



KITSAP COUNTY

KINGSTON REGIONAL STORMWATER FACILITY PLAN



Prepared for:

KITSAP COUNTY PUBLIC WORKS

614 Division Street, MS 24
Port Orchard, WA 98366

January 2019

Prepared By: Struck Environmental, Inc.
and Parametrix, Inc.

TABLE OF CONTENTS

1	SUMMARY	1-1
2	INTRODUCTION.....	2-1
2.1	Purpose and Scope.....	2-2
2.2	Goals and Objectives.....	2-3
2.3	Project Background and Development.....	2-3
2.4	Alternatives Considered.....	2-6
2.5	Recommended Facility Alternative.....	2-7
3	PROGRAM DESCRIPTION AND SERVICE AREA.....	3-1
3.1	Kitsap County Policy.....	3-1
3.2	State and County Stormwater Management Regulations.....	3-1
3.3	Program Eligibility and Applicability	3-2
3.4	Payment in Lieu of Construction.....	3-3
3.5	Program Modifications	3-3
3.6	Service Area	3-3
3.7	Phasing Plan	3-4
4	FACILITY PLAN.....	4-1
4.1	Conveyance and Flow Control Improvements.....	4-1
4.2	Port of Kingston Treatment and Conveyance System	4-1
4.3	Treatment System.....	4-1
4.4	Ownership, Operation and Maintenance	4-4
5	SYSTEM COSTS AND CONNECTION CHARGES	5-1
5.1	Capital Costs.....	5-1
5.2	Estimated Connection Charge	5-1
5.3	Final Connection Charge Calculation	5-2
5.4	Comparison to On-Site Stormwater Costs.....	5-2
5.5	Comparison to Other Regional Stormwater Connection Charges.....	5-4
5.6	Cost Recovery Estimates.....	5-4
5.7	Operation and Maintenance Costs.....	5-5
6	IMPLEMENTATION PLAN.....	6-1
6.1	Public Outreach and Information	6-1
6.2	Plan Adoption and Kitsap County Code Updates	6-1
6.3	Design and Construction.....	6-1
6.4	Site-Specific Connection Procedures	6-1
6.5	Program Administration	6-2
7	REFERENCES.....	7-1

LIST OF TABLES

Table 1-1. Regional Facility Summary.	1-1
Table 1-2. Estimated Connection Charge.	1-2
Table 4-1. Preliminary Regional Facility Summary.	4-1
Table 4-2. Treatment System Sizing Summary.	4-4
Table 5-1. Capital Cost Summary.	5-1
Table 5-2. Capital Costs and Year Cost Incurred.	5-1
Table 5-3. Proposed Connection Charge.	5-2
Table 5-4. Total Stormwater Management Costs, On-site Versus Regional Facility.	5-3
Table 5-5. Cost Comparison for Typical Development Project (with 10,000 sq-ft new impervious surfaces).	5-4
Table 5-6. Comparison of Regional Facility Connection Charges.	5-4
Table 5-7. Comparison of O&M Costs, On-site Versus Regional Facility.	5-5

LIST OF FIGURES

Figure 1-1. Stormwater Costs for On-site Facilities versus Kingston Regional Facility.	1-2
Figure 2-1. Kingston Regional Stormwater Plan Study Area.	2-4
Figure 2-2. Kingston Zoning.	2-5
Figure 2-3. Alternatives Comparison Summary.	2-6
Figure 3-1. Regional Facility Service Area.	3-5
Figure 3-2. Regional Facility Phasing Plan.	3-6
Figure 4-1. Conveyance and Treatment Schematic Plan.	4-2
Figure 4-2. Treatment Cells Schematic Design Concept.	4-3
Figure 4-3. Manchester Stormwater Park.	4-4
Figure 5-1. Cost of Representative On-site Facilities versus Kingston Regional Facility.	5-3

APPENDICES

Appendix A Cost Worksheets

ACRONYMS AND ABBREVIATIONS

County	Kitsap County
Ecology	Washington State Department of Ecology
CIP	Capital Improvement Program
GMA	Growth Management Act
KCAC	Kingston Community Advisory Committee
KCSWDM	Kitsap County Stormwater Design Manual (2016)
KCC	Kitsap County Code
NPDES	National Pollution Discharge Elimination System
O&M	Operation and Maintenance
PORT	Port of Kingston
SEPA	State Environmental Policy Act
SWMM	2012 Department of Ecology Stormwater Management Manual
Sq-Ft	Square feet
UGA	Urban Growth Area
USACE	United States Army Corps of Engineers
WDFW	Washington Department of Fish and Wildlife

This page intentionally blank.

1 SUMMARY

This plan describes the proposed Kingston Regional Stormwater Facility (regional facility). This regional facility would serve the central Kingston urban growth area and treat stormwater runoff from multiple projects and/or properties through a Kitsap County-sponsored program. This program would allow individual developments to pay a connection charge to connect to the facility, and thereby reduce the requirements and costs for on-site controls. Under the Kingston Regional Stormwater Facility Plan (Plan), Kitsap County would construct a single regional stormwater facility and developers connecting to the facility would pay a proportionate fee (connection charge) in lieu of constructing on-site stormwater facilities.

The Kingston regional facility provides several advantages compared to traditional on-site stormwater controls. These include reduced construction, operation and maintenance costs, better treatment performance, and better utilization of developable land that would have been otherwise set aside for the construction of on-site stormwater facilities.

The contributing basin to the regional facility is 98-acres of Urban Village, Commercial, Industrial and Urban Residential zoned land primarily within the “Old Town” area of Kingston. The preferred treatment site is located on Port of Kingston (Port) property in an existing landscaped area between the Port parking lot and marina. In general, the preferred treatment facility consists of two high capacity media cells within landscaped areas of the Port parking lot. Conveyance improvements would also be constructed in the upstream contributing basin. Table 1-1 summarizes regional facility elements.

Table 1-1. Regional Facility Summary.

FACILITY ATTRIBUTE	DESCRIPTION
Total Contributing Basin	98-acres
Zoning	Urban Village, Commercial, Industrial and Residential
Treatment Type	Enhanced
Treatment Media	Proprietary, high capacity
Infiltration Rate	70.92 inch/hour
Min. Treatment Area Required	2,444 sq-ft
Treatment Area Available	2,768 sq-ft (maximum)
Flow Control	Marine Direct Discharge

Total capital construction costs for the regional facility are estimated at \$2,607,260. A connection charge of \$867 is proposed for each 1,000 sq-ft area of new or redeveloped impervious area that is subject to stormwater Minimum Requirements (MR) 6 and 7 under the Kitsap County Stormwater Design Manual (KCSWDM). Table 1-2 summarizes the estimated connection charge calculation. The final connection charge would be calculated after construction is complete and actual capital construction costs are available.

Table 1-2. Estimated Connection Charge.

ELEMENT	VALUE
Total Service Area (acres) ¹	92
Impervious Area at Full Build out	75%
Impervious Acres at Full Build out	69
<hr/>	
Total Capital Cost	\$ 2,607,260
<hr/>	
Connection Charge per 1,000 sq-ft Impervious Area	\$ 867

¹ Service area does not include Port parking lot (6-acres).

Connection to the regional facility would be required for all projects that trigger MR 6 or 7 as described in the KCSWDM. Development projects would still be required to meet MR 1-5, which includes on-site stormwater management provisions.

To ensure that the program is cost effective, the proposed connection charge was compared to typical costs to construct an equivalent on-site stormwater system. Figure 1-1 show that the proposed regional facility is more cost-effective than on-site stormwater management under both a residential plat and commercial/multi-family development scenario. On-site facility costs for existing residential lots or new small (short) plat low density residential development may be approximately equivalent to the regional facility. Total cost recovery over the 30-year life cycle is estimated to be in the range of \$1,000,000 or about 40 percent of total capital cost.

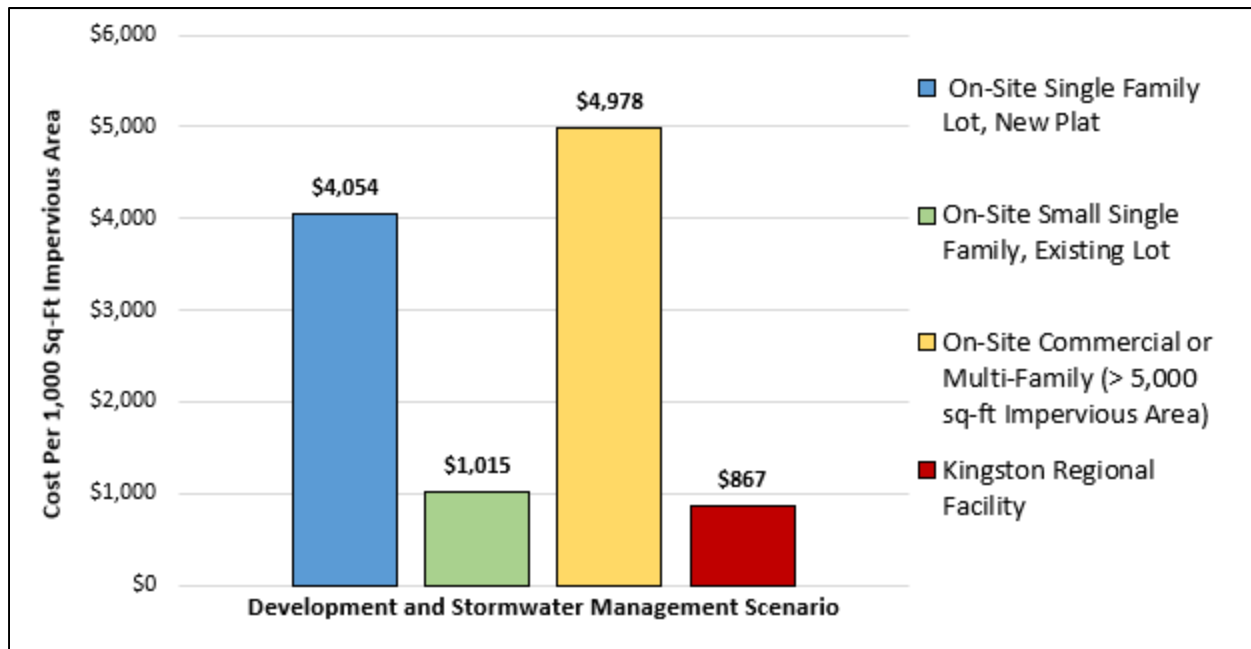


Figure 1-1. Stormwater Costs for On-site Facilities versus Kingston Regional Facility.

Implementation of the Plan will follow presentation of the draft Plan to the Port, Kingston Community Advisory Committee (KCAC) and Kingston community. Updates to KCC necessary to implement the Plan would be prepared concurrent with preparation of the final Plan. The final Plan and associated Kitsap County Code (KCC) updates would then be presented for adoption by the Board of County Commissioners at public hearing. Depending on final approval date, the plan may be approved in 2019 with the facility available for connection in 2020 or 2021.

