stormwater management actions included in this SMAP. Two virtual public workshops were advertised through the City's listserv, website, direct email to stakeholders and interested citizens, and a postcard mailed to addresses in the Edmonds portion of the Perrinville Creek watershed. Two 1-hour virtual workshops covering the same content were held February 22, 2023 at 12:00 pm and 6:00 pm. A total of 39 attendees participated in the workshops (21 attendees at the 12:00 pm workshop and 18 attendees at the 6:00 pm workshop). A total of 13 responses were received from the public input survey, which may include multiple responses from an individual (i.e., surveys are anonymous, and no restriction was placed on multiple entries). The workshop materials and a recording of the presentation can be found on the City's [Stormwater Management Action Planning web page](#). A summary of the public survey input is included in Appendix B.

Workshop attendees were asked to select the top three stormwater management actions from a combined list of land management strategies and stormwater program enhancements (a total of nine stormwater management actions). The results showed a high level of support for three out of the four land management strategies included in Table 2:

- LM-1. Strengthen stormwater design requirements for redevelopment
- LM-2. Work with the City of Lynnwood to find ways to control runoff from existing development in Lynnwood's portion of the watershed
- LM-3. Identify hard surface areas (such as sections of parking lots or other paved areas) that are no longer of service to the property owner where pavement could be removed

The results also showed a moderate level of support for the remaining land management strategy included in Table 2 and two out of the five stormwater program enhancements included in Table 3:

- LM-4. Provide technical assistance to streamside landowners regarding improving streams and/or runoff on their property
- SE-2. Provide workshops and technical assistance for constructing rain gardens
- SE-5. Develop and implement a natural yard care program

The public input survey (on the project web page) asked respondents to rank the list of land management strategies and stormwater program enhancements separately. Survey respondents were asked two additional questions:

1. *List other strategies or actions the City could consider to improve conditions in Perrinville Creek.*

2. Add other areas in the Perrinville Creek watershed where you've seen uncontrolled and damaging stormwater runoff, for consideration of potential stormwater facility retrofit projects by pinning the location on the map provided.

When survey participants were asked to *Rank the proposed land management strategies in order of importance*, the strategy that received the highest average score was:

- LM-2. Work with the City of Lynnwood to find ways to control runoff from existing development in Lynnwood’s portion of the watershed

Average scores from 11 participants for each proposed land management strategy are summarized in Figure 4. Two survey participants skipped this ranking question.

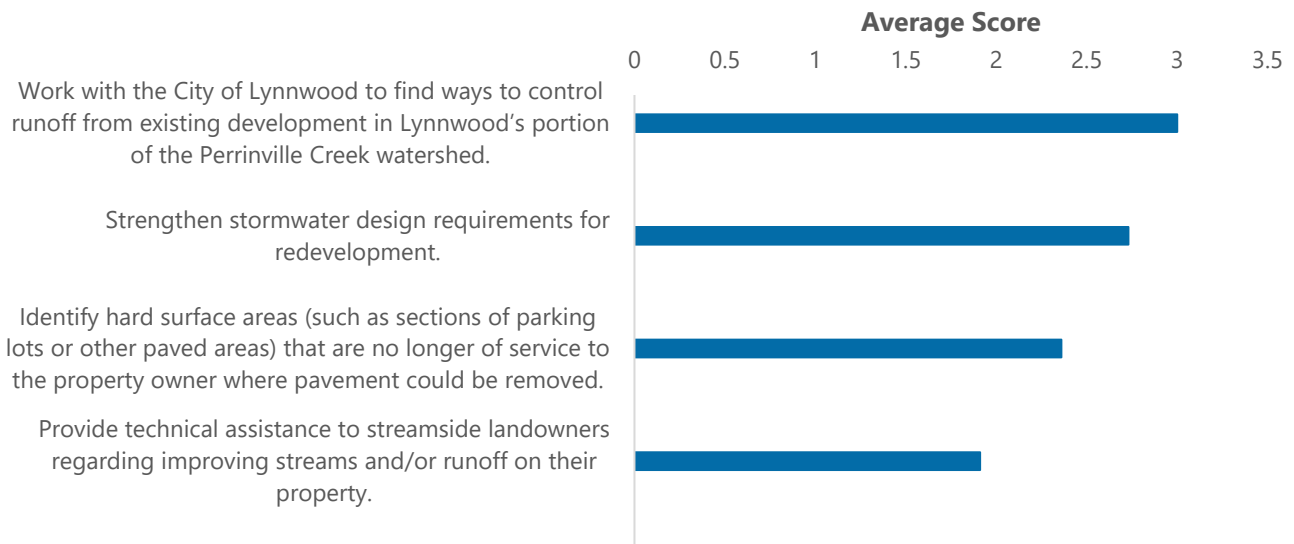


Figure 4. Results from the Public Survey Question on Ranking Proposed Land Management Strategies.

When survey participants were asked to *Rank the proposed stormwater program enhancement actions in order of importance*, the strategy that received the highest average score was:

- SE-1. Continue to train City staff on green stormwater facility maintenance practices

Average scores from 11 participants for each proposed stormwater program enhancement action are summarized in Figure 5. Two survey participants skipped this ranking question.

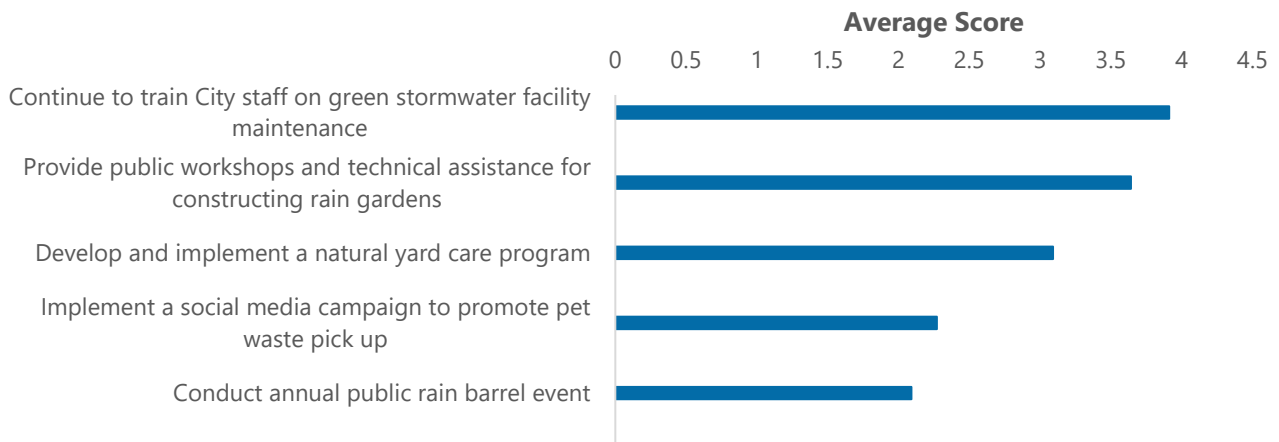


Figure 5. Results from the Public Survey Question on Ranking Proposed Stormwater Program Enhancement Actions.

