Seattle Public Utilities

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Green Stormwater Infrastructure in Seattle

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Working Together to Protect our Waterways

Green Stormwater Infrastructure Manual for Capital Improvement Projects

Volume IV: Construction, On-Boarding & Commissioning

MIG | SvR

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This is the fourth of five volumes of the Green Stormwater Infrastructure (GSI) Manual for Capital Improvement Projects (GSI Manual). Please consult with other volumes for additional information:

VOLUME:

I	Project Initiation / Partnering Framework
II	Options Analysis Phase
III	Design Phase
IV	**Construction, On-Boarding & Commissioning**
V	Operations & Maintenance

This GSI Manual supplements (not replaces) City and County project guideline manuals.

This document was prepared and compiled by MIG|SvR for Seattle Public Utilities (SPU) and King County Wastewater Treatment Division (WTD) for the GSI Program (SPU Contract C12-004). Additional contributors to this document included representatives from SPU, WTD and results from the City's Interdepartmental Team Meetings in 2013 to 2017 along with updates in 2019 from SPU Construction and Asset Management. Guidance for construction of deep infiltration facilities was developed through a joint SPU and WTD workgroup in 2019.

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List of Abbreviations*

*See COS Standard Plan (COS Std Plan) 002 for other General Abbreviations used for Street Improvement Permitting plans in City's ROW.

Term	Abbreviation Definition
AM	GSI Asset Manager (SPU)
AMP	Asset Management Plan
BMPs	best management practices
BOD	Basis of Design
BSM	Bioretention Soil Media/Bioretention Soil Mix
CEG	Cost Estimating Guide (SPU)
CIP	Capital Improvement Project
CMMS	Computerized Maintenance Manual System (WTD)
CM	Construction Management
CMD	Construction Management Division (SPU)
CMQM	Construction Management Quality Manual (SPU)
COS	City of Seattle
CRZ	Critical Root Zone
CSO	Combined Sewer Overflow
CSECP	Construction Stormwater and Erosion Control Plan
CSS	combined sewer system (combined stormwater and sanitary sewer flows)
DSG	SPU's Design Standards & Guidelines
DSO	Design Services Office (SPU)
Ecology	Washington State Department of Ecology
EOR	Engineer of Record
FAQ	Frequently Asked Questions
GIS	Geographic Information System
GSI	Green Stormwater Infrastructure
IDT	interdepartmental team
IP	Integrated Plan (SPU)
LL	Lesson Learned from past SPU/WTD projects
LOB	Line of Business representative (SPU)
LTCP	Long-Term Control Plan
MAXIMO	Asset management tracking software (SPU)
MOA	Memorandum of Agreement
NDS	Natural Drainage System (SPU)
NG	Neighborhood Greenways
NPDES	National Pollutant Discharge Elimination System
O&M or OM	Operations and Maintenance

Term	Abbreviation Definition (Continued)
OPCD	Seattle Office of Planning and Community Development
PACT	Planning Analysis Coordination Tool
PDB	Project Delivery Branch (SPU)
PE	Professional Engineer
PEG	Public Engagement Guidelines
PEP	Public Engagement Plan
PLA	Professional Landscape Architect
PMP	Project Management Plan
PROWAG	Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way
PS	piped sewer combined
PSD	piped storm drain
PSS	piped sanitary sewer
PSE	Puget Sound Energy
PS&E	Plans, Specifications and Estimates
QA/QC	quality assurance/quality control
ROW	rights-of-way (or also referred to as “right-of-way”)
ROWIM	City of Seattle Right-of-Way Improvements Manual Streets Illustrated
SCL	Seattle City Light
SDCI	Seattle Department of Construction and Inspections
SDOT	Seattle Department of Transportation
SEPA	State Environmental Policy Act
SFD	Seattle Fire Department
SG	Stage Gate (SPU)
SIP	Street Improvement Permitting (SDOT)
SMC	Seattle Municipal Code
SME	Subject Matter Experts
SOP	Standard Operating Procedures
SPS	Seattle Public Schools
SPU	Seattle Public Utilities
SSD	Sub surface drainpipe (underdrain pipe)
STD	Standard
SWM	Stormwater Manual for City of Seattle
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
TVSPP	Tree, Vegetation and Soil Protection Plan
UIC	Underground Injection Control (Ecology)
UMH	Underdrain maintenance hole
USM	Utilities System Management (SPU)
WTD	King County, Department of Natural Resources, Wastewater Treatment Division

Definitions

These definitions are focused on implementing green stormwater infrastructure in the City's right-of-way (ROW) or on utility owned or managed parcels as part of capital improvement projects (as opposed to implementation on private owned parcels). These definitions are not intended to be exhaustive as used or on the subject however some key terms are included for easy access. See www.streetsillustrated.seattle.gov for an expanded glossary of terms in the public realm. See also each agency's Construction Management Quality Manuals for additional definitions specific to construction.