This page intentionally blank.

2 INTRODUCTION

This Plan describes the proposed Kingston Regional Stormwater Facility (facility). This regional stormwater facility would serve the central Kingston urban growth area (UGA) and treat stormwater runoff from multiple projects and/or properties through a Kitsap County-sponsored program. This program would allow individual developments to participate in the financing of the facility, and thereby reduce the requirements and costs for on-site stormwater controls.

Traditionally, on-site structural stormwater controls like vaults, ponds, and swales are constructed for each individual development to control stormwater quantity and quality. Under this on-site approach, the developer finances the design and construction of these controls. On commercial sites, and on some developed residential lots, property owners are also responsible for maintaining these facilities. Under the regional approach described in this plan, Kitsap County would construct a single regional facility and developers connecting to the facility would pay a fee in lieu of constructing on-site facilities.

Regional facilities have several advantages compared to traditional on-site controls. These include:

- Reduced design costs. Design requirements to connect to the regional facility would be abbreviated compared to design of an on-site stormwater system, resulting in reduced costs and less permitting time.
- Reduced construction costs. Construction of a single regional stormwater control facility would be more cost-effective than numerous individual on-site structural controls.
- Reduced operation and maintenance costs. Rather than multiple owners being responsible for the maintenance of multiple stormwater facilities, it is more cost-effective to maintain a single regional facility.
- Better performance. Regional stormwater facilities are more likely to be properly operated and maintained by trained County staff, resulting in better treatment and performance.
- Increased utilization of developable land. Developers would be better able to maximize development area by minimizing the land that would have otherwise been set aside for the construction of stormwater facilities.
- Increased water quality benefit. Regional facilities treat existing developed areas that were built before water quality and/or quantity were required, as well as provide for future development.

- Incentivize development. Regional facilities incentivize development by reducing design costs, construction costs, land set-aside requirements and permitting time.
- More affordable housing. Regional facilities reduce overall residential development project costs, resulting in lower costs to home buyers and potential for more affordable housing opportunities.

The Kingston Regional Stormwater Facility Plan (Plan) proposes that Kitsap County (County) construct a facility that will be shared by developers who would like to take advantage of the above benefits and reduce their on-site stormwater requirements and costs, while optimizing water quality treatment.

2.1 Purpose and Scope

The purpose of the Plan is to provide a cost-effective stormwater strategy for Kingston that addresses economic development goals, aging infrastructure and improves water quality and habitat protection.

For the purposes of this Plan, a regional facility consists of a stormwater facility that will be owned by the County and serve multiple parcels. Under the regional facility concept, development and re-development that is located within the contributing basin and that triggers stormwater treatment and flow control requirements under KCC would connect to the regional facility and pay a connection charge to Kitsap County on an impervious area basis in-lieu-of constructing individual site-specific facilities. The regional facility includes collection, conveyance, treatment and outfall components. This Plan seeks to:

- Mitigate stormwater impacts in areas of Kingston faster than would occur under normal development and redevelopment circumstances which will result in flow and pollutant load reductions to receiving waters by building regional facilities upfront of development/redevelopment;
- Use economy of scale to get the best unit price for both construction and operations as well as maintenance of stormwater facilities by building a larger regional facility as opposed to multiple smaller on-site facilities; and
- Build mitigation in specific areas of concern resulting in an immediate relief in areas prone to localized flooding and an immediate increase in pollutant load removal.

With this Plan, public and private entities will be allowed to pay a system development charge (connection charge) in-lieu-of constructing individual site-specific stormwater treatment and flow control best management practices. The system development charge will be used to reimburse the County's capital costs associated with construction of the regional facility.

2.2 Goals and Objectives

The primary goal of this Plan is to establish a “payment in-lieu-of construction” program for new development and redevelopment projects where stormwater flow control and/or water quality treatment is required by current County development regulations. Goals of this plan include:

- Provide high performing and sustainable facilities for stormwater treatment for new and redevelopment projects.
- In partnership with the Port of Kingston, create cost efficiencies by combining the stormwater mitigation needs of individual projects into one larger regional project.
- Reduce the cost and land impacts imposed on the development community by reducing land requirements for on-site stormwater facilities.
- Promote development, redevelopment and jobs in Kingston and north Kitsap County.
- Efficiently meet the County’s NPDES Stormwater Permit requirements.
- Providing an effective and transparent accounting structure for tracking connection charges, stormwater mitigation needs and system capacity.

An additional goal of this Plan is to develop a template and process that can be used in other locations in Kitsap County to site, design and finance regional stormwater facilities.

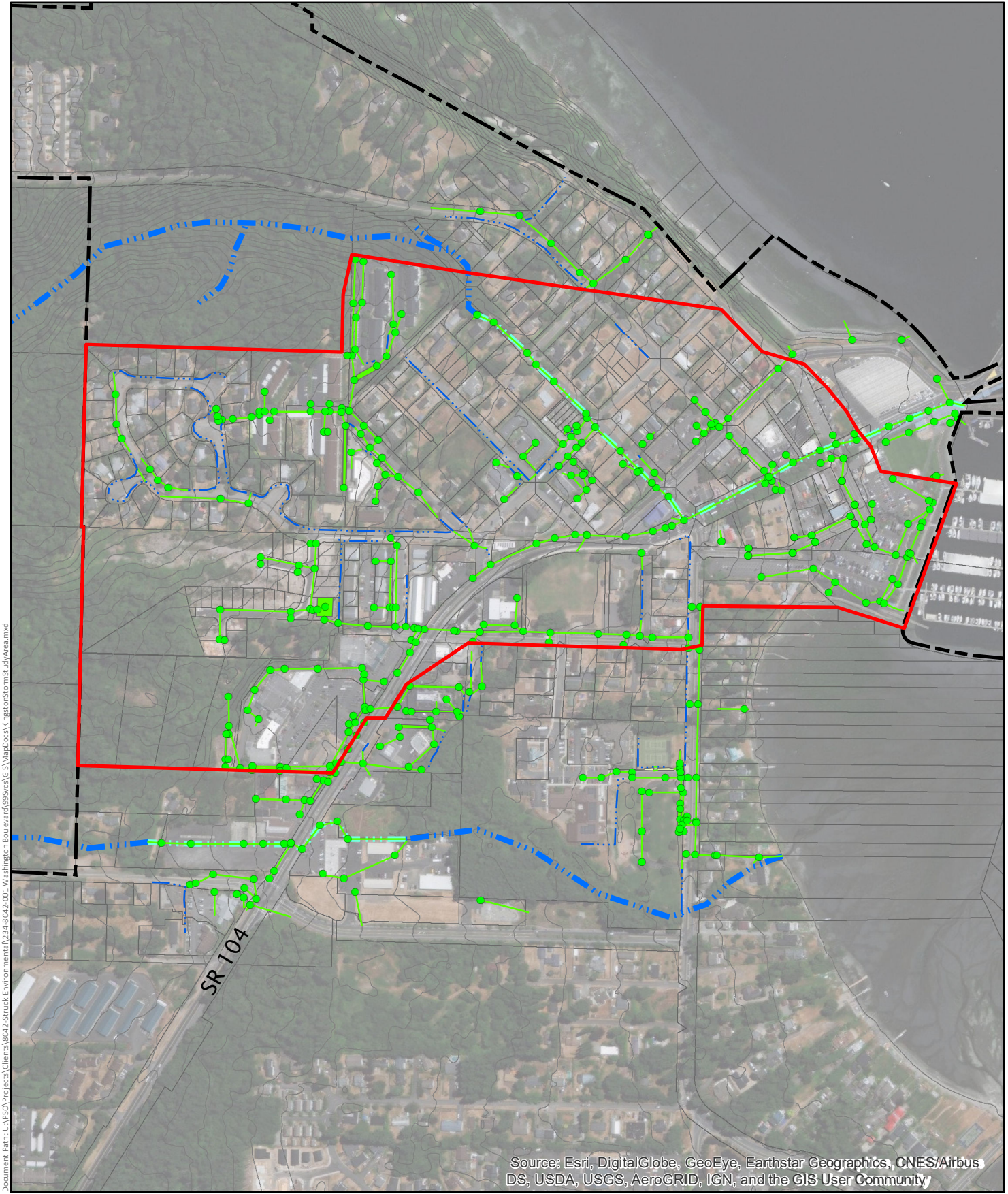
2.3 Project Background and Development

The Kingston Urban Growth Area (UGA) was established in May 1998 through adoption of the Kitsap County Comprehensive Plan. The Kingston UGA encompasses about 1,400 acres and has a population of about 2,200 (Kitsap County 2016).

Kingston’s defined areas include Old Town, adjacent to the marina and ferry terminal; the Village Green district; and Lindvog Commercial, encompassing the uptown area along State Route 104. The regional facility would serve primarily the Old Town area (Figure 2-1).

The Kingston area was selected for the County’s pilot regional stormwater facility program based on several factors, including:

- Ability to treat the majority of the Urban Village (UV) and Commercial zone (see Figure 2-2) in a single regional facility.
- Availability of a suitable regional facility site and outfall.
- Need to update and replace an aging collection and conveyance system.
- Expectations for accelerated growth.
- Potential cost efficiencies associated with integrating regional stormwater with other public road projects including Washington Boulevard and State Route (SR) 104.
- Ability to provide water quality treatment for stormwater runoff from high use roads that typically have relatively high pollutant loads.