A variety of comments were received from survey participants regarding other strategies or actions the City could consider to improve conditions in Perrinville Creek. Several comments relate to in-stream work that is not the focus of this SMAP. Other comments express a need for additional stormwater facilities and proposed locations for new facilities or retrofits of older facilities. A subset of comments is listed below and all comments are included in Appendix B:

- Larger scale infiltration facilities utilizing [underground injection controls] UICs and having small footprints have been shown feasible and highly beneficial in parts of the watershed: Seaview Park (Phases 1 and 2), Lynndale Elementary School. There are several existing detention facilities along the Olympic View Drive corridor in Lynnwood which could be modified to promote infiltration.
- Request Lynnwood actively participate in addressing and funding the stormwater damage caused to Perrinville Creek.
- Other than [technical assistance] TA for rain gardens, I doubt the other enhancement actions will bear many results for the effort.

The City’s initial responses to these comments are also included in Appendix B.

Survey participants were also invited to put points on a map indicating areas in the Perrinville Creek watershed where uncontrolled and damaging stormwater runoff has been observed. A map of pinned locations is included as Figure B-1 in Appendix B. Several points are clustered in one area on a residential street, which indicates that those points may not have been adjusted from the default point included on the map.

The City will continue to inform the public during implementation of the SMAP. Public input and future Phase II Permit requirements will be considered during SMAP implementation.

PROPOSED IMPLEMENTATION SCHEDULE AND BUDGET SOURCES

For each action, the City identified whether the action would be implemented in the short-term (accomplished within 6 years) or long-term (accomplished within 7 to 20 years). Short-term is assumed to be 2024-2030 and long-term is assumed to be 2031-2044, and is dependent on the requirements in the Phase II Permit reissuance on August 1, 2024.

The proposed budget source for a majority of the stormwater management actions is the existing stormwater utility fund, with the exception of the stormwater retrofit projects. Stormwater retrofit projects may be included in the future stormwater comprehensive plan update and incorporated into capital project planning. Future Phase II Permit requirements for stormwater facility retrofits will be reviewed and apply to capital project planning.

Table 4 identifies the proposed implementation and potential budget sources for each action.

Appendix C summarizes the cost estimate and assumptions for short-term actions (Table C-1) and long-term actions (Table C-2). The cost estimates and assumptions are in 2023 dollars and designed to inform the potential impact to the City stormwater funds of future anticipated Phase II Permit requirements.

Table 4. City of Edmonds Stormwater Management Actions Schedule and Budget Sources.

Action	Schedule		Budget Source
	Implement 2024–2030 Short-term	Implement 2031–2044 Long-term	
RP-1. Perrinville 1 Neighborhood Scale Retrofit Feasibility Analysis and Community Outreach	✓		Not determined
RP-2. Perrinville 2 Neighborhood Scale Retrofit Feasibility Analysis and Community Outreach	✓		Not determined
LM-1. Strengthen stormwater design requirements for redevelopment	✓		Existing stormwater utility fund
LM-2. Work with the City of Lynnwood to find ways to control runoff from existing development in Lynnwood’s portion of the watershed	✓	✓	Existing stormwater utility fund
LM-3. Identify hard surface areas that are no longer of service to the property owner where pavement could be removed	✓		Existing stormwater utility fund
LM-4. Provide technical assistance to streamside landowners regarding improving streams and/or runoff on their property	✓	✓	Existing stormwater utility fund
SE-1. Continue to train City staff on green stormwater facility maintenance practices	✓		Existing stormwater utility fund
SE-2. Provide workshops and technical assistance for constructing rain gardens	✓		Existing stormwater utility fund
SE-3. Conduct annual public rain barrel event	✓	✓	Existing stormwater utility fund
SE-4. Implement a social media campaign to promote pet waste pickup	✓		Existing stormwater utility fund
SE-5. Develop and implement a natural yard care program	✓		Existing stormwater utility fund

RP = Retrofit Project, LM = Land Management Strategy, SP = Stormwater Management Program Enhancement



FUTURE ASSESSMENT AND FEEDBACK

This SMAP identifies and describes retrofit projects, land management strategies, and enhanced stormwater management actions that are intended to protect or enhance Perrinville Creek. The City will assess implementation of this SMAP by tracking project implementation and program effectiveness. The City will use the results of this assessment to adjust SMAP implementation over time.

Retrofit projects will be reviewed and tracked as part of capital project planning and budgeting. More detailed stormwater program assessment, capital project planning, and financial analysis will occur on a 6-year cycle as part of comprehensive planning and provide an additional opportunity for tracking.

Progress on land management strategies will be assessed annually and staff allocation will be shifted as needed to meet implementation goals.

Stormwater program activities will be reviewed annually during Phase II Permit reporting and staff and budget allocation will be shifted as needed to meet implementation goals.

REFERENCES

Ecology. 2019. Stormwater Management Action Planning Guidance. Washington Department of Ecology-Water Quality Program. Publication Number 19-10-010.

Herrera. 2022a. City of Edmonds Receiving Water Conditions and Stormwater Management Influence Assessment. Prepared for the City of Edmonds by Herrera Environmental Consultants, Seattle, Washington. March 21. Addendum prepared June 28, 2022.

Herrera. 2022b. City of Edmonds Receiving Water Prioritization. Prepared for the City of Edmonds by Herrera Environmental Consultants, Seattle, Washington. June 27.

Note:

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APPENDIX A

Project Summary Sheets

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PERRINVILLE CREEK WATER QUALITY RETROFIT

Perrinville 1 Neighborhood Scale Retrofit Feasibility Analysis and Community Outreach

Existing Site Map



Location

Perrinville 1 (approximately 71 acres) consists of neighborhood streets bounded between 179th Street (northern extent), Olympic View Drive (southern extent), the ravine west of Ridge Way (western extent), and 72nd Avenue (eastern extent).