Asset Management:

Generally, the broader use of the term is for cradle to grave adaptive management. The term includes everything at the operation level, maintenance, resource planning, reporting and financing to achieve the best results.

Biofiltration Swale:

An open, gently sloped, vegetated earthen channel designed to treat stormwater by evenly distributing stormwater flows laterally (as opposed to vertically with infiltration) across the entire width of a densely vegetated channel that has a minimum length of 100 feet (or greater depending upon project design). Stormwater runoff flows into the facility at the head of the swale. The bottom width (2 ft to 10 ft) of the channel is to be constant along the entire length. Longitudinal slope ranges from 1.5% to 2.5%. Basic biofiltration swales provide "basic" water quality treatment in accordance with City of Seattle (COS) Stormwater Manual (SWM) Volume 3, Section 5.8.3.

Bioretention:

A designed shallow earthen depression with engineered soil mix and plants adapted to the local climate and soil conditions to provide water quality treatment and either retain or detain the treated stormwater for flow attenuation. The facility is designed to mimic natural processes by filtering stormwater through the vegetation and into the imported bioretention soil mix (BSM). When designed with required BSM depth (at least 18 inches),and infiltrating into the underlying soil or in soils with lower infiltration rates, collected by an underdrain these bioretention facilities provide "enhanced" water quality treatment in accordance with COS SWM, Volume 3, Section 5.4.4 (infiltrating bioretention) and Section 5.8.2 (non-infiltrating bioretention).

In the City's right-of-way (ROW), stormwater enters the bioretention facility through sheet flow across landscape/pavement; through breaks in the curb along the roadway or sidewalk; and/or through a piped/culvert system daylighting into the facility.

Depending upon the rainfall event and intensity, stormwater may:

- filter through the bioretention plantings and BSM and infiltrate into the underlying soils;
- filter through the bioretention plantings and BSM and collect in an underdrain pipe that connects to the drainage/sewer system or is conveyed and infiltrates into the underlying soils via a deeper infiltration facility such as a screen well; or
- overflow out of the cell via a drain curb cut or overflow pipe and continue to flow down the road to the next bioretention cell or into the drainage sewer system.

The terms Rain garden and “Natural Drainage System” or “NDS” may also be used to describe bioretention in public outreach materials. See Rain garden and Natural Drainage System definitions.

Block:

Refers to a street length from intersection to intersection. A block includes the street and adjacent private/public parcels (residential, commercial, parks etc.). A City block can range from 300-feet to 800-feet long, varying widths, surrounded on four corners by public street right-of-way and may/may not include a public alley through the block.

Blue Book:

SPU asset management term for a project’s operation and maintenance manual for non-standard elements. Describes how to maintain and operate new assets.

Cells:

Individual depressions within a bioretention facility are called “**cells**”. For ROW applications usually, there are multiple bioretention cells in a series within a block. Because each cell is a depression, water ponds in the cell and infiltrates downward into the underlying soil as opposed to continuing to flow horizontally along the longitudinal profile like a conveyance swale or biofiltration swale. However, if the cell receives more water than it was designed for, the water ponds up and overflows out of the cell either through a drain curb cut or overflow pipe in the cell. See “bioretention” in this section.

Combined Sewer Overflow (CSO):

Combined sewer overflow is the result of combined sewers that are designed to collect rainwater runoff, domestic sewage and industrial wastewater in the same pipe. During periods of heavy rainfall or snowmelt however, the wastewater volume can exceed the capacity of the pipe or treatment plan and at that point they are designed to overflow to the stream, river or water bodies. CSO’s may be thought of as a type of “urban wet weather” discharge. Source: EPA

Component:

A part or element of a larger whole. Used herein to refer to various tools or elements that are part of a GSI facility.