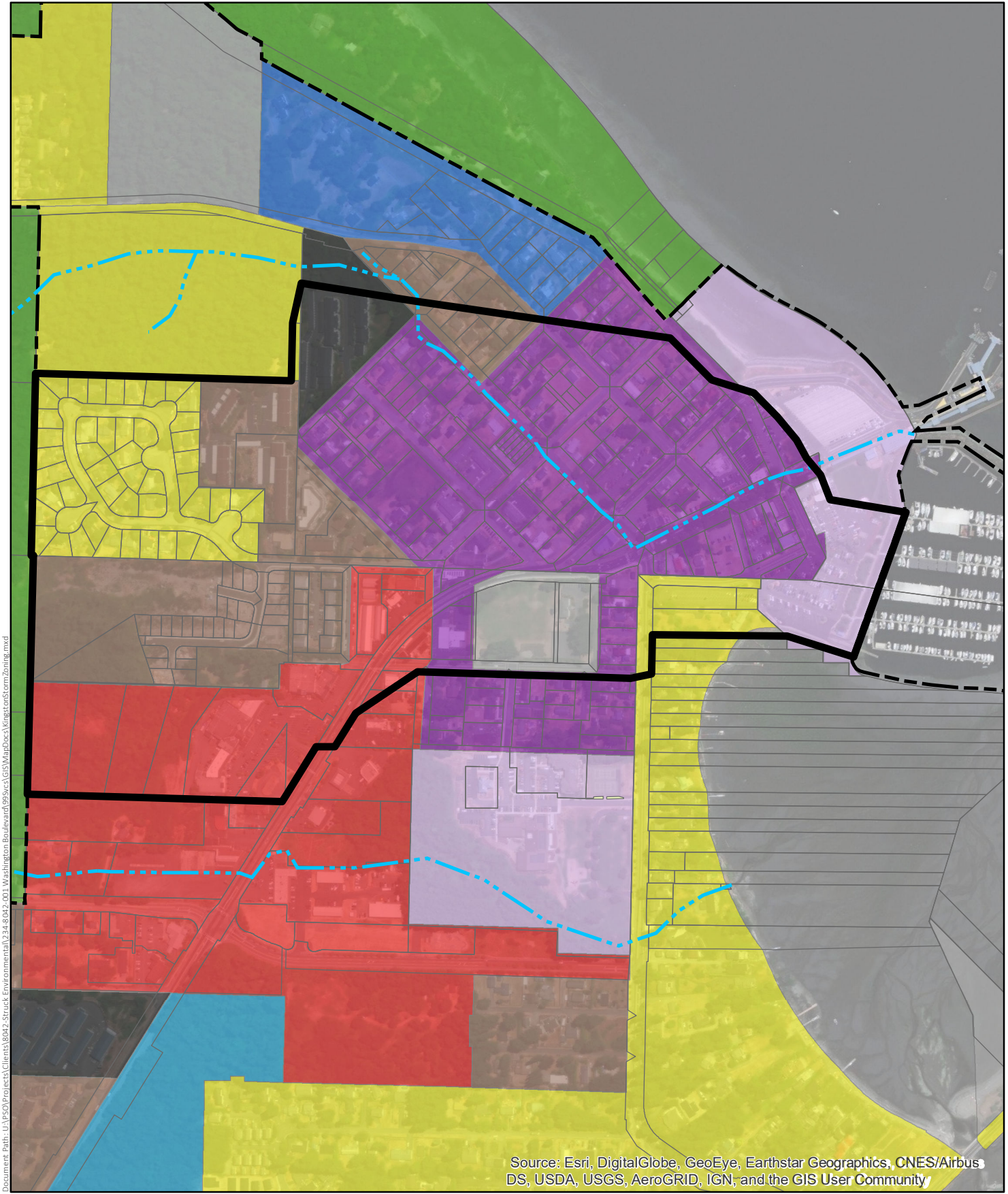
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Parametrix
ENGINEERING · PLANNING · ENVIRONMENTAL SCIENCES

- Catchbasins
- Storm Pipe
- Parcel Boundaries
- 10' Contours
- - - Ditch
- - - Stream Type F (Fish Habitat)
- - - Stream Type N (Non-Fish Habitat)
- Urban Growth Area Boundary
- Contributing Area to Regional Facility

FIGURE 2-1
Kingston Regional Stormwater Plan
Study Area

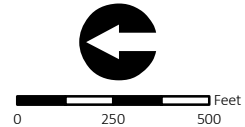
Document Path: U:\PSO\Projects\Clients\6042-Struck Environmental\234.8042-001-Washington Boulevard\995\GIS\MapDocs\KingstonStormStudyArea.mxd



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FIGURE 2-2
Kingston Zoning

- Service Area Contributing Basin
- Rural Residential
- Industrial
- Commercial
- Neighborhood Commercial
- Urban Restricted
- Urban Low Residential
- Urban Medium Residential
- Urban High Residential
- Urban Village Center
- Park
- Urban Growth Area



2.4 Alternatives Considered

Several alternative sites were evaluated as part of project planning. These sites are summarized in Figure 2-3 and included:

- Washington Boulevard at the intersection of Central Avenue;
- Kola Kola Park;
- Port of Kingston landscaped area between parking lot and marina; and
- Port of Kingston undeveloped property on West Kingston Road

Alt. No.	Description	Contributing Basin Area	Flow Control and Flood Reduction	Capital Cost Recovery	O& M Costs	Public Space	Capital Cost	Site Ownership	FINAL RANK
1	Washington Boulevard BioPod or MWS								2
2	Port of Kingston Marina Media Cells								1
3A	Kola Kola Park Infiltration								Not Feasible
3B	Kola Kola Park Media Cells								Not Feasible
4	Port of Kingston Undeveloped Property Media Cells								3

Figure 2-3. Alternatives Comparison Summary.

Each site was screened against several criteria including:

- Size of the contributing basin area that could be served.
- The degree to which the facility provides flow control and/or flood reduction.
- Capital cost and the extent to which the facility would be financially beneficial) to developers.
- The relative expected level of effort (cost) for long term operation and maintenance.
- Site location that is within the Kitsap County right of way or owned by a potentially willing public agency partner.

2.5 Recommended Facility Alternative

Based on the alternative analysis, media treatment cells at the Port of Kingston landscape area between the parking lot and marina was selected as the preferred alternative. In general, this alternative consists of constructing two high capacity media treatment cells within landscaped areas of the Port of Kingston parking lot. This area of the Port is generally considered “undevelopable” due to shoreline proximity. Siting the regional treatment facility in this location allows the property to be effectively used for a purpose that benefits the community, the environment and is consistent with the Port’s purpose and mission.

The remaining sections of this Plan provide additional details on the preferred regional facility design, costs and implementation plan.

This page intentionally blank.

3 PROGRAM DESCRIPTION AND SERVICE AREA

This chapter describes the regional facility program and the enabling County and state policy and regulations.

3.1 Kitsap County Policy

The Kitsap County Comprehensive Plan (2016) recognizes and encourages development of regional stormwater facilities (Land Use Goal 8). Specific policies consist of:

Land Use Policy 34. As part of periodic updates to the County’s Stormwater Comprehensive Plan, the County will identify basins and sub-basins that may be suitable for development of regional stormwater facilities. Regional facilities may be proposed in other locations by either the County or developer, subject to review and approval by the County Public Works Director and a determination that the regional facility is consistent with applicable County goals and policies.

Land Use Policy 35. New development or redevelopment projects that are located within a basin that drains to an existing or proposed regional stormwater facility, may be required to contribute toward the cost of planning, designing, constructing and maintaining that facility in lieu of building onsite improvements. The amount of the contribution will be proportionate to the amount of stormwater being added by the property relative to the capacity of the regional facility.

Land Use Policy 36. The County may enter into Latecomer Agreements with developers for recovery of their costs for capital improvements which benefit other parties in accordance with State law. The County may add an administrative charge for this service.

3.2 State and County Stormwater Management Regulations

The Plan is intended to meet the intent of Minimum Requirement #6 – Water Quality and Minimum Requirement #7 – Flow Control for stormwater mitigation as required by the Phase II National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater Permit (Permit) for public and private new development and redevelopment projects that are located within the contributing basin service area.

Section S5.C.4 of the NPDES Permit requires Kitsap County to have a program to prevent and control the impacts of runoff from new development, redevelopment and construction activities. The County has met these requirements through adoption of the KCSWDM (2016) and KCC Title 12. The KCSWDM requires certain projects to comply with Minimum Requirements (MR) #6 –

Water Quality Treatment, Minimum Requirement #7 – Flow Control, and/or MR #8 – Wetlands Protection. These MRs are typically met through the use of individual site-specific best management practices (BMPs).

Regional stormwater facilities for new development and redevelopment projects are permitted as an alternative to on-site stormwater management by the NPDES Permit and are described in the 2012 Department of Ecology (Ecology) Stormwater Management Manual for Western Washington (SWMM). Ecology’s SWMM allows regional stormwater facilities as an alternative method of meeting MR #6, MR #7, and/or MR #8 for new development and redevelopment projects as referenced in the following sections:

SWMM Section 2.4.1 – New Development: Regional stormwater facilities may be used as an option for meeting MR 6, 7, and 8, through documented engineering reports detailing how the proposed facilities meet these requirements for the sites that drain to them. Such facilities must be operational prior to and must have capacity for new development.

SWMM Section 2.4.2 – Redevelopment: Local governments can also establish criteria for allowing redevelopment projects to pay a fee in lieu of constructing water quality or flow control facilities on a redeveloped site. At a minimum, the fee should be the equivalent of an engineering estimate of the cost of meeting all applicable stormwater requirements for the project. The local government should use such funds for the implementation of stormwater control projects that would have similar benefits to the same receiving water as if the project has constructed its required improvements. Expenditure of such funds is subject to other state statutory requirements.

This Plan does not propose altering existing SWMM water quality or flow control standards, and it does not change the requirement for stormwater mitigation as defined in KCC Title 12 and the KCSWDM. Sites that utilize the regional facility for MR 6, 7 and 8 must still meet MR 1 through 5 via on-site methods. The facility would accommodate full build-out of the basin and may be upgraded over time to meet relevant changes to stormwater treatment standards.

3.3 Program Eligibility and Applicability

Connection to the regional facility would be required for all projects that trigger Minimum Requirements (MR) 6 or 7 as described in the KCSWDM. Development projects would still be required to meet MR 1-5, which includes on-site stormwater management provisions.

Both public and private projects are eligible to participate in this Plan. New development or redevelopment projects will only be allowed to participate in the regional facility if it is operational at the time of complete application for private projects, or at 30 percent design phase for public projects such as County or State roads, Port projects or public parks.

New development or redevelopment projects would be connected to the regional facility on a first-come, first-served basis until water quality treatment and/or flow control (conveyance) capacity is no longer available.

All projects are responsible for ensuring compliance with all applicable MRs even if some of these MRs are met through the use of this program. All development and redevelopment projects that exceed applicable thresholds of the KCSWDM will be required to meet MR 1-5 including those projects that connect to the Kingston regional stormwater facility.

Regional oil control facilities will not be constructed under this program; individual on-site oil treatment BMPs will be required for any project that triggers oil treatment per the SWMM. If a regional water quality treatment facility does not meet the treatment goals of the project, the project will not qualify for the program and must apply individual onsite BMPs per the KCSWDM (e.g. projects required to provide oil treatment). Construction stormwater will not be allowed to discharge to the facility and development could not connect until the development site is fully stabilized.

The property owner will be required to sign an agreement to participate in the program and a project applicant or developer may not enter into the agreement unless they are also the property owner. The property owner may enter into the agreement and the developer or applicant may pay the fees on behalf of the property owner.

3.4 Payment in Lieu of Construction

A payment in-lieu-of construction charge would be calculated for each project/property participating in the program based on the amount of impervious surface being developed. This one-time charge will be paid by the property owner or developer and would be used for capital cost recovery.