Opportunity

Runoff from this neighborhood area drains into Perrinville Creek, where erosive flows are a major concern. Neighborhood streets have unimproved right-of-way (ROW) areas along the edge of street pavement that are a mixture of gravel, grass, and landscaping. Existing conveyance includes ditches and culverts. Piped storm drain conveyance is present in some portions of the neighborhood. Although slopes are too steep for green infrastructure in some ROW locations, there may be several opportunities to reduce erosive flows and support infiltration prior to entering Perrinville Creek. To date, this neighborhood has not received City investment in green infrastructure.

Benefits

Future bioretention projects in this neighborhood would help reduce flows to Perrinville Creek while also improving water quality, increasing stormwater educational opportunities, and providing aesthetic benefits in an area that historically has not received green infrastructure investments.

Site Considerations

Underlying soils are Vashon glacial till, which overlays more permeable Vashon advance outwash at depths of 5 to 40+ feet. Perched groundwater was identified below the till soils in one boring in Perrinville 1 and slopes are also steep in many sections of the ROW. Given the variability in site characteristics, detailed infiltration testing and hydrogeologic analyses will be needed to determine which sites and BMP configurations will be most effective for promoting detention and infiltration.

Existing Conditions Photos



Existing stormwater drainage ditches in the ROW could be retrofitted to provide water quality treatment and infiltration.



The neighborhood has many gravel ROW areas.



This is an example of a large grassy area in the ROW at a topographic low.

PERRINVILLE CREEK WATER QUALITY RETROFIT

Perrinville 1 Neighborhood Scale Retrofit Feasibility Analysis and Community Outreach

Concept Site Plan



Project Description

For the 3.05 acres of potentially suitable ROW area (green), conduct community outreach and a feasibility analysis to prepare for future green infrastructure projects in the neighborhood:

- Secure grant funding for community engagement and feasibility evaluation.
- Develop a community outreach plan and engage neighborhood residents to help identify desired project locations in the ROW.
- Investigate hydrogeologic conditions, given the potential for perched groundwater below the till, to identify suitable locations.
- Apply the results of the feasibility evaluation and hydrogeologic investigation to prioritize sites with the highest level of community support and greatest cost-benefit.
- Develop conceptual designs in anticipation of final design and construction.
- Apply for grants to fund design and construction.

Bioretention could be used for water quality treatment, coupled with either detention and/or infiltration, depending on site conditions. Detention could be constructed using detention pipes, detention chambers, or modular suspended pavement systems. Infiltration could take the form of infiltration trenches, pit drains, or drilled drains, depending on the location, depth to till, and presence of an unsaturated receptor layer.

Cost

The adjacent table summarizes planning-level cost estimates for Perrinville 1. Cost estimates assume that the project will occur concurrently with Perrinville 2 and share tasks. Costs would be higher if the projects are conducted separately.

Project Task	Cost Estimate (2023 Dollars)
Community Engagement	\$50,000
Hydrogeologic Investigation*	\$126,800
Feasibility Evaluation*	\$109,900
Concept Development*	\$40,300
Total	\$327,000

* Indicates costs based on the Stormwater Retrofit Feasibility grant application, with costs split evenly with Perrinville 2.

Design Precedents



Barton Roadside Rain Gardens

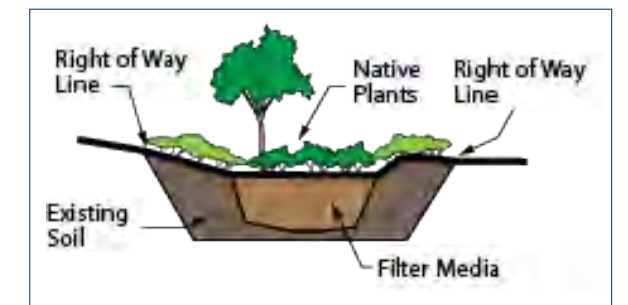
West Seattle, WA

- Neighborhood-scale retrofit
- Connected to deep well for infiltration



Bioretention with Silva Cells

- Suspended pavement system traps and stores water
- Bioretention and trees provide aesthetic benefits



Bioretention Concept Diagram

- Bioretention in ROW
- Incorporates native plants

PERRINVILLE CREEK WATER QUALITY RETROFIT

Perrinville 2 Neighborhood Scale Retrofit Feasibility Analysis and Community Outreach

Location

Perrinville 2 (approximately 55 acres) consists of neighborhood streets bounded by 188th Street (northern extent), 196th Street (southern extent), the Perrinville Creek watershed boundary (western extent, excluding the area that drains to the Seaview Park stormwater facility), and 76th Avenue (eastern extent).

Opportunity

Runoff from this neighborhood area drains into Perrinville Creek, where erosive flows are a major concern. Neighborhood streets have unimproved right-of-way (ROW) areas along the edge of street pavement that are a mixture of gravel, grass, and landscaping. Existing conveyance includes ditches and culverts. Piped storm drain conveyance is present in some portions of the neighborhood. Although slopes are too steep for green infrastructure in some ROW locations, there may be several opportunities to reduce erosive flows and support infiltration prior to entering Perrinville Creek.

Residential rain gardens are present within the Perrinville 2 project area. Another neighborhood located south of Perrinville 2, in the southern portion of the Perrinville Creek watershed, has also been the focus of rain garden retrofit projects within its ROW. These existing local projects indicate there is potential for additional, community supported, green infrastructure projects.

Benefits

Future bioretention projects in this neighborhood would help reduce flows to Perrinville Creek while also improving water quality, increasing stormwater educational opportunities, and providing aesthetic benefits.

Site Considerations

Underlying soils are Vashon advance outwash in some areas. In other areas, 5 to 20+ feet of Vashon glacial till overlies the more permeable Vashon advance outwash. Given the variability in site characteristics, detailed infiltration testing and hydrogeologic analyses will be needed to determine which sites and BMP configurations will be most effective for promoting detention and infiltration.

Existing Conditions Photos



The neighborhood has many gravel ROW areas that could be retrofitted for infiltration.