Consent Decree:

Specific to stormwater and CSO's: Since 2000 EPA has taken enforcement actions under the Clean Water Act (CWA) to reduce violations under municipal stormwater permits. As part of these judicial actions the EPA has required permittees to commit to implement green infrastructure. Pursuit to Section 309€ of the CWA, the State of Washington joins the United States as a Plaintiff to both SPU and WTD's Consent Decrees with EPA. Washington State Department of Ecology (ECOLOGY) is the state regulatory agency.

Conveyance Swale:

Conveyance swale refers to shallow vegetated earthen channel to convey stormwater runoff (as opposed to a piped system). See COS Standard Plan 294 for cross section of a vegetated conveyance swale that is not for water quality treatment.

Deep Infiltration:

A term describing various methods of moving water from the surface of the land into the subsurface. In this volume Pit drains, drilled drains and screen wells are all considered deep infiltration. See Section 3 herein and GSI Manual, Volume III: Design's Section 10 for general descriptions.

Guidance:

Specific to the intent of this Volume, Guidance is intended to mean "Help or advice about how to do something or about how to deal with problems." Source Cambridge Dictionary. The GSI program is looking to establish consistent procedures for implementing GSI in the City's right-of-way.

Hardscape:

A term typically used to describe fixed surfaces on the ground plane. For GSI facilities this may mean pavement, pavers, curb cuts, gutter line, sidewalk, structures, lids, walls etc.

Landscape:

For GSI facilities this refers to the surface area as a whole and the term may also refer generically to trees, plantings or vegetation in areas without bioretention cells.

Maintenance:

Maintenance is the set of activities to preserve a good, stable condition and keep operations running. You can usually look at maintenance as a subset of overall operations management. Operations is the set of activities directly responsible for achieving GSI objectives.

Natural Drainage System:

A term used by SPU for the natural approach to manage urban stormwater through bioretention cells. “NDS” partnering is the program where SPU partners with city departments, agencies and/ or private partners. See definition for “bioretention” in this section.

Permeable Pavement Facilities:

Permeable pavement is a paving system that allows rainfall to infiltrate into an underlying aggregate storage reservoir, where stormwater is stored and infiltrated to the underlying subgrade or (for larger storms where it cannot infiltrate) removed by an overflow drainage system (such a perforated pipe) that discharges into the drainage system. Permeable pavement typically consists of a wearing course (e.g. porous asphalt, pervious concrete) and an underlying aggregate storage reservoir/subbase, which is designed to both temporarily store water and provide structural support for intended loads. See COS 2017 SWM Volume 3, Section 5.4.6.

Permeable Pavement Surfaces:

See COS 2017 SWM, Volume 3, Section 5.6.2.

Planting Strip:

The term planting strip means that part of a street right of way between the abutting property line and the curb or traveled portion of the street, exclusive of any sidewalk (Seattle Municipal Code 10.52.01H)

Rain Garden:

Rain gardens are typically non-engineered shallow landscape depressions with compost-amended native soil or imported bioretention soils and plants adapted to the local climate and soil moisture conditions. Rain gardens may only be used to meet “on-site” Stormwater Code requirements. Rain gardens are not defined as a water quality treatment or flow control facility as described in the COS Stormwater Manual, Volume 3, Section 5.4.5, and Washington State Department of Ecology’s Stormwater Management Manual for Western Washington. Rain gardens may be used to manage runoff from new sidewalks to meet “On-Site Stormwater Management” requirements described in COS SWM and SPU’s Client Assistance Memo (CAM) 1190. The term “rain garden” may be

used to describe bioretention systems to the public; however, rain gardens are defined as a different type of facility from bioretention in the COS SWM.

Regulatory:

Generally used to refer to organizations or agencies enforcing compliance with laws, polices rules, and regulations.

Report / Reporting:

Generally used to mean a written account of what occurred or what was observed or what was accomplished. The intent is to document both for the agency and to improve the implementation for GSI as a new infrastructure asset. Refer to specific agency requirements for definition of compliance reporting.

Right of Way (ROW):

The strip of land platted, dedicated, condemned, established by prescription or otherwise legally established for the use of pedestrians, vehicles and/or utilities.