3.5 Program Modifications

Development patterns and treatment regulations may change over the life cycle of the facility. These future changes may affect the ability of the regional facility to meet all necessary treatment requirements. In the event that the regional facility is not able to meet future treatment requirements, Kitsap County may require additional on-site treatment for new development that triggers stormwater treatment requirements, is within the service area and is not currently connected to the regional facility.

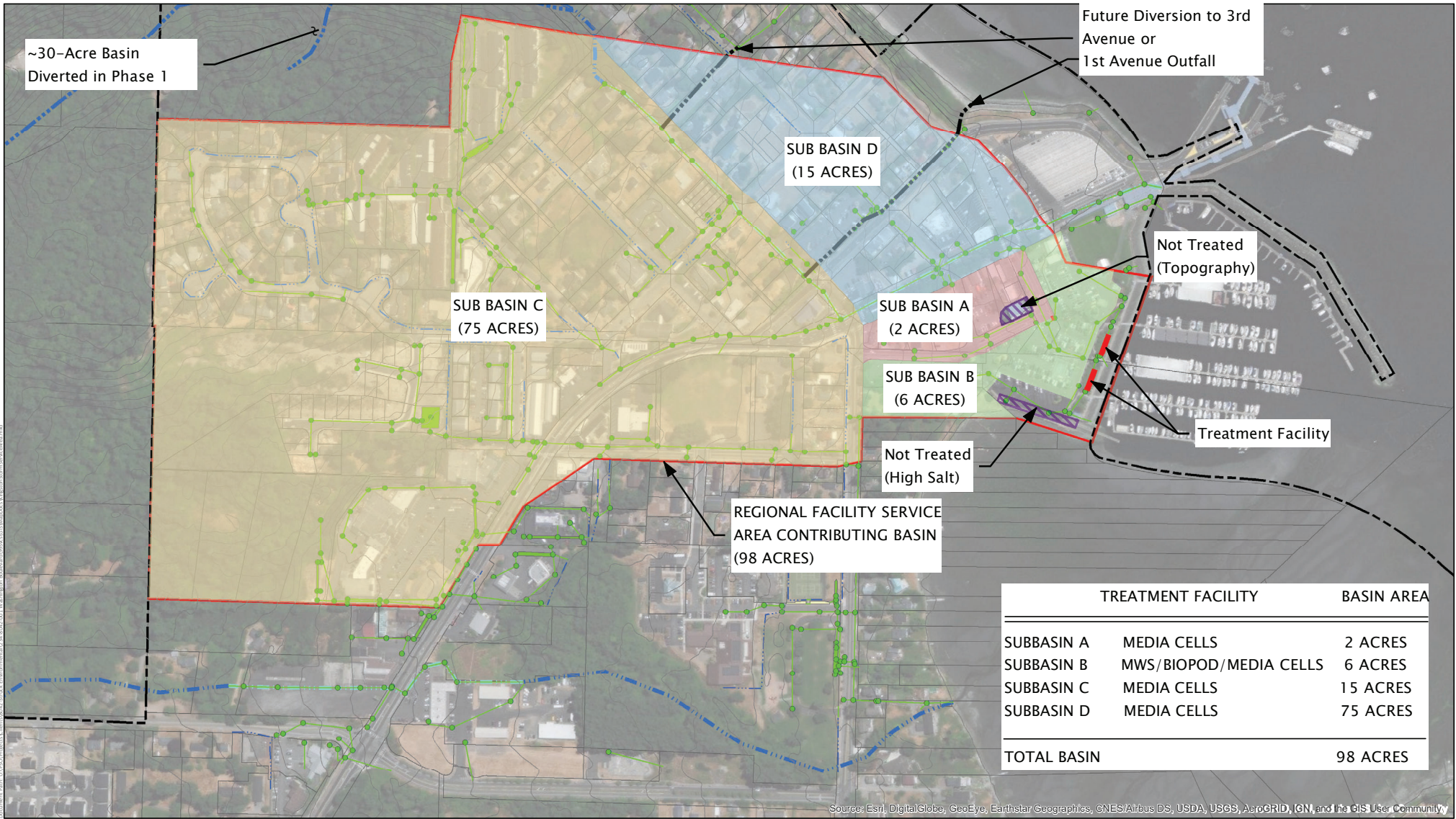
3.6 Service Area

The service area consists of a 92-acre portion of the 98-acre contributing basin. The 6-acre portion of the basin that would be associated with the Port parking lot would be included in the

treatment facility but would not be included in calculation of the connection charge. The basin area is shown in Figure 3-1.

3.7 Phasing Plan

The service area is expected to connect to the treatment facility in two phases as depicted in Figure 3-2. This phasing plan reflects that new and modified stormwater conveyance systems will be associated with SR104 improvements, and that it will be most efficient for the areas served by these systems to connect to the regional facility at the time those improvements are constructed.



TREATMENT FACILITY		BASIN AREA
SUBBASIN A	MEDIA CELLS	2 ACRES
SUBBASIN B	MWS/BIOPOD/MEDIA CELLS	6 ACRES
SUBBASIN C	MEDIA CELLS	15 ACRES
SUBBASIN D	MEDIA CELLS	75 ACRES
TOTAL BASIN		98 ACRES

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Catchbasins
- - - Ditch
- - - Urban Growth Area
- Sub Basin A
- Sub Basin C
- Pipe
- - - Stream Type F (Fish Habitat)
- Parcel Boundary
- Sub Basin B
- Sub Basin D
- 10' Contours
- - - Stream Type N (Non-Fish Habitat)
- ▭ Service Area Contributing Basin
- ▨ Areas Not Treated

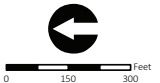
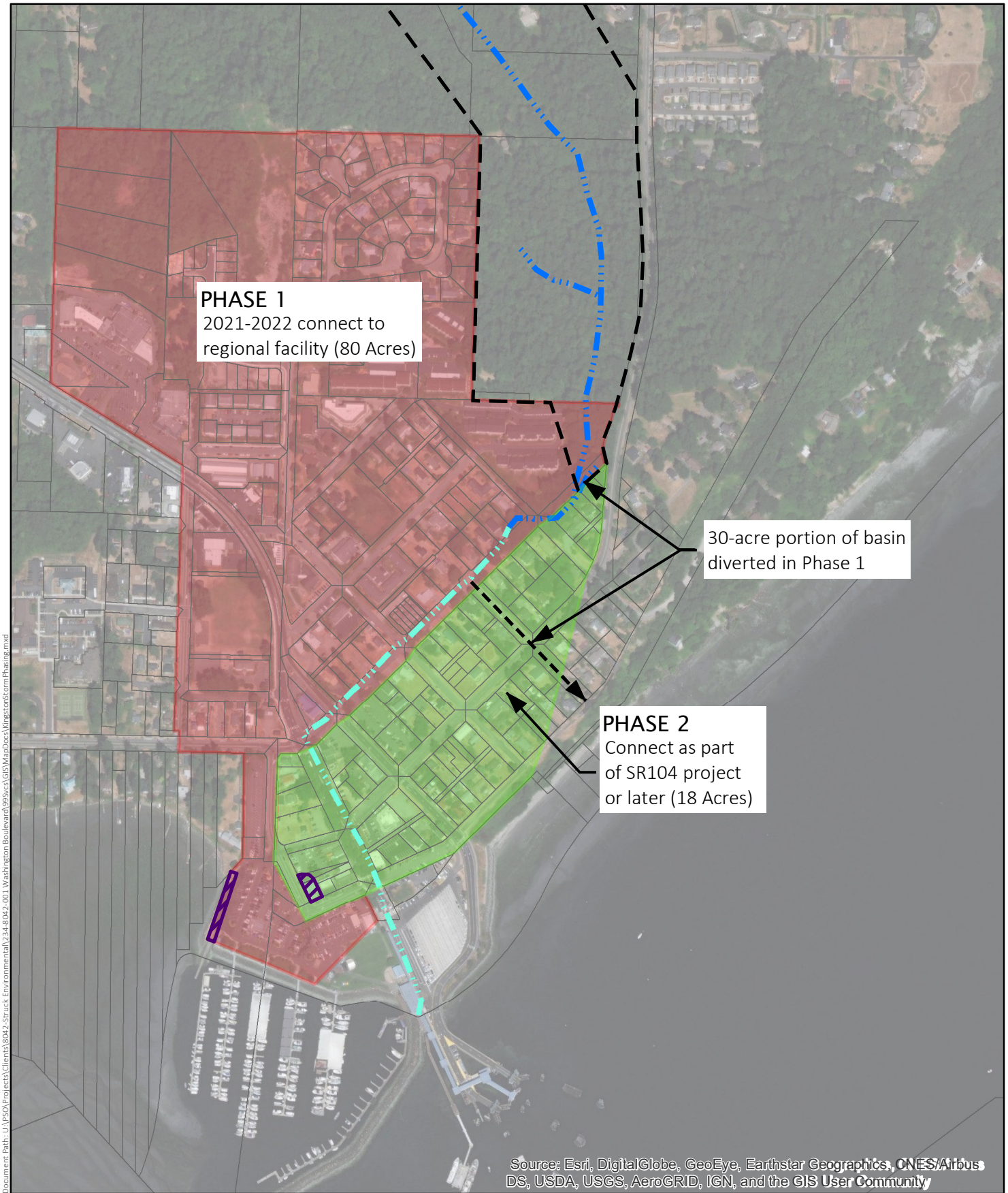


FIGURE 3-1
 Regional Stormwater Facility Service Area

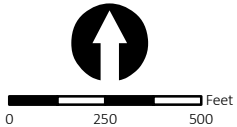


Document Path: U:\PSO\Projects\Clients\8042-Struck Environmental\234.8042-001-Washington Boulevard\995\svcs\GIS\MapDocs\KingstonStormPhasing.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FIGURE 3-2
Kingston Regional Stormwater Facility Phasing Plan

- - - - Existing Stream
- Area Not Treated Due to Topography Or High Salt Content



4 FACILITY PLAN

The proposed facility plan includes both conveyance and treatment components. Conveyance improvements are proposed to maximize stormwater flows to the facility and provide a flow-control exempt marine discharge. The treatment component provides water quality treatment to enhanced levels for the contributing basin area. The system is summarized in Table 4-1 and Figure 4-1 and is described in more detail below.

Table 4-1. Preliminary Regional Facility Summary.

FACILITY ATTRIBUTE	DESCRIPTION
Total Contributing Basin	98-acres
Zoning	Urban Village, Commercial, Industrial and Residential
Treatment Type	Enhanced
Treatment Media	Proprietary, high capacity
Infiltration Rate	70.92 inch/hour
Min. Treatment Area Required	2,444 sq-ft
Treatment Area Available	2,768 sq-ft (maximum)
Flow Control	Marine Direct Discharge

4.1 Conveyance and Flow Control Improvements

Conveyance improvements would be needed for new trunk lines on Washington Boulevard and West Kingston Road to maximize the contributing basin to the treatment facility. The new storm drains would divert flows from the existing 12-inch diameter trunk on SR104/Main Street, and the outfall downstream of West Kingston Road near the stream that traverses the west side of Village Greens. These conveyance improvements would reduce requirements for on-site flow control that currently exist due to conveyance capacity on the SR104/Main Street system and stream discharge/flooding constraints near the outfall on West Kingston Road.