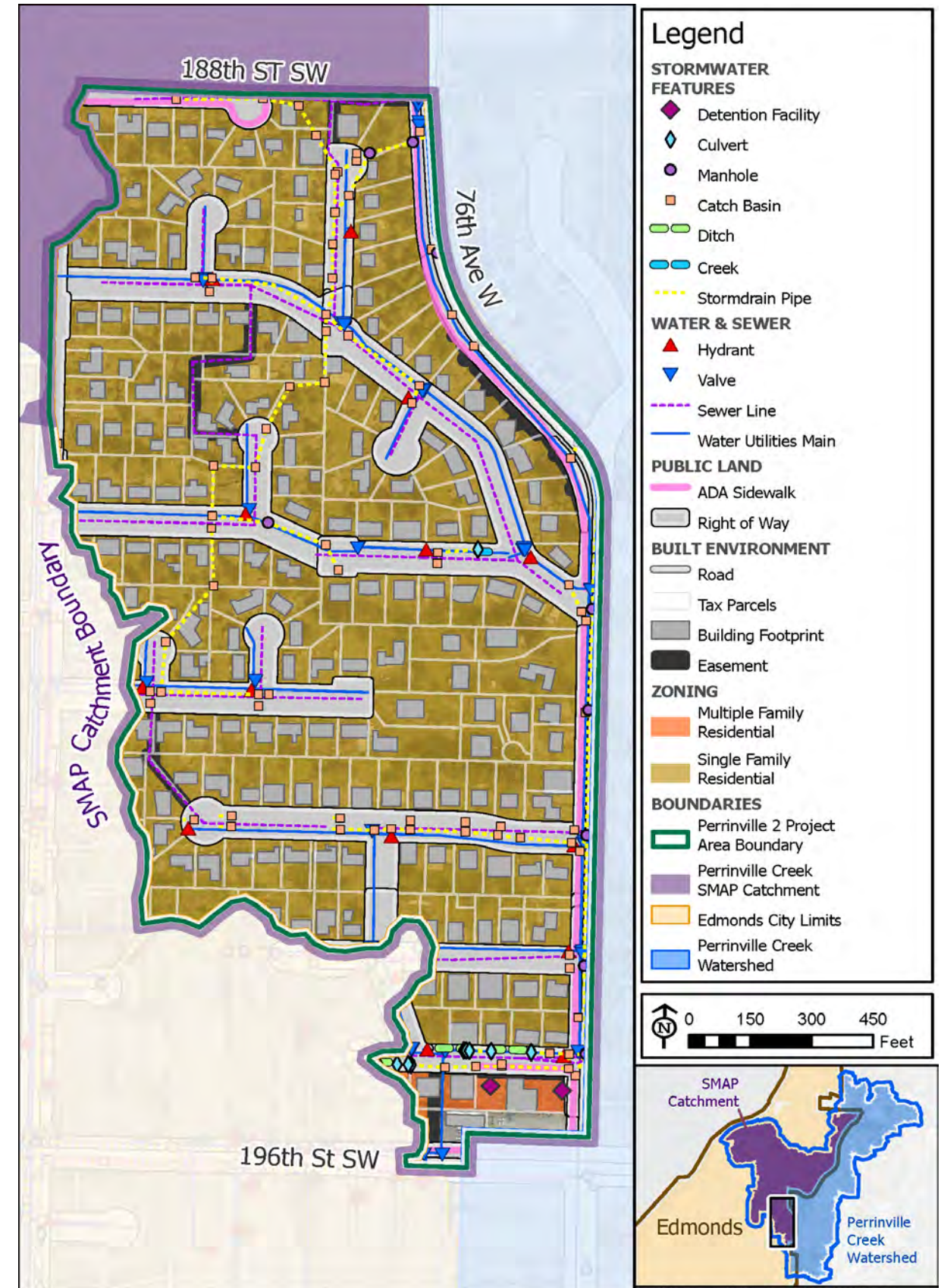


Section of 191st St SW with excess pavement that could be removed and retrofitted with bioretention.



The neighborhood has many grassy ROW areas that could be retrofitted for infiltration.

Existing Site Map



PERRINVILLE CREEK WATER QUALITY RETROFIT

Perrinville 2 Neighborhood Scale Retrofit Feasibility Analysis and Community Outreach

Project Description

For the 3.38 acres of potentially suitable ROW area (green), Conduct community outreach and a feasibility analysis to prepare for future green infrastructure projects in the neighborhood:

- Secure grant funding for community engagement and feasibility evaluation.
- Develop a community outreach plan and engage neighborhood residents to help identify project locations in the ROW.
- Investigate hydrogeologic conditions, given the potential for high groundwater levels, to identify suitable locations.
- Apply the results of the feasibility evaluation and hydrogeologic investigation to prioritize sites with the highest level of community support and greatest cost-benefit.
- Develop conceptual designs and cost estimates in anticipation of final design and construction.
- Apply for grants to fund design and construction.

Bioretention could be used for water quality treatment, coupled with either detention and/or infiltration, depending on site conditions. Detention could be constructed using detention pipes, detention chambers, or modular suspended pavement systems. Infiltration could take the form of infiltration trenches, pit drains, or drilled drains, depending on the location, depth to till, and presence of an unsaturated receptor layer.

Cost

The adjacent table summarizes planning-level cost estimates for Perrinville 2. Cost estimates assume that the project will occur concurrently with Perrinville 1 and share tasks. Costs would be higher if the projects are conducted separately.

Project Task	Cost Estimate (2023 Dollars)
Community Engagement	\$50,000
Hydrogeologic Investigation*	\$126,800
Feasibility Evaluation*	\$109,900
Concept Development*	\$40,300
Total	\$327,000

* Indicates costs based on the Stormwater Retrofit Feasibility grant application, with costs split evenly with Perrinville 1.