Road:

The road or also referred to as roadway is the portion of a street improved, designed, or ordinarily used for vehicular travel and parking, exclusive of the sidewalk or shoulder. Where there are curbs, the roadway is the curb to curb width of the street. *Definition from Glossary in Streets Illustrated, Seattle's Right-of-Way Improvements Manual (ROWIM). In this document the general rule is to use "street" when referring to the full right of way or elements within the right of way and "road" when being specific regarding the vehicular surface area. The roadway may or may not have a curb along the road edge.*

Street:

A public right-of-way that includes a roadway, shoulder, planting strips and/or sidewalk(s) along other public infrastructure and utilities. For full definition, see Glossary in Streets Illustrated ROWIM. See also above definition for "road". "Travelled way" refers to just the portion of the street that receives vehicular traffic.

Street Typology:

See Streets Illustrated, Seattle's Right of Way Improvements Manual.

Tree:

Generally, a woody plant with single or dominate stems and few or no lower branches and over 20 feet in height. See Appendix G GSI Tree List for Bioretention in the Right of Way; SDOT Street Tree Manual Streets Illustrated; Seattle's ROWIM.

Trenching:

Trenching: Any excavation to install or repair foundations, utility lines, services, pipe, drainage, irrigation infrastructure or other property improvements below grade. Trenching within the CRZ is injurious to roots and tree health and is prohibited, unless approved. If trenching is approved within the CRZ, it must be in accordance with instructions outlined in SDOT Street Tree Manual.

Underground Injection Control (UIC):

For the GSI program purpose this refers to the Environmental Protection Agency (EPA) program that consists of six classes of injection wells. Each class is based on the type and depth of injection activity and the potential for that activity to result in endangerment of a USDW (underground sources of drinking water). Washington State Department of Ecology regulates and permits UIC's for the EPA. UIC's used with GSI are described in herein in Section 3 and in Section 10 of the GSI Manual, Volume III: Design.

Section 1

Introduction to GSI Construction Phase

1.1 Purpose

The purpose of this volume of the Green Stormwater Infrastructure (GSI) Manual for Capital Improvement Projects (GSI Manual) is to provide construction, on-boarding and commissioning protocols guidance and standard procedures for Seattle Public Utilities (SPU) and King County Wastewater Treatment Division (WTD) led capital improvement projects (CIP) implementing GSI technologies along streets in the City of Seattle (City) rights-of-way (ROW). This volume covers from Contract Execution to On-Boarding for the Construction Phase. The end users of this manual may include SPU, WTD, and/or their design consultants hired to oversee construction of a CIP implementing GSI. This manual is currently not intended to be used by other entities (e.g. private developers) constructing GSI in the City's ROW or by the City for inspecting GSI projects designed by private developers in the public right-of-way.

The GSI technologies described in **Volume IV: Construction, On-Boarding & Commissioning** of the GSI manual focus on the more commonly used bioretention facilities retrofitted into the public ROW along Neighborhood Yield and Neighborhood Curbless streets (see the City of Seattle Right-of-way Improvement Manual Streets Illustrated (ROWIM) for street typology descriptions).

Implementing GSI technologies in the ROW for a CIP will have different performance targets from project to project. For WTD-led CIPs, the project goal is to use GSI technologies (such as roadside bioretention cells and/or permeable pavements) to reduce combined sewer overflow (CSO) events in combined sewer basins where the overflow is managed by WTD. For SPU-led CIPs, the target will vary depending upon the basin. Bioretention facilities may be used for providing creek protection, water quality treatment, flow mitigation, CSO control and/or other citywide stormwater performance targets along with community streetscape and habitat enhancements.

Construction for non-bioretention GSI facilities in ROW

Pervious concrete sidewalks and rain gardens for mitigating runoff for sidewalks are inspected by Seattle Department of Transportation (SDOT).

Pervious concrete alleys are not common in the City and if used on a CIP project then Project Team to identify elements for construction observation and inspection for use by SPU/WTD/SDOT construction staff.

This is the fourth volume of the GSI Manual. See other volumes for additional information:

Volume I:	Project Initiation / Partnering Framework Flow Chart
Volume II:	Options Analysis Phase
Volume III:	Design Phase
Volume IV:	**Construction, On-Boarding & Commissioning**
Volume V:	Operations & Maintenance

1.2 How to Use this Volume of the GSI Manual

The GSI Manual and information in this volume supplements but does not replace City and County standard construction guidelines and manuals for capital improvement projects.

It is intended that the Construction Project/Team read the entirety of this Volume IV: Construction, On-Boarding & Commissioning. The design of roadside bioretention in the public ROW requires an integrated multidisciplinary team ranging from outreach specialists, landscape architects, hydrogeologists, civil engineers, arborists, geotechnical engineers and maintenance staff along with construction staff in the development of the Project Manual and Plans.