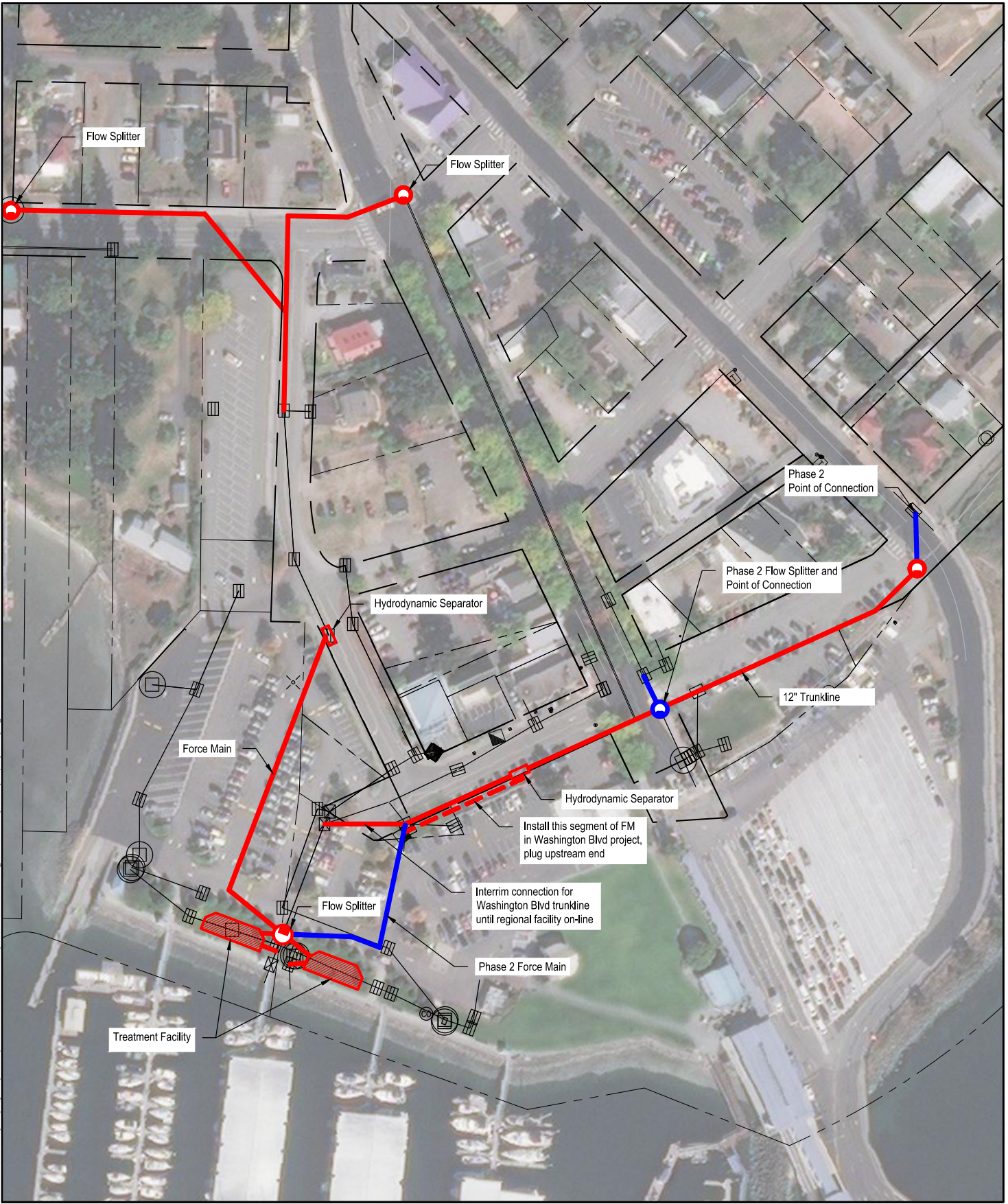
4.2 Port of Kingston Treatment and Conveyance System

The existing Port parking lot storm system is low-gradient 12-inch diameter pipe. The existing Port system is not sufficient to support the contributing basin flows from this Plan and connection of the majority of the contributing basin to the regional treatment facility. New conveyance pipes are therefore proposed across the Port parking lot to connect to the treatment system as shown in Figure 4-2. Conveyance pipe size and location will be defined as part of detailed hydraulic analysis that occurs as part of final engineering design.

4.3 Treatment System

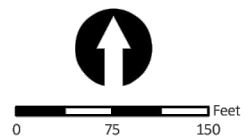
The treatment system would consist of two high capacity media filter treatment cells within landscaped areas of the Port parking lot (Figure 4-2).

Document Path: U:\PSO\Projects\Clients\6042-Struck Environmental\234-4042-001- Washington Boulevard\995\GIS\MapDocs\KingstonStormInterimPlan.mxd



Parametrix
ENGINEERING, PLANNING, ENVIRONMENTAL SCIENCES

FIGURE 4-1
Conveyance and Treatment Plan



- Hydrodynamic Separator
 - ▭ Phase 1
 - ▭ Phase 2
- Flow Splitter
 - Phase 1
 - Phase 2
- Conveyance Pipe
 - Phase 1
 - Phase 2

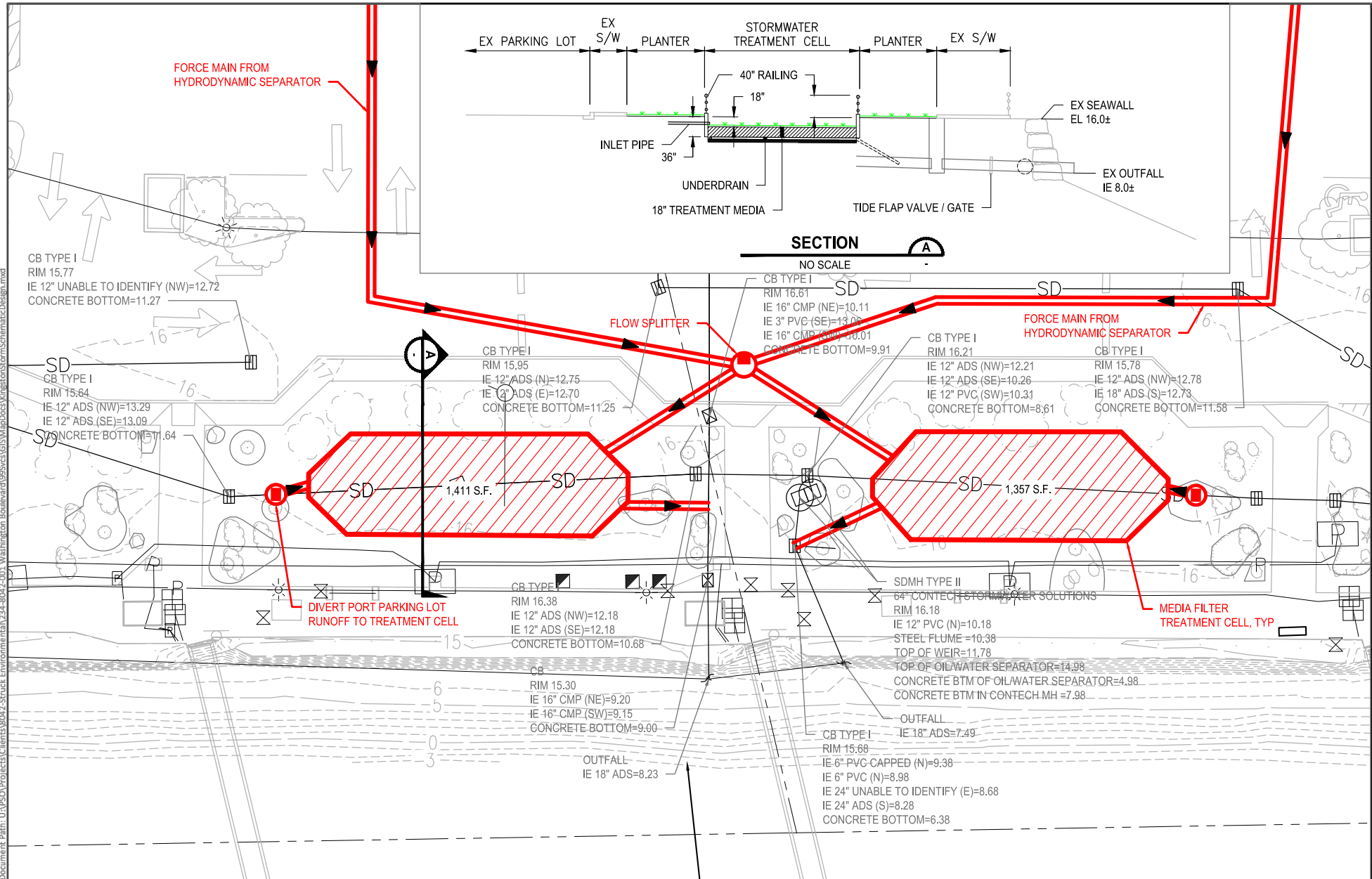


FIGURE 4-2
Treatment Cells Schematic
Design Concept



The existing Port treatment system near the proposed media filter cells would be removed as part of the project and runoff from the Port parking lot would be routed to the media cells for treatment. Treatment media would be a high capacity proprietary material from an approved vendor such as Filterra™ or BioPod™. Treatment facility sizing is summarized in Table 4-2.

Table 4-2. Treatment System Sizing Summary.

Phase	Basin Size (ac)	WQ Treatment Flow at Full Build Out (cfs) ¹	Treatment Area Required (sq-ft) ^{1,2}
1	83	4.28	2,070
2	15	1.00	374
Total	98	5.28	2,444

¹ Full build out assumes development under existing zoning.

² 91% of water quality storm treatment volume.

The treatment facility would be contained within a concrete walled structure and would use surface dispersion through a media cell landscaped with grass similar to the Manchester regional treatment facility (Figure 4-3). Treatment cells would be located below the ground surface and would be enclosed by an attractive decorative fence material. Perimeter landscaping and lighting would be provided to create an attractive and sustainable appearance consistent with adjacent Port areas. Interpretive displays would be placed to provide public educational opportunity.



Figure 4-3. Manchester Stormwater Park.

4.4 Ownership, Operation and Maintenance

The treatment facility would be located on property owned by the Port. Facility construction, operation and maintenance would be provided by Kitsap County under an Interlocal Agreement (or similar) with the Port.