Design Precedents



81st Ave W Raingarden Retrofit

Edmonds, WA

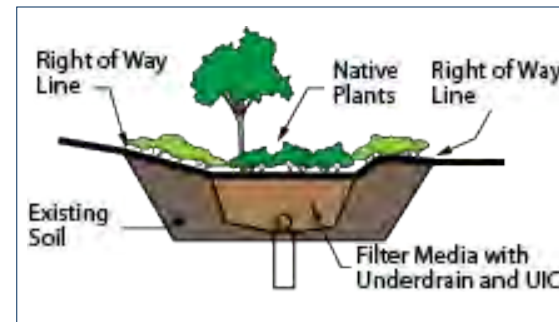
- Neighborhood-scale rain gardens
- Implemented with support from the Snohomish Conservation District



Venema Creek Bioretention

Seattle, WA

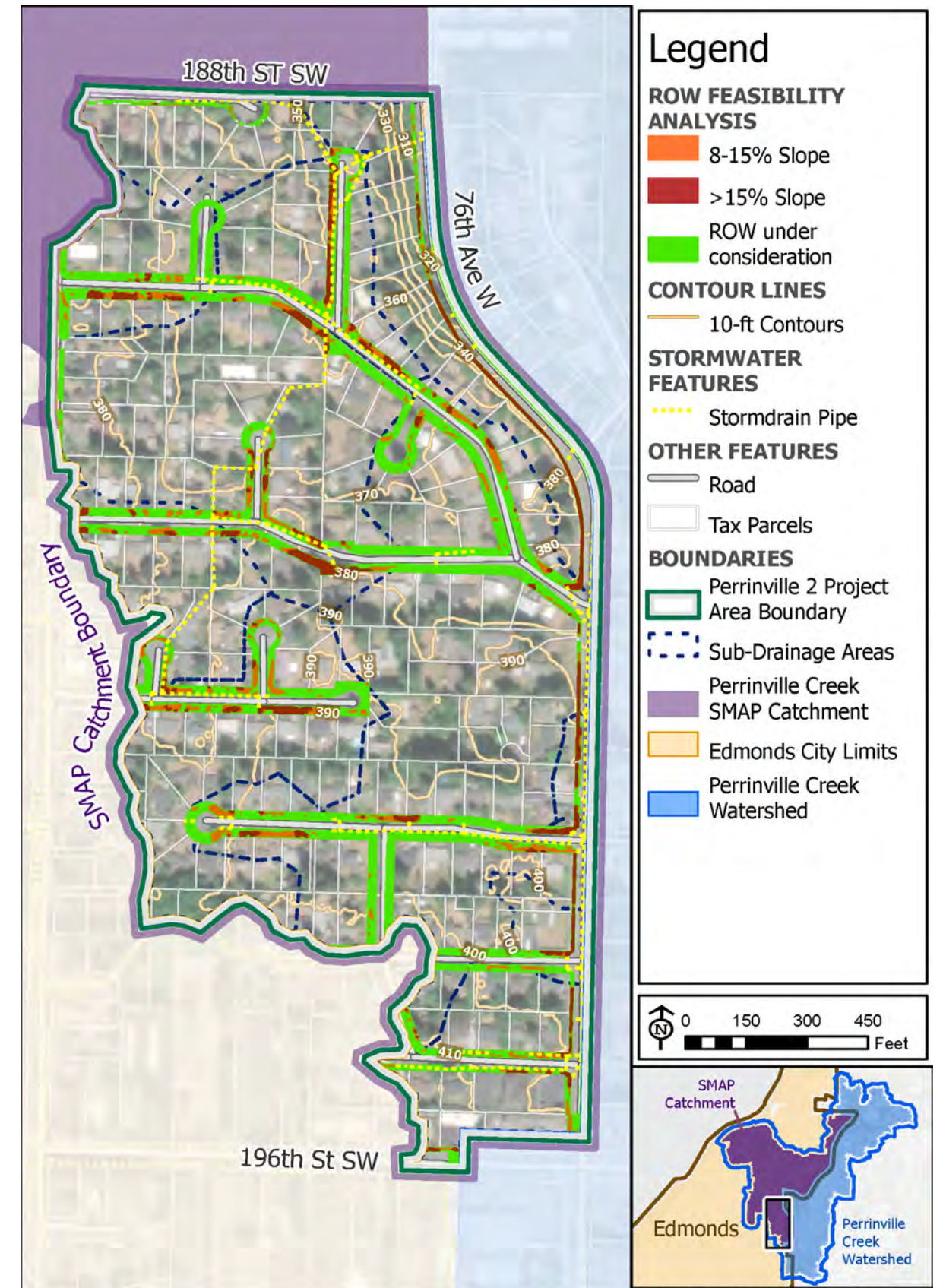
- Neighborhood with steep slopes
- Bioretention with deep infiltration well to reduce runoff quantity and speed



Bioretention Concept Diagram

- Bioretention in ROW
- Incorporates native plants
- Includes an underdrain and UIC well for infiltration

Concept Site Plan



APPENDIX B

Public Input Responses

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Public Survey Summary

Q1. Rank the proposed land management strategies in order of importance:

Table B-1. Proposed Land Management Strategy Scores.

Choice Number	Choices	Percent of Total Responses/ Response Count	Participant Selected Rank				Average Score
			1	2	3	4	
1	Work with the City of Lynnwood to find ways to control runoff from existing development in Lynnwood's portion of the Perrinville Creek watershed.	Percent of Total Responses	45.5%	27.3%	9.1%	18.2%	3
		Response Count	5	3	1	2	
2	Strengthen stormwater design requirements for redevelopment.	Percent of Total Responses	27.3%	36.4%	18.2%	18.2%	2.73
		Response Count	3	4	2	2	
3	Identify hard surface areas (such as sections of parking lots or other paved areas) that are no longer of service to the property owner where pavement could be removed.	Percent of Total Responses	27.3%	9.1%	36.4%	27.3%	2.36
		Response Count	3	1	4	3	
4	Provide technical assistance to streamside landowners regarding improving streams and/or runoff on their property.	Percent of Total Responses	0.0%	27.3%	36.4%	36.4%	1.91
		Response Count	0	3	4	4	

Note: Includes 11 responses out of 13 total responses. Two survey participants skipped this question.

Average score is calculated by assigning a weighted value to the participant-selected rank. For this question, the following weights were used:

Selected Rank	Assigned Score
1	4
2	3
3	2
4	1

Using Question 1, Choice 1 as an example, out of 11 total responses, five respondents selected a rank of 1, three respondents selected a rank of 2, and so forth. Assigning a weighted score to each selected rank, the Question 1, Choice 1 average score is calculated as:

$$\frac{(5 \times 4) + (3 \times 3) + (1 \times 2) + (2 \times 1)}{11} = 3$$

Q2. Rank the proposed stormwater program enhancement actions in order of importance:

Table B-2. Proposed Stormwater Program Enhancement Action Scores.