1.3 Related Documentation

This volume is a supplement to the standards and guidelines used by SPU and WTD for this phase (note documents with "*" are typically drafted during design and updated after construction):

SPU Documents:

- SPU Construction Management Quality Manual (CMQ). Contact SPU PM for document from CMD.
- SPU Design Standards and Guidelines (DSG) https://www.seattle.gov/utilities/construction-and-development/design-standards
- City of Seattle Standard Plans and Standard Specifications for Municipal Construction http://www.seattle.gov/utilities/construction-and-development/standard-specs-plans
- SPU Asset Management Plan for Green Stormwater Infrastructure Right-of-Way Facilities (AMP)
- SPU Stage Gate 5 Requirements to Approve Closeout
    - O&M Resourcing Spreadsheet
    - O&M Basis of Estimate
    - Lesson Learned

GSI Checklist for Asset Approval

GSI Component Design Checklist for Asset Approval is in Volume III: Design. It is expected that the Project Team has obtained approval from OM of the design prior to construction and completed this checklist. If there are changes during construction to the design that will revise this checklist then the EOR/ LA Lead shall update the checklist for OM approval.

- DWW O&M Resourcing Plan
- DWW Operation's Plan
- Asset ID On-Boarding list/sheet*

WTD Documents:

- Construction Management Quality Manual (WTD CM)

1.4 Overview of GSI Construction, On-Boarding & Commissioning

As is typical for all SPU CIP Construction, the GSI Construction phase starts at Contract Execution and, except for Landscape Establishment, ends at Physical Completion as defined in City of Seattle Standard Specifications. (Some assets may not be transferred to their long-term owner for some time after Physical Completion, example 3 year for trees to go to SDOT).

For CIPs installing GSI, the processes for the project construction, on-boarding and commissioning mostly follows typical CIP processes, however they have some unique elements important for long term performance as well as to provide long-term community amenities. This volume focuses on providing tools and resources to project managers, resident engineers (SPU term), construction inspectors, communications staff, asset manager (SPU term) and the commissioning authority.

Most City GSI assets will be commissioned using standard asset acceptance procedures done during the construction. A few GSI elements associated with the supporting infrastructure, such as an Underground Injection Control (UIC) screen well, have a unique acceptance process. Or the establishment of plants for bioretention systems can take up to two to three years which can be considered part of the commissioning phase of a project, such as for meeting permit or consent decrees that have commissioning deadlines for a requirement.

1.5 Construction and Commissioning Flow Chart

Figure 1-1 provides a flow chart for developing a GSI commissioning plan from Design to Operation and Maintenance for bioretention facilities. Teams shall tailor the flow chart given project specific design elements. For SPU projects, contact SPU GSI commissioning staff for a more specific construction and commissioning workflow chart. For WTD projects, during design phase, Figure 1-1 can also be used for planning construction commissioning specifications for how long facilities should be kept off-line (bypass in place) depending upon which season bioretention plantings are installed.

If a project is being constructed that has a regulatory requirement for commissioning (such as Consent Decree), for bioretention facilities the project's "Commissioning" period could be up to three years after construction. Typically, it takes two to three years for plants to become fully established for providing its intended stormwater function (e.g. soil stabilization and filtration).