5 SYSTEM COSTS AND CONNECTION CHARGES

The system development (connection) charge is based upon total capital construction costs. These costs are described in greater detail below and in the cost estimates provided in Appendix A.

5.1 Capital Costs

Capital cost is based on total estimated planning, design and construction costs. Total capital costs by project element are summarized in Table 5-1. Total capital costs by estimated date incurred are shown in Table 5-2. Refer to Table A-1 in Appendix A for additional detail.

Table 5-1. Capital Cost Summary.

PROJECT ELEMENT	COST
Construction with Tax and Contingency	\$ 2,100,329
Planning, Design and Permits	\$ 322,335
Project Management and Construction Management	\$ 184,596
TOTAL CAPITAL COST	\$ 2,607,260

Table 5-2. Capital Costs and Year Cost Incurred.

DESCRIPTION	COST	YEAR INCURRED
Preliminary Stormwater Assessment	\$ 15,000	2016
Alternatives Analysis	\$ 15,000	2017
Concept Design and Facility Plan	\$ 45,000	2018
Washington Boulevard Conveyance	\$ 252,906	2019
Regional Facility Design	\$ 223,795	2019
Phase 1 Construction	\$ 1,830,870	2020-21
Phase 2 Construction	\$ 224,689	2022 +
TOTAL	\$ 2,607,260	

5.2 Estimated Connection Charge

The proposed estimated connection charge is \$867 for each 1,000 sq-ft of impervious surface area created by the new development or redevelopment project. The service area at full build-out is estimated at approximately 75 percent total impervious area, which is consistent with underlying zoning (which typically allows up to 85 percent impervious surfaces) as well as typical full build-out conditions in urban areas in the Puget Sound region (Ecology 2009). Table 5-3 summarizes the proposed connection charge.

Table 5-3. Proposed Connection Charge.

ELEMENT	VALUE
Total Service Area (acres) ¹	92
Impervious Area at Full Build out	75%
<i>Impervious Acres at Full Build out</i>	69
<i>Capital Cost</i>	\$ 2,607,260
Connection Charge per 1,000 sq-ft Impervious Area	\$ 867

¹ Service area does not include Port parking lot (6-acres).

5.3 Final Connection Charge Calculation

Table 5-3 summarizes the estimated connection charge calculation, which is based on estimated capital costs. The final connection charge would be calculated after construction is complete and actual capital construction costs are available.

5.4 Comparison to On-Site Stormwater Costs

To ensure that the program is cost effective, the proposed connection charge was compared to typical costs to construct an equivalent on-site stormwater system at representative development sites.

Ecology (2013) prepared a comprehensive analysis of costs to implement current stormwater requirements under a variety of development scenarios. The City of Tacoma (2016) also developed costs for representative on-site stormwater management. These representative costs are compared to the proposed regional facility in Table 5-4 and Figure 5-1. Appendix A provides additional detail on representative stormwater capital and O&M costs.

Table 5-4 and Figure 5-1 show that the proposed regional facility is more cost-effective than on-site stormwater management under both a residential plat and commercial/multi-family development scenario. Table 5-4 and Figure 5-1 estimates do not include the expected costs to implement MR 1-5 at all sites.

Table 5-4. Total Stormwater Management Costs, On-site Versus Regional Facility.

DEVELOPMENT SCENARIO	ON-SITE FACILITIES CAPITAL COST ¹
On-Site Existing Residential Lot or Small Plat ²	\$ 1,015
On-Site New Plat Residential Lot ³	\$ 4,054
On-Site Commercial or Multi-family ³	\$ 4,978
Kingston Regional Facility	\$ 867

¹ Cost per 1,000 sq-ft of impervious area.

² Data from City of Tacoma (2016). Present value 2018.

³ Data from Department of Ecology (2013). Present value 2018.

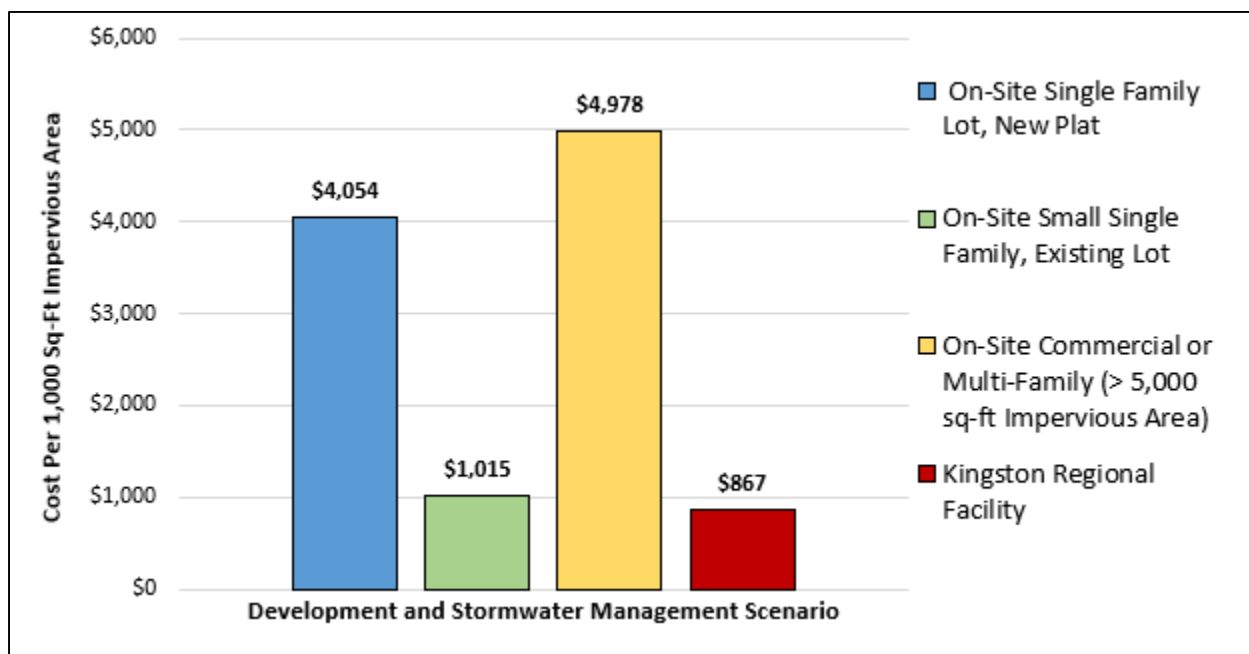


Figure 5-1. Cost of Representative On-site Facilities versus Kingston Regional Facility.

Based on City of Tacoma data, costs for connection of existing residential lots or new small (short) plat low density residential development may be approximately equivalent to the regional facility.

Table 5-5 compares total estimated capital costs for a typical residential or commercial development project that creates 10,000 sq-ft of new and/or redeveloped impervious surface.

Table 5-5. Cost Comparison for Typical Development Project (with 10,000 sq-ft new impervious surfaces).

COST ELEMENT	DEVELOPMENT AND STORMWATER MGMT. SCENARIO		
	RESIDENTIAL ON-SITE	COMMERCIAL ON-SITE	KINGSTON REGIONAL FACILITY
Engineering Design	\$20,000	\$21,000	\$5,000 ¹
Flow Control and Treatment ²	\$20,000	\$49,000	\$8,670
TOTAL	\$40,000	\$69,000	\$13,670
<i>Cost Savings Due to Regional Facility</i>	<i>\$26,330</i>	<i>\$55,330</i>	-

¹ Assumes abbreviated engineering report.

² Does not include costs to implement on-site stormwater management elements required under MR 5.

5.5 Comparison to Other Regional Stormwater Connection Charges

Estimated Kingston regional facility costs are typically lower compared to other regional stormwater facilities that have been developed in the Puget Sound area. Table 5-6 compares estimated Kingston costs to regional facility costs in Redmond and Tacoma.

Table 5-6. Comparison of Regional Facility Connection Charges.

Cost Per Sq-ft Impervious Area	Kingston Regional Facility ¹	City of Redmond ¹		City of Tacoma		
		Downtown Basin	Overlake Basin	23 rd St. ^{2,3}	A St. ^{2,3}	Hood St. ²
Basin Size (Ac)	92	500	320	42	33	35
Capital Cost	\$0.87	\$ 2.72	\$ 4.27	\$ 0.35	\$ 1.02	\$ 0.74
O&M/General Facility Charge	\$ 0	\$ 0.48	\$ 0.48	\$ 0.24	\$ 0.36	\$ 0.42
Totals	\$0.87	\$ 3.20	\$ 4.75	\$ 0.59	\$ 1.38	\$ 1.16

¹ Includes flow control and water quality treatment.

² Water quality treatment only.

³ Basic treatment only (storm filter cartridges).

5.6 Cost Recovery Estimates

The existing service area is estimated at approximately 60 percent developed based on existing zoning. Total impervious area under existing conditions is also estimated at 60 percent. Assuming 75 percent impervious area at full build-out, there is approximately 650,000 sq-ft of potential new impervious surface area in the service area at full build-out. It is assumed that 20 percent of these new impervious surfaces would be associated with residential development that would be exempt from stormwater mitigation requirements.

Under these assumptions, there would be approximately \$500,000 in total potential connection

charge reimbursements over the life cycle of the facility. Assuming 20 percent of the remaining area redevelops in a manner that triggers stormwater mitigation requirements would result in an additional 500,000 sq-ft of impervious area or approximately \$470,000 in connection charge reimbursements. Total cost recovery is therefore estimated to be in the range of \$1,000,000 or approximately 40 percent of total capital costs.

5.7 Operation and Maintenance Costs

Operation and maintenance (O&M) costs are not included in the connection charge calculation but are provided for comparison. Table 5-7 compares estimated O&M costs under several development scenarios. Operation and maintenance costs for the Kingston regional facility are based upon the present worth value of 30-year life cycle costs. O&M costs for typical residential and commercial projects are based on data from Ecology’s 2013 “Cost Analysis for Western Washington LID Requirements and Best Management Practices”. Refer to Appendix A for additional O&M cost detail.

Table 5-7. Comparison of O&M Costs, On-site Versus Regional Facility.

DEVELOPMENT AND STORMWATER TREATMENT SCENARIO	O&M COST PER 1,000 SQ-FT IMPERVIOUS AREA ¹	O&M COST FOR TYPICAL DEVELOPMENT ¹	O&M SAVINGS FROM USING REGIONAL FACILITY
Commercial or Multi-Family ²	\$1,285	\$12,850	\$5,250
Residential Lot in New Plat ²	\$1,865	\$18,650	\$11,050
Existing Residential Lot ³	\$1,890	\$5,670	\$0
Kingston Regional Facility	\$ 760	\$7,600	-

¹ 30-year life cycle operation and maintenance costs. Does not include costs to maintain on-site stormwater controls required under MR 5.