Choice Number	Choices	Percent of Total Responses/ Response Count	Participant Selected Rank					Average Score
			1	2	3	4	5	
1	Continue to train City staff on green stormwater facility maintenance	Percent of Total Responses	45.5%	18.2%	27.3%	0.0%	9.1%	3.91
		Response Count	5	2	3	0	1	
2	Provide public workshops and technical assistance for constructing rain gardens	Percent of Total Responses	27.3%	45.5%	9.1%	0.0%	18.2%	3.64
		Response Count	3	5	1	0	2	
3	Develop and implement a natural yard care program	Percent of Total Responses	18.2%	9.1%	45.5%	18.2%	9.1%	3.09
		Response Count	2	1	5	2	1	
4	Implement a social media campaign to promote pet waste pick up	Percent of Total Responses	0.0%	18.2%	9.1%	54.6%	18.2%	2.27
		Response Count	0	2	1	6	2	
5	Conduct annual public rain barrel event	Percent of Total Responses	9.1%	9.1%	9.1%	27.3%	45.5%	2.09
		Response Count	1	1	1	3	5	

Note: Includes 11 responses out of 13 total responses. Two survey participants skipped this question.

Average score is calculated by assigning a weighted value to the participant-selected rank. For this question, the following weights were used:

Selected Rank	Assigned Score
1	5
2	4
3	3
4	2
5	1

Using Question 2, Choice 1 as an example, out of 11 total responses, five respondents selected a rank of 1; two respondents selected a rank of 2, and so forth. Assigning a weighted score to each selected rank, the Question 2, Choice 1 average score is calculated as:

$$\frac{(5 \times 5) + (2 \times 4) + (3 \times 3) + (0 \times 2) + (1 \times 1)}{11} = 3.91$$

Q3. Please list other strategies or actions the City could consider to improve conditions in Perrinville Creek:

Note: The City has provided initial responses to submitted comments (Public Survey Comment) in the City Response column in Table B-3.

Table B-3. Other Strategies or Actions Identified for Improving Conditions in Perrinville Creek and Initial City Responses.		
Map ID	Public Survey Comment	City Response
0	One action to improve conditions of Perrinville Creek would be to encourage the removal and restoration of the illegal bicycle pump track in the east side of Southwest County Park. This BMX track is above Perrinville Creek, allowing the erosive soil to run down slope into the creek. I have recently seen people actively digging and shaping the track for bicycle use, but no action has been taken by Snohomish County to stop this activity and restore the park to its natural state.	Southwest County Park is owned and maintained by Snohomish County. The City plans on continued discussions on a number of issues and retrofits related to Perrinville Creek with various Snohomish County Departments including Parks and Surface Water Management.
1	There needs to be an Infiltration facility installed on the west side of Olympic View drive sufficient in size to control any surge in stormwater caused by a significant rain event. This facility needs to include a filtering system to screen out oil particulates before they enter Perrinville Creek.	The City plans to update the 2015 <i>Perrinville Creek Stormwater Flow Reduction Retrofit Study</i> that will include looking at additional adding infiltration facilities in the entire watershed, pending additional funding. In addition, updating the City's <i>Storm and Surface Water Comprehensive Plan (Plan)</i> beginning this year will include the Perrinville Creek watershed. The extent of capital projects, programs, code/policy changes and other actions in the Perrinville watershed will depend on the Council-approved scope for the Plan, allotted funding by Council, and ability to get outside grants and additional personnel for the work.
	Also, if feasible, change the flow of stormwater where it enters the creek, to a point angled downstream from where it is today. The stormwater entering the creek as it is today enters at roughly a 90-degree angle causing an erosion of the far side bank and streambed siltation. Siltation has been an enormous downstream problem, especially near the outlet to Brown's Bay.	This SMAP, per Department of Ecology guidance, does not include in-water projects. This comment will be considered for additional work planned for the Perrinville Creek watershed.
	Also, there is far too much groundwater seeping under 76th Ave from the Lynnwood side, just north of the Perrinville Post office. The City of Lynnwood needs to redirect that seepage into a stormwater drainage system before entering the creek.	The City does not regulate or control the flow of groundwater.
2	save the Perrinville woods. do not those huge precious trees be cut down. no development of that property at the headwaters of the Perrinville creek.	The Perrinville woods are mostly owned by private property owners. The City has no plans to develop its portion of that area.

Table B-3 (continued). Other Strategies or Actions Identified for Improving Conditions in Perrinville Creek.		
Map ID	Attendee Comment	City Response
3	[none]	No response necessary.
4	No new development	This is beyond the scope of this SMAP and other planned City actions in the watershed.
5	Clean up the park surrounding the creek. Make ingress/egress safer and easier so that neighborhood folks can easily assist with upkeep	Southwest County Park is owned and maintained by Snohomish County. The City plans on continued discussions on a number of issues and retrofits related to Perrinville Creek with various Snohomish County Departments including Parks and Surface Water Management.
6	[none]	No response necessary.
7	Larger scale infiltration facilities utilizing UICs and having small footprints have been shown feasible and highly beneficial in parts of the watershed: Seaview Park (Phases 1 & 2), Lynndale Elementary School. There are several existing detention facilities along the Olympic View Drive corridor in Lynnwood which could be modified to promote infiltration.	The City plans to update the 2015 <i>Perrinville Creek Stormwater Flow Reduction Retrofit Study</i> that will include looking at additional underground injection control (UIC) wells for flow control, pending additional funding. In addition, updating of the City's <i>Storm and Surface Water Comprehensive Plan</i> (Plan) beginning this year will include the Perrinville Creek watershed. The extent of capital projects, programs, code/policy changes and other actions in the Perrinville watershed will depend on the Council-approved scope for the Plan, allotted funding by Council, and ability to get outside grants and additional personnel for the work.
8	Other than [technical assistance] TA for rain gardens, I doubt the other enhancement actions will bear many results for the effort. I think Sno Co needs to be involved for the Southwest County Park (SWCP) portion. You mention pet waste, and there are many dogs walked thru the park daily, but zero garbage cans provided by the park. In the 6pm meeting you also mention teaching homeowners to remove invasives by the stream. A group of volunteers remove invasives in SWCP every Saturday and could be planting natives to parallel the stormwater program action plans. This would be an effort that could be brought to scale. I also wonder if a properly built trail accessing the creek within the park could do two things-- 1) prevent erosion by eliminating the current steep "social trails" and 2) provide a view of the creek to visitors so that they can appreciate better the assets and issues of the creek and water shed and engage in local improvements.	Southwest County Park is owned and maintained by Snohomish County, the City plans on continued discussions on a number of issues and retrofits related to Perrinville Creek with various Snohomish County Departments including Parks and Surface Water Management.