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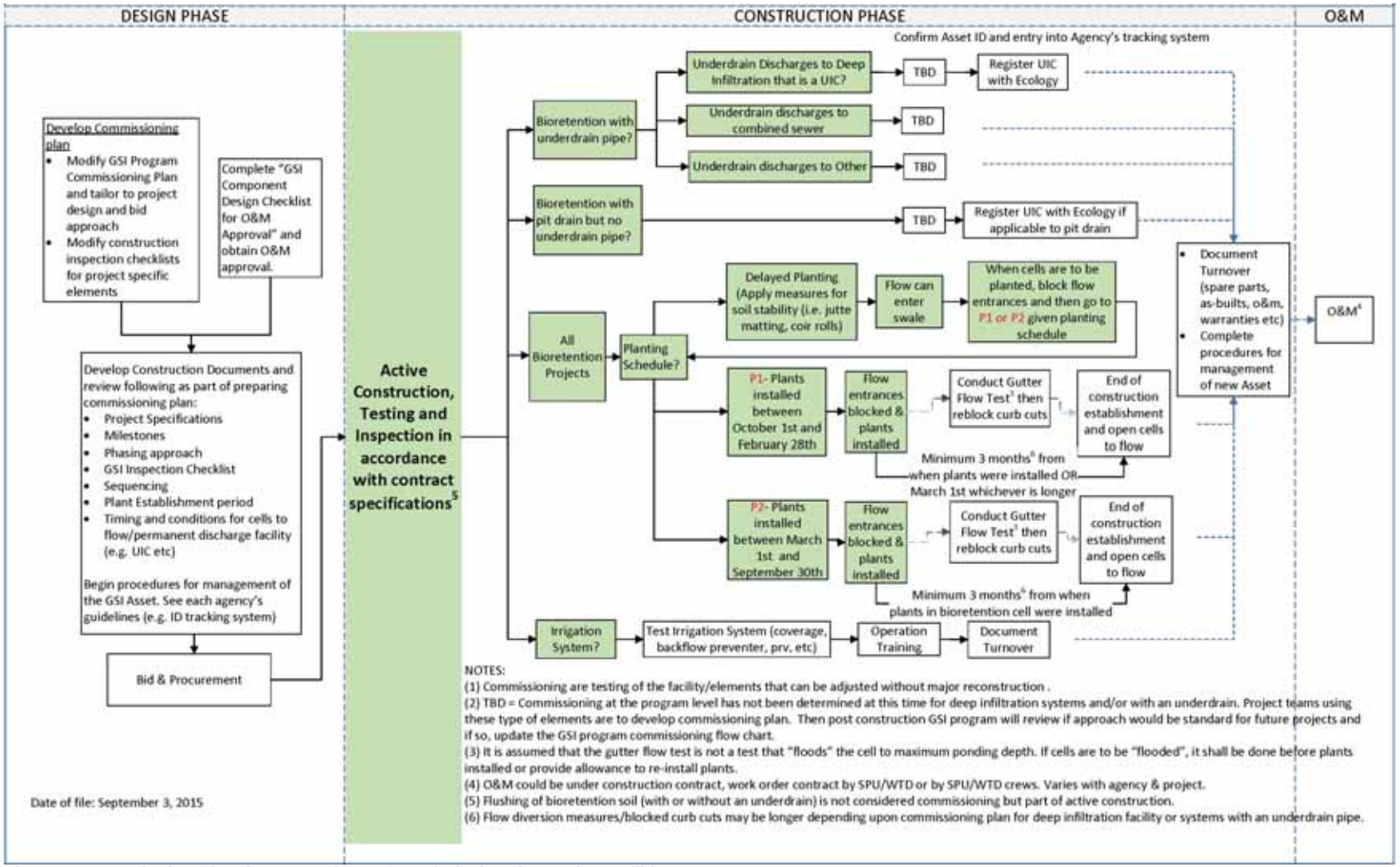

Figure 1-1: Example Flow Chart for Approaches to Commissioning Bioretention Facilities

Reviewed and confirmed by WTD in 2015.

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Section 2

Construction Phase Initiation

For typical CIP projects, the construction phase begins at Contract Execution after procurement and when the project is awarded to a contractor.

2.1 Construction Project/Management Team

The formation of the Construction Project/Management team will have begun prior to the start of the construction phase and representatives from construction and contracting will have been involved in the review of the design and contract documents.

The Project Team for the Construction Phase shall include representatives from the Project Team during the CIP Design Phase and Construction Management staff from SPU/WTD.

Aside from each agency's standard construction management services, the construction management team shall also include for GSI CIP projects, the following at a minimum:

- Project Manager*
- Resident Engineer (RE) for Construction (SPU-led CIP)
- Supervising Construction Engineers (SPU-led CIP)*
- WTD's O&M representative(s) or SPU's GSI Asset Manager*
- Engineer of Record (EOR)*
- Landscape Architect of Record (LOR)*
- Geotechnical Engineer*
- Hydrogeologist*
- Community Relations Lead/Public Engagement Specialist*

*For continuity of the design into construction it is recommended that to the extent possible the people who had these roles during the Design phase continue for the Construction.