² Data from Department of Ecology (2013). Present value 2018.

³ Data from City of Tacoma (2016). Present value 2018.

This page intentionally blank.

6 IMPLEMENTATION PLAN

Implementation elements include public review, Plan adoption, final design and construction. Each of these elements is described in greater detail below.

6.1 Public Outreach and Information

Public outreach for the Plan will consist of the following activities:

- Presentation to the Port of Kingston
- Presentation to the Kingston Community Advisory Committee
- Mailing to all landowners in the contributing basin service area
- Posting of the draft Plan on the County web site
- Presentation of the Plan to the Kingston Chamber of Commerce
- Public Hearing with the Kitsap County Commissioners

Following adoption of the Plan and implementing ordinance, the County will develop additional outreach materials to inform the community of regional facility costs, availability and connection procedures.

6.2 Plan Adoption and Kitsap County Code Updates

The draft plan will be presented for review by the Port, KCAC and larger community and finalized based on comments received. Updates to KCC necessary to implement the regional facility plan will be prepared concurrent with the final Plan. The final Plan and associated KCC will then be presented for adoption by the Board of County Commissioners at a public hearing.

6.3 Design and Construction

The regional facility design and capacity will be confirmed through a detailed Engineering Report that will be prepared as part of facility design. This engineering report will provide the calculations that confirm equivalency under both the KCSWDM and Ecology's 2012 SWMMM. Final design and construction would commence upon final plan approval with the facility on-line within approximately 1-2 years.

6.4 Site-Specific Connection Procedures

As part of KCC updates, the County would develop procedures to guide how specific development and re-development projects would connect to and pay for regional stormwater services. These procedures would include:

- Drainage Plan and engineering design requirements

- Fee payment
- Permit review and approval

6.5 Program Administration

The County will maintain and track the balance of regional stormwater facility capacity used including the following information:

- Total amount of capacity available
- Total amount of capacity remaining
- Data for each project utilizing the program, including:
 - Total project area
 - Hard surfaces area requiring mitigation
 - Lawn/landscaped areas requiring mitigation
 - Hard surfaces area utilizing regional facility
 - Lawn/landscaped area utilizing regional facility
 - System connection charge paid

When the amount of capacity used reaches 85 percent, the County may seek to provide additional regional facility capacity through construction of new facilities or retrofit of the existing facility. If additional flow control or water quality treatment capacity is not provided for in the regional facility basin area, Kitsap County will discontinue the regional program and require subsequent new development and/or redevelopment to meet all MRs that are in effect at that time through the use of individual site-specific stormwater facilities.

The program will be reviewed annually. This review will include:

- Evaluation of any regulatory changes or modifications
- Assessment of system operation and maintenance costs
- Calculation of system use and remaining capacity

7 REFERENCES

- Ecology 2013. "Cost Analysis for Western Washington LID Requirements and Best Management Practices", State of Washington Department of Ecology, prepared by Herrera Environmental Consultants, Inc., June 28, 2013.
- Ecology 2009. Land Use, Impervious Surface, and Water Quality, City of Redmond. Water Quality Program Washington State Department of Ecology Olympia, Washington 98504-7710.
- Kitsap County 2016. Kitsap County Comprehensive Plan 2016-2036. June 2016.
- Redmond, City of 2010. City of Redmond Regional Facilities Plan. February 2010.
- Tacoma, City of 2016. City of Tacoma Regional Stormwater Facility Plan. Prepared by City of Tacoma Environmental Services Department Science and Engineering Division, Environmental Programs Group. July 2016.

This page intentionally blank.

APPENDIX A: COST WORKSHEETS

This page intentionally blank

**TABLE A-1. KINGSTON REGIONAL STORMWATER FACILITY
PLANNING LEVEL CAPITAL COST ESTIMATE**

Date: 12/17/2018

Item	Description	Quantity	Unit	Unit Cost	Amount
PLAN DEVELOPMENT AND CONCEPT DESIGN					
1	Preliminary Stormwater Assessment	1	LS	\$ 15,000	\$ 15,000
2	Alternatives Analysis	1	LS	\$ 15,000	\$ 15,000
3	Concept Design	1	LS	\$ 20,000	\$ 20,000
4	Plan Preparation	1	LS	\$ 25,000	\$ 25,000
Subtotal Plan Development and Preparation					\$ 75,000
WASHINGTON BLVD CONVEYANCE					
5	Plans, Specifications and Est.	1	LS	\$ 20,000	\$ 20,000
6	Connect to Drainage Structure	7	EA	\$ 1,100	\$ 7,700
7	Removing Drainage Structures	1	EA	\$ 5,000	\$ 5,000
8	Catch Basin, Type 1	2	EA	\$ 1,500	\$ 3,000
9	Catch Basin, Type 2	6	EA	\$ 3,000	\$ 18,000
10	Structure Excavation Incl Haul	350	CY	\$ 30	\$ 10,500
11	Gravel Backfill for Drain	350	CY	\$ 50	\$ 17,500
12	Adjust Catch Basin	8	EA	\$ 5,000	\$ 40,000
13	CPE Storm Sewer Pipe, 12-in. dia.	540	LF	\$ 40	\$ 21,600
14	Solid Wall PVC Storm Sewer Pipe, 6-in. dia	100	LF	\$ 40	\$ 4,000
15	Hydrodynamic Separator	1	EA	\$ 60,000	\$ 60,000
Subtotal					\$ 207,300
16	Construction Contingency	10%			\$ 20,730
17	Pro. Mgmt. and Const. Mgmt.	12%			\$ 24,876
Subtotal Washington Blvd Construction					\$ 252,906
PHASE 1 REGIONAL CONVEYANCE IMPROVEMENTS					
18	Mobilization (10%)	1	LS	\$ 34,300	\$ 34,300
19	Site Prep, Demo, TESC	1	LS	\$ 20,000	\$ 20,000
20	CPE Storm Sewer Pipe, 18-in. dia.	600	LF	\$ 80	\$ 48,000
21	Solid Wall PVC Storm Sewer Pipe, 6-in. dia	350	LF	\$ 40	\$ 14,000
22	Catch Basin, Type 1	4	EA	\$ 1,500	\$ 6,000
23	Catch Basin, Type 2	5	EA	\$ 3,000	\$ 15,000
24	Catch Basin Type 2 with flow splitter	3	EA	\$ 10,000	\$ 30,000
25	Structure Excavation Incl Haul	500	CY	\$ 30	\$ 15,000
26	Gravel Backfill for Drain	500	CY	\$ 50	\$ 25,000
27	Trench and Pavement Repair	800	SY	\$ 100	\$ 80,000
28	Hydrodynamic Separator	1	EA	\$ 60,000	\$ 60,000
29	Traffic Control	1	LS	\$ 30,000	\$ 30,000
Subtotal					\$ 377,300
30	Tax	8.9%			\$ 33,580
31	Construction Contingency	30%			\$ 113,190
32	Engineering and Permits	15%			\$ 56,595
33	Pro. Mgmt. and Const. Mgmt.	12%			\$ 45,276
Subtotal Phase 1 Regional Conveyance Improvements					\$ 625,941
PHASE 1 STREAM DIVERSION CONVEYANCE IMPROVEMENTS					
34	Mobilization (10%)	1	LS	\$ 20,900	\$ 20,900
35	Site Prep, Demo, TESC	1	LS	\$ 10,000	\$ 10,000
36	CPE Storm Sewer Pipe, 24-in. dia.	800	LF	\$ 80	\$ 64,000
37	Catch Basin, Type 1	4	EA	\$ 1,500	\$ 6,000
38	Catch Basin, Type 2	3	EA	\$ 3,000	\$ 9,000
39	Structure Excavation Incl Haul	500	CY	\$ 30	\$ 15,000
40	Gravel Backfill for Drain	500	CY	\$ 50	\$ 25,000

Item	Description	Quantity	Unit	Unit Cost	Amount
41	Trench and Pavement Repair	500	SY	\$ 100	\$ 50,000
42	Outfall Improvements	1	LS	\$ 20,000	\$ 20,000
43	Traffic Control	1	LS	\$ 10,000	\$ 10,000
				Subtotal	\$ 229,900
44	Tax	8.9%			\$ 20,461
45	Construction Contingency	30%			\$ 68,970
46	Engineering and Permits	20%			\$ 45,980
47	Pro. Mgmt. and Const. Mgmt.	12%			\$ 27,588
				Subtotal Stream Diversion Conveyance Improvements	\$ 392,899
REGIONAL TREATMENT FACILITY					
48	Mobilization (10%)	1	LS	\$ 55,100	\$ 55,100
49	Site Prep, Demo, TESC	1	LS	\$ 20,000	\$ 20,000
50	CPE Storm Sewer Pipe, 18-in. dia.	100	LF	\$ 80	\$ 8,000
51	Solid Wall PVC Storm Sewer Pipe, 6-in. dia	50	LF	\$ 40	\$ 2,000
52	Catch Basin, Type 2	4	EA	\$ 3,000	\$ 12,000
53	Structure Excavation Incl Haul	900	CY	\$ 30	\$ 27,000
54	Prefabricated Media Cells	2	EA	\$ 80,000	\$ 160,000
55	Dispersion and Underdrain System	2	EA	\$ 10,000	\$ 20,000
56	Media Cell Railing	360	LF	\$ 100	\$ 36,000
57	Treatment Media	160	TON	\$ 600	\$ 96,000
58	Mulch and Plants	2	EA	\$ 15,000	\$ 30,000
59	Landscaping and Irrigation	2000	SF	\$ 20	\$ 40,000
60	Sidewalk and Utility Restoration	1	LS	\$ 20,000	\$ 20,000
61	Traffic Control	1	LS	\$ 10,000	\$ 10,000
62	Connect Port stormwater system	1	LS	\$ 50,000	\$ 50,000
63	Tide Flaps and Outfall Adjustments	2	EA	\$ 10,000	\$ 20,000
				Subtotal	\$ 606,100
64	Tax	8.9%			\$ 53,943
65	Construction Contingency	30%			\$ 181,830
66	Engineering and Permits	20%			\$ 121,220
67	Pro. Mgmt. and Const. Mgmt.	12%			\$ 72,732
				Subtotal Regional Treatment Facility	\$ 1,035,825
PHASE 2 REGIONAL CONVEYANCE IMPROVEMENTS					
68	Mobilization (10%)	1	LS	\$ 10,700	\$ 10,700
69	Site Prep, Demo, TESC	1	LS	\$ 8,000	\$ 8,000
70	CPE Storm Sewer Pipe, 18-in. dia.	100	LF	\$ 120	\$ 12,000
71	Solid Wall PVC Storm Sewer Pipe, 6-in. dia	200	LF	\$ 50	\$ 10,000
72	Catch Basin, Type 1	2	EA	\$ 1,500	\$ 3,000
73	Catch Basin, Type 2	2	EA	\$ 3,000	\$ 6,000
74	Catch Basin Type 2 with flow splitter	1	EA	\$ 10,000	\$ 10,000
75	Connect to Drainage Structure	2	EA	\$ 5,000	\$ 10,000
76	Structure Excavation Incl Haul	100	CY	\$ 30	\$ 3,000
77	Gravel Backfill for Drain	100	CY	\$ 50	\$ 5,000
78	Trench and Pavement Repair	200	SY	\$ 100	\$ 20,000
79	Traffic Control	1	LS	\$ 20,000	\$ 20,000
				Subtotal	\$ 117,700
80	Tax	8.9%			\$ 10,475
81	Construction Contingency	50%			\$ 58,850
82	Engineering and Permits	20%			\$ 23,540
83	Pro. Mgmt. and Const. Mgmt.	12%			\$ 14,124
				Subtotal Phase 2 Regional Conveyance Improvements	\$ 224,689
TOTAL CAPITAL COST					\$ 2,607,260

Table A-2. Typical stormwater costs (2018 values) for residential and commercial developments (all data from Ecology 2013).