Table B-3 (continued). Other Strategies or Actions Identified for Improving Conditions in Perrinville Creek.		
Map ID	Attendee Comment	City Response
9	Large stormwater retention ponds and infiltration galleries are required to reduce stormwater impacts. Planning should include the impacts of more severe rain events as the climate changes in the future. Responsible design should include a time horizon of 100 years.	The City plans to update the 2015 <i>Perrinville Creek Stormwater Flow Reduction Retrofit Study</i> that will include looking at retention ponds and infiltration galleries, pending additional funding. In addition, updating the City's <i>Storm and Surface Water Comprehensive Plan</i> (Plan) beginning this year will include the Perrinville Creek watershed. The extent of capital projects, programs, code/policy changes and other actions in the Perrinville watershed will depend on the Council-approved scope for the Plan, allotted funding by Council, and ability to get outside grants and additional personnel for the work.
10	would love to see you open up/restore more of Perrinville creek currently in culvert and covered up.	This SMAP, per Department of Ecology guidance, does not include in-water projects. This comment will be considered for additional work planned for the Perrinville Creek watershed. While most of Perrinville Creek is not in a pipe or culvert, as opportunities and funding source arise, opening up the creek will be evaluated.
11	Drastically reduce volume of stormwater going into Perrinville Creek during rainstorms. Request Lynnwood actively participate in addressing and funding the stormwater damage caused to Perrinville Creek. Develop daily maximum cfs "target" for stormwater flows into Perrinville Creek (the cfs would be based on maximum flow that would NOT damage natural creek conditions) and THEN implement retrofits in Edmonds AND Lynnwood within one year that will ensure the maximum flow is NOT exceeded. Obtain DOE grants for expensive projects to reduce stormwater flow and include Lynnwood in matching funding for such projects. Eliminate streambank erosion in Perrinville Creek caused by excess stormwater flows from Lynnwood AND Edmonds. Fix the damage caused to the lower stream salmon spawning areas caused by the excess stormwater flows. Fix the stormwater damaged creek ravine that will otherwise continue to slough sediment into the creek destroying aquatic organisms and their habitat.	The City is in active talks with the City of Lynnwood about the issues in Perrinville Creek. The City of Lynnwood's most recent Surface Water Management Comprehensive Plan (2020) includes four flow control projects in the Perrinville watershed (pages 61-62 of their Plan). The City of Edmonds plans to update the 2015 <i>Perrinville Creek Stormwater Flow Reduction Retrofit Study</i> that will include looking at flow "targets," pending additional funding. In addition, updating the City's <i>Storm and Surface Water Comprehensive Plan</i> (Plan) beginning this year will include the Perrinville Creek watershed. The extent of capital projects, programs, code/policy changes and other actions in the Perrinville watershed will depend on the Council-approved scope for the Plan, allotted funding by Council, and ability to get outside grants and additional personnel for the work.

Table B-3 (continued). Other Strategies or Actions Identified for Improving Conditions in Perrinville Creek.

Map ID	Attendee Comment	City Response
12	Place a diversion structure under the Perrinville Post Office that will divert excess stormwater flow into a pipe under 76th Ave that flows in separate pipe along the Lynnwood sewer pipe down to the Lynnwood Treatment Plant and exits to Puget Sound AFTER it flows through stormwater treatment vaults. ACTIVELY pursue state & federal funding for this–DON'T just say it's too expensive.	The City of Edmonds plans to update the 2015 <i>Perrinville Creek Stormwater Flow Reduction Retrofit Study</i> that will include looking at flow diversion options, pending additional funding. In addition, updating the City's <i>Storm and Surface Water Comprehensive Plan (Plan)</i> beginning this year will include the Perrinville Creek watershed. The extent of capital projects, programs, code/policy changes and other actions in the Perrinville watershed will depend on the Council-approved scope for the Plan, allotted funding by Council, and ability to get outside grants and additional personnel for the work.
	Restore a "fish friendly" connection to Puget Sound (that was destroyed by excess stormwater) that has appropriate low gradient stream channel for chum salmon spawning including assurance of clean spawning gravel. Include an estuary on east side of railroad tracks to provide essential habitat for juvenile salmon.	The City is currently working on a design for the mouth of Perrinville Creek that will be more fish friendly. For the project to succeed, agreements with private property owners and BNSF Railway need to be obtained as well as permits from several state and Federal environmental permitting agencies
	Mitigate the losses caused to salmonid populations in Perrinville Creek by excess stormwater by implementing a juvenile salmonid re-introduction and enhancement project.	Once Perrinville Creek is more "fish friendly" in terms of sediment load and velocity, a juvenile salmonid re-introduction and enhancement project would be an appropriate follow-up action.

Q4. Add other areas in the Perrinville Creek watershed where you’ve seen uncontrolled and damaging stormwater runoff, for consideration of potential stormwater facility retrofit projects by pinning the location on the map provided:

Note: Numerical labels on Figure B-1 correspond to the “Map ID” in Table B-3. There is a cluster of points that indicates participants may not have selected a point location when completing the survey.



- ▲ Survey Result
- Creek
- Waterbody
- Perrinville Creek Watershed
- Perrinville Creek SMAP Catchment
- City of Edmonds
- City of Lynnwood
- Road
- Storm Drain
- Highway

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 Date: 3/28/2023
 Author: kevingrove

Public Meeting Summary

Summary of Poll Responses

Select the top **THREE** actions that you think will help Perrinville Creek:

12PM Meeting Responses

Stormwater Action	# of Attendees Supporting
Strengthen stormwater design requirements for redevelopment	14
Work with Lynnwood to control flows in the upper watershed	13
Identify hard surface areas where pavement could be removed	11
Provide workshops and technical assistance for constructing rain gardens	5
Implement a streamside landowner technical assistance program	4
Develop and implement a natural yard care program	3
Conduct annual rain barrel event	2
Promote pet waste pick up	2
Train city staff on green stormwater facility maintenance	2

6PM Meeting Responses

Stormwater Action	# of Attendees Supporting
Work with Lynnwood to control flows in the upper watershed	14
Strengthen stormwater design requirements for redevelopment	13
Identify hard surface areas where pavement could be removed	7
Implement a streamside landowner technical assistance program	7
Provide workshops and technical assistance for constructing rain gardens	4
Develop and implement a natural yard care program	3
Conduct annual rain barrel event	2
Train city staff on green stormwater facility maintenance	1

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APPENDIX C

Stormwater Management Action Plan Short-Term and Long-Term Cost Estimates and Assumptions

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Table C-1. Stormwater Management Action Plan–Short-Term Action Cost Assumptions.