2.2 Information Meeting with Project Team from Design Phase

While the Supervising Construction Engineer or other lead SPU/WTD construction representative will have typically participated in review of the plans and contract documents during the Design Phase and have familiarity with the Project Design, if the on-the-ground agency inspectors/resident engineers and/or SDOT Street Use Inspector were not involved with the design and/or have limited experience inspecting GSI, it is recommended that an information and coordination meeting be held with the designers (such as Landscape Architect of Record, Civil Engineer of Record, Hydrogeologist, Geotechnical Engineer) from the Project Team to review the approved permitted plans, communication protocols during construction, requirements and what to look for in review of mock-up submittals, key elements for inspection,

and special provisions/specifications and other issues that are specific to the project. It is recommended that this meeting occur prior to the preconstruction meeting with the Contractor for open forum discussion amongst agency staff and the designers. See Appendix A for PowerPoint template for use at this meeting between the Construction Management team and the Project Team from design. The Project Team shall tailor the template and develop the content to the project's final design/bid documents.

Prior to this information meeting, it is recommended that the field personnel who will be doing the inspection for SDOT and SPU/WTD review the following materials that were developed during the Design Phase:

- Plans and specifications for the contract documents
- Construction Inspection Checklists (see Appendix C for template that can be used as a starting point by the Project Team)
- Quality Assurance Plan (See example in Appendix H for past example on WTD project.)

SPU Inspection of Bioretention Plantings

For SPU-led CIP projects, SPU Asset Management recommends that the Project retain the Landscape Architect of Record to review plant submittals, substitution requests, landscape mock-ups, construction observation and other construction observation supports the work progresses.

Examples of elements to review at the information meeting

- **Pavement Restoration Extents that Differ from ROWORR:** Plans may show full panel replacement which may not be required as described in Seattle's Right-of-Way Opening and Restoration Rules (ROWORR). This may have been done for other reasons for the GSI project such as to reduce the number of new joints in the roadway that could hinder stormwater sheet flow across the pavement and into the drain curb cut for the roadside bioretention.
- **Bioretention Plantings:** Review when to notify Landscape Architect lead for review of bioretention plantings delivered, mock-up of planting layout, soil preparation, irrigation placement (if applicable) and plant installation. In the past SPU GSI Inspectors do not have expertise in inspection of bioretention plantings and rely on the Landscape Architect of Record for its review. Small modifications, substitutions or changes to the placement of bioretention planting design (and or irrigation) without consultation with the LA of Record can have significant long-term maintenance impacts once plants mature, such as impeding flow into the bioretention facility, blocking step out zone areas and/or requiring more frequent pruning maintenance.
- **Deep Infiltration Facilities Inspection and Testing:** Review the testing procedures, well development requirements and when to notify the Hydrogeologist of Record for inspection of the installation of deep infiltration facilities (e.g. screen wells, drilled drains and other underground injection control wells (UICs)). See Section 3 for more information on deep infiltration facilities.

A follow-up check-in meeting shall be conducted after construction has begun (ground disturbance) with the Project Team and SPU/WTD construction staff to answer any questions and review key elements to watch for during construction.

2.3 Pre-construction Meeting

As is typical for all CIPs in the City right-of-way, SDOT will schedule a Pre-Construction Meeting prior to the start of work. SDOT CAM 2216 describes process for Pre-Construction meetings for projects that were approved through Street Improvement Permitting (such as WTD-led CIPs). See Section 3 for more information about Pre-Construction Meetings.

2.4 Coordination Meetings for Construction Work by Others

For work that was determined during the Design phase to be installed by other entities outside the construction contract, such as franchise utility adjustments by utility purveyor or water service adjustments by SPU crews, it is recommended to hold a preconstruction meeting between the agency-led CIP Construction Management team for GSI, the designers from the Project Team and the lead for the franchise utility crew doing the work. For example, on a past WTD-led CIP, it was decided with the utility purveyor during the Design Phase through a Memorandum of Agreement (MOA), that the franchise utility crews would adjust the gas services and mains prior to WTD's CIP construction contract to reduce the potential for scheduling conflicts during CIP construction. Prior to the franchise utility purveyor doing their work, a preconstruction meeting between the Franchise, Project Team, and SDOT Inspector was held to review temporary pavement patching/street restoration, the scope of work, coordination for future GSI work, schedule, the MOA (if developed for project) and other elements.

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Section 3

Construction Procedures

3.1 Policies, Standards and Construction Protocols

The CIP Project Team for construction shall follow each agency's standard construction practices. However, in addition to the standard procedures and construction protocols, some SPU/WTD GSI CIP staff (especially those who are new to GSI construction) may be required to attend training to learn how to inspect and what to look for as GSI elements are constructed. GSI also has some specialty inspections requirements. These policies are described herein.