Development Type	Site Area (Sq-Ft)	TIA (Sq-Ft)	Costs		
			O&M	Capital	Total
Single Family Residential					
Total	5,000	3,000	\$11,185.51	\$24,325.28	\$35,510.79
Cost after meeting MR 5 ¹			\$5,592.76	\$12,162.64	\$17,755.39
Cost/Sq-Ft (Gross Lot Area)			\$1.12	\$2.43	\$3.55
Cost/Sq-Ft TIA			\$1.86	\$4.05	\$5.92
Commercial or Multifamily					
Total	43,560	35,000	\$89,946.95	\$248,909.81	\$338,856.76
Cost after meeting MR 5 ²			\$62,962.87	\$174,236.86	\$237,199.73
Cost/Sq-Ft (Gross Lot Area)			\$1.45	\$4.00	\$5.45
Cost/Sq-Ft TIA			\$1.80	\$4.98	\$6.78

¹ Assumes 50% of total costs are associated with meeting on-site stormwater management requirement of MR 5.

² Assumes 30% of total costs are associated with meeting on-site stormwater management requirement of MR 5.

TIA = Total Impervious Area

Table A-3. Estimated operation, maintenance and administration costs, Kingston regional stormwater facility (present value 2018).

Item	Description	Labor Hr	Labor \$/Hr \$85	Equip. Hr	Equip \$/Hr \$150	Material Cost	Tot. Cost Each	Frequency	Annual Cost
1	Routine inspection	2	\$ 170	-	-	-	\$ 170	1/week	\$ 8,840
2	Plant and structure maintenance (weed, trim, repair)	24	\$ 2,040	-	-	\$ 500	\$ 2,540	3/year	\$ 7,620
3	Plant Replacement	24	\$ 2,040	-	-	\$ 1,000	\$ 3,040	1/year	\$ 3,040
4	Mulch replacement	24	\$ 2,040	8	\$1,200	\$ 2,000	\$ 5,248	1/year	\$ 5,248
5	Hydrodynamic Separator, solids removal	24	\$ 2,040	8	\$1,200	\$ 1,000	\$ 4,248	every 2 yrs	\$ 2,124
6	Filter media replacement, incl plants and mulch	120	\$ 10,200	40	\$6,000	\$ 100,000	\$ 116,360	every 10 yrs	\$ 11,636
8	Perimeter landscaping maintenance			By Port of Kingston					\$ -
9	Program Administration (8 hr/month)	96	\$ 8,160	-	-	-	\$ 8,256	annual	\$ 8,256
Est. Total Annualized O&M Cost									\$ 46,764

Table A-4. Operation, Maintenance and Administration Life Cycle Costs, Kingston Regional Stormwater Facility.

Asset Type	Stormwater
Useful Life	30
Capital Cost	\$ 2,607,260
Inflate Rate	2.5%
Inspection	\$ 8,840
Plant and Structure Maint.	\$ 7,620
Plant Replacement	\$ 3,040
Mulch replacement	\$ 5,248
H-S solids removal	\$ 4,248
Media replacement	\$ 116,360
Administration	\$ 8,256
Year 1	1.00
Year 2	1.025
Year 3	1.05
Year 4	1.08
Year 5	1.10
Year 6	1.13
Year 7	1.16
Year 8	1.19
Year 9	1.22
Year 10	1.25
Year 11	1.28
Year 12	1.31
Year 13	1.34
Year 14	1.38
Year 15	1.41
Year 16	1.45
Year 17	1.48
Year 18	1.52
Year 19	1.56
Year 20	1.60
Year 21	1.64
Year 22	1.68
Year 23	1.72
Year 24	1.76
Year 25	1.81
Year 26	1.85
Year 27	1.90
Year 28	1.95
Year 29	2.00
Year 30	2.05

ASSET LIFE	Inspection		Plant and Structure Maintenance		Plant Replacement		Mulch Replacement		H-S Solids Removal		Media Replacement		Program Administration		Total
	# per year	Cost	Year (x)	Cost	Year (x)	Cost	Year (x)	Cost	Year (x)	Cost	# per year	Cost	# per year	Cost	
Year 1	1	\$ 8,840	1	\$ 7,620	1	\$ 3,040	1	\$ 5,248		\$ -		\$ -	1	\$ 8,256	\$ 33,004
Year 2	1	\$ 9,061	1	\$ 7,811	1	\$ 3,116		\$ -	1	\$ 4,354		\$ -	1	\$ 8,462	\$ 32,804
Year 3	1	\$ 9,288	1	\$ 8,006	1	\$ 3,194	1	\$ 5,514		\$ -		\$ -	1	\$ 8,674	\$ 34,675
Year 4	1	\$ 9,520	1	\$ 8,206	1	\$ 3,274		\$ -	1	\$ 4,575		\$ -	1	\$ 8,891	\$ 34,465
Year 5	1	\$ 9,758	1	\$ 8,411	1	\$ 3,356	1	\$ 5,793		\$ -		\$ -	1	\$ 9,113	\$ 36,430
Year 6	1	\$ 10,002	1	\$ 8,621	1	\$ 3,439		\$ -	1	\$ 4,806		\$ -	1	\$ 9,341	\$ 36,210
Year 7	1	\$ 10,252	1	\$ 8,837	1	\$ 3,525		\$ -		\$ -		\$ -	7	\$ 67,021	\$ 89,635
Year 8	1	\$ 10,508	1	\$ 9,058	1	\$ 3,614	1	\$ 6,238	1	\$ 5,050		\$ -	1	\$ 9,814	\$ 44,281
Year 9	1	\$ 10,771	1	\$ 9,284	1	\$ 3,704		\$ -		\$ -		\$ -	1	\$ 10,059	\$ 33,818
Year 10	1	\$ 11,040	1	\$ 9,516	1	\$ 3,797	1	\$ 6,554	1	\$ 5,305	1	\$ 145,318	1	\$ 10,311	\$ 191,840
Year 11	1	\$ 11,316	1	\$ 9,754	1	\$ 3,891		\$ -		\$ -		\$ -	1	\$ 10,568	\$ 35,530
Year 12	1	\$ 11,599	1	\$ 9,998	1	\$ 3,989	1	\$ 6,886	1	\$ 5,574		\$ -	1	\$ 10,833	\$ 48,878
Year 13	1	\$ 11,889	1	\$ 10,248	1	\$ 4,088		\$ -		\$ -		\$ -	1	\$ 11,103	\$ 37,329
Year 14	1	\$ 12,186	1	\$ 10,504	1	\$ 4,191	1	\$ 7,234	1	\$ 5,856		\$ -	1	\$ 11,381	\$ 51,352
Year 15	1	\$ 12,491	1	\$ 10,767	1	\$ 4,295		\$ -		\$ -		\$ -	1	\$ 11,666	\$ 39,219
Year 16	1	\$ 12,803	1	\$ 11,036	1	\$ 4,403	1	\$ 7,601	1	\$ 6,152		\$ -	1	\$ 11,957	\$ 53,952
Year 17	1	\$ 13,123	1	\$ 11,312	1	\$ 4,513		\$ -		\$ -		\$ -	1	\$ 12,256	\$ 41,204
Year 18	1	\$ 13,451	1	\$ 11,595	1	\$ 4,626	1	\$ 7,985	1	\$ 6,464		\$ -	1	\$ 12,562	\$ 56,683
Year 19	1	\$ 13,787	1	\$ 11,885	1	\$ 4,741		\$ -		\$ -		\$ -	1	\$ 12,877	\$ 43,290
Year 20	1	\$ 14,132	1	\$ 12,182	1	\$ 4,860	1	\$ 8,390	1	\$ 6,791	1	\$ 186,019	1	\$ 13,198	\$ 245,572
Year 21	1	\$ 14,485	1	\$ 12,486	1	\$ 4,981		\$ -		\$ -		\$ -	1	\$ 13,528	\$ 45,481
Year 22	1	\$ 14,848	1	\$ 12,798	1	\$ 5,106	1	\$ 8,814	1	\$ 7,135		\$ -	1	\$ 13,867	\$ 62,568
Year 23	1	\$ 15,219	1	\$ 13,118	1	\$ 5,234		\$ -		\$ -		\$ -	1	\$ 14,213	\$ 47,784
Year 24	1	\$ 15,599	1	\$ 13,446	1	\$ 5,364	1	\$ 9,261	1	\$ 7,496		\$ -	1	\$ 14,569	\$ 65,735
Year 25	1	\$ 15,989	1	\$ 13,782	1	\$ 5,499		\$ -		\$ -		\$ -	1	\$ 14,933	\$ 50,203
Year 26	1	\$ 16,389	1	\$ 14,127	1	\$ 5,636	1	\$ 9,729	1	\$ 7,876		\$ -	1	\$ 15,306	\$ 69,063
Year 27	1	\$ 16,799	1	\$ 14,480	1	\$ 5,777		\$ -		\$ -		\$ -	1	\$ 15,689	\$ 52,745
Year 28	1	\$ 17,219	1	\$ 14,842	1	\$ 5,921	1	\$ 10,222	1	\$ 8,274		\$ -	1	\$ 16,081	\$ 72,559
Year 29	1	\$ 17,649	1	\$ 15,213	1	\$ 6,069		\$ -		\$ -		\$ -	1	\$ 16,483	\$ 55,415
Year 30	1	\$ 18,090	1	\$ 15,594	1	\$ 6,221	1	\$ 10,740	1	\$ 8,693		\$ -	1	\$ 16,895	\$ 76,233
TOTALS	30	\$ 388,100	30	\$ 334,539	30	\$ 133,464	15	\$ 116,209	15	\$ 94,401	2	\$ 331,337	36	\$ 419,907	\$ 1,817,956