Action	Type	Description	Total Cost	Cost Assumptions
RP-1. Perrinville 1 Neighborhood Retrofit Feasibility Analysis	Retrofit	Conduct community outreach, hydrologic investigation, feasibility evaluation and concept development for bioretention facilities at 179th St., Olympic View Dr., Ridge Way and 72nd Ave.	\$327,000	Assumption based upon field reconnaissance, analogous projects. See project summary sheet in Appendix A.
RP-2. Perrinville 2 Neighborhood Retrofit Feasibility Analysis	Retrofit	Conduct community outreach, hydrologic investigation, feasibility evaluation and concept development for bioretention facilities at 188th St., 196th St., and 76th Ave.	\$327,000	Assumption based upon field reconnaissance, analogous projects. See project summary sheet in Appendix A.
LM-1. Strengthen stormwater design requirements for redevelopment	Land Management Strategy	Current City code requires 50% retrofit on “remaining” hard surfaces during redevelopment. Consider revising code to increase this retrofit requirement to 75%. Consider stricter flow control standards than what is in the current code for new and redevelopment projects.	\$13,700	Assumes 60 hours of consultant and 40 hours of City management staff hours.
LM-2. Work with the City of Lynnwood to increase coordination to address flow control from existing development in Lynnwood’s portion of the watershed	Land Management Strategy	Excluding areas that infiltrate or drain directly to Puget Sound, over 70% of the area draining to Perrinville Creek is located in the City of Lynnwood. Identify opportunities to build support for increased coordination to address flow control in the upper Perrinville Creek watershed.	\$28,800	Assumes 60 hours of staff time (management level) each year for a total of 6 years to identify policies, programs for coordination, conduct meetings internally and with City of Lynnwood.
LM-3. Identify hard surface areas (such as sections of parking lots or other paved areas) that are no longer of service to the property owner where pavement could be removed	Land Management Strategy	Conduct evaluation of locations and high-level feasibility of areas as candidates for pavement removal and replacement with pervious surfaces and/or techniques to encourage infiltration. Identify potential cooperative projects and discuss with landowners.	\$13,700	Assumes 60 hours of consultant and 40 hours of City planner and management staff hours.

Table C-1 (continued).		Stormwater Management Action Plan–Short-Term Action Cost Assumptions.		
Action	Type	Description	Total Cost	Cost Assumptions
LM-4. Provide technical assistance to streamside landowners regarding improving streams and/or runoff on their property	Land Management Strategy	Create a 3-year pilot program to develop educational resources, conduct outreach, and implement “boots on the ground” technical assistance to support streamside private property landowners with managing their land for the benefit of the stream.	\$22,500	Assumes 80 hours of stormwater technical staff time to research materials, conduct a mailing to streamside property owners, conduct one workshop annually, print materials and conduct five site visits each year for a total of 3 years. Allows \$8,100 for material costs and advertising.
SE-1. Continue to train City staff on green stormwater facility maintenance practices	Stormwater Program Enhancement	Maintained green stormwater facilities will result in optimum water quality treatment and flow control of the designed system.	\$5,000	Assumes enrollment and attendance of 5 staff at O&M training provided by WSU Stormwater Center or similar training program.
SE-3. Conduct annual public rain barrel event	Stormwater Program Enhancement	This event provides an opportunity for community members to purchase a low-cost rain barrel and learn about conserving water resources and stormwater runoff.	\$15,000	Assumes cost for payment to Snohomish Conservation District Interlocal Agreement for this event each year over 6 years.
SE-4. Implement a social media campaign to promote pet waste pickup	Stormwater Program Enhancement	Conduct messaging encouraging pet waste pick up for clean water and clean shoes.	\$6,000	Assumes initial cost for 60 hours of staff time to develop 5 messages and post to social media. Assumes 20 hours of staff time to refresh messages and post each year for a total of 2 years.
SE-5. Develop and implement a natural yard care program	Stormwater Program Enhancement	Promote natural yard care through social media and other educational materials encouraging less use of fertilizers and chemicals.	\$8,400	Assumes 40 hours of stormwater technical staff time to research materials, develop social media posts, and post materials to City website. Conduct outreach through listserv and other newsletters each year for a total of 5 years. Assumes 20 hours each year to conduct outreach.
Total Short-Term Cost			\$767,100	

RP = retrofit, LM = land management strategy, SE = stormwater program enhancement

Table C-2. Stormwater Management Action Plan–Long-term Action Cost Assumptions.

Action	Type	Description	Total Cost	Cost Assumptions
LM-2. Work with the City of Lynnwood to find ways to control runoff from existing development in Lynnwood’s portion of the watershed	Land Management Strategy	Excluding areas that infiltrate or drain directly to Puget Sound, over 70% of the area draining to Perrinville Creek is located in the City of Lynnwood. Identify opportunities to build support for increased coordination to address flow control in the upper Perrinville Creek watershed.	\$67,200	Assumes 60 hours of staff time (management level) each year for a total of 14 years to identify policies, programs for coordination, conduct meetings internally and with City of Lynnwood.
LM-4. Provide technical assistance to streamside landowners regarding improving streams and/or runoff on their property	Land Management Strategy	Create a 3-year pilot program to develop educational resources, conduct outreach, and implement “boots on the ground” technical assistance to support streamside private property landowners with managing their land for the benefit of the stream.	\$22,500	Assumes 80 hours of stormwater technical staff time to research materials, conduct a mailing to streamside property owners, conduct one workshop annually, print materials and conduct five site visits each year for a total of 3 years. Allows \$8,100 for material costs and advertising.
SE-2. Provide workshops and technical assistance for constructing rain gardens	Stormwater Program Enhancement	Work with property owners of developed lots to encourage rain gardens or other infiltration methods to soak in runoff.	\$63,000	Cost assumption from existing interlocal agreement with Snohomish Conservation District. Assumes 100 hours of City staff time (stormwater technician, O&M staff) and donated materials for 4 rain gardens installed each year for a total of 3 years.
SE-3. Conduct annual public rain barrel event	Stormwater Program Enhancement	This event provides an opportunity for community members to conserve water resources and learn about stormwater runoff.	\$35,000	Assumes cost for payment to Snohomish Conservation District Interlocal Agreement for this event each year over 14 years.
Total Long-Term Cost			\$187,700	

RP = retrofit, LM = land management strategy, SP = stormwater program enhancement