3.2 Preconstruction Meetings for GSI

After Contract Execution, prior to the notice to proceed for SPU-led CIPs, Pre-Construction Meetings are held with the Contractor. The agenda for all CIP Pre-Construction Meetings cover such topics as review of the project specifications, communication protocols and other contractual items. For GSI projects, aside from having both the Landscape Architect of Record and Engineer of Record attend the Preconstruction Meeting, additional focus may be needed on the following items:

- If required, any mandatory bioretention construction kick-off meeting for crews constructing GSI elements. (See Appendix B for PowerPoint template that can be used to develop kick-off meeting elements)
- Any required Contractor staff training
- Unique aspects for GSI Construction
- Any GSI specific testing and QA requirements for commissioning and on-boarding

3.3 Submittal Review

Follow each agency standards for construction submittal reviews. Any changes (such as plant substitutions to the bioretention, modifications to drain curb cut placement) require review with the design professional of record (LA or Engineer) and lead agency for the project (SPU/WTD) including the Asset Manager prior to SDOT approving and issuance to contractor. Some changes can have impacts to the operation and maintenance of the facility (such as increase/decrease in drainage area to a facility when inlets/drain curb cuts are modified) and will need Asset Management's review and concurrence.

Plant Substitutions

Plant substitutions (including changes to size) shall be reviewed by the Landscape Architect of Record in coordination with agency's Asset Management. Plant substitutions must be on the GSI Bioretention Plant Lists (see GSI Manual, Volume III: Design).

3.4 Bioretention Cell Elements Mock-ups (if in contract)

Some CIP contracts may require “mock-up” submittals for the GSI elements. The following mock-ups may be included in the project specifications:

- Grading of a typical bioretention cell(s) prior to planting to check slopes and level areas
- Plant Palettes and layout for a typical cell(s)
- Drain Curb Cuts (for each type)
- Weirs (for each type)
- Presettling Zone

There may be multiple mock-ups for the categories above if the project design has different cross section types, such as bioretention with graded side slopes within the existing planting strip versus at a curb bulb; or planting palettes at an intersection vs in the middle of a block; or boulder weir vs cast in place concrete weir. In addition, there may be testing involved as part of review of the mock-up such as water flow test to check that water from the road will drain into and through the drain curb cut.

Private Developer installed public bioretention facilities

For private developers installing public bioretention facilities (to become City asset) see SPU’s GSI Special Inspection for construction. http://www.seattle.gov/util/EngineeringDevelopmentServicesOffice/DrainageWastewater/GSIRequirements/index.htm

Some contracts do not require mock-ups but require acceptance of a given phase of work before moving on to the next phase.

Figure 3-1: Examples of cell grading and planting palette mock-ups

Figure 3-1 shows examples from a WTD CIP including a cell grading mock-up (left photo) and a planting palette mockup (right photo) prior to installing planting. See template in Appendix A for more examples.

3.5 Pervious Concrete

The City has developed standard plans and specifications for pervious concrete sidewalks and alleys in the City's ROW. As stated in SPU and SDOT's MOA (as of 2019) inspection of Pervious Concrete Sidewalks is done by SDOT Street Use inspectors. Because of the limited application of pervious concrete alleys in the City's ROW, it is intended that a specific CIP Project Team develop the guidance for construction inspectors during the Design Phase in coordination with SPU and SDOT.

3.6 Deep Infiltration

(Note: This section has been updated by the work from a joint SPU and WTD work group in 2019 and SPU's testing of UIC's at Delridge and Venema that was funded in part from a King County Waterworks grant).

Deep infiltration infrastructure is used to direct stormwater past near surface soil layers with low infiltration (such as glacial till) to soils below with higher infiltration potential (such as glacial outwash sand and gravel). This section provides construction of deep infiltration methods when shallow infiltration is not feasible or when augmenting infiltration capacity with deeper infiltration methods. Deep infiltration facility strategies are dependent on the unsaturated thickness between the base of the low-permeability unit at the surface and the depth to groundwater in the infiltration receptor horizon.

Section 10 in GSI Manual's Volume III: Design Phase, provides details on the different types of deep infiltration and their design methodologies. The construction and asset on-boarding of deep infiltration facilities described in this section include horizontal and vertical pit drains, drilled drains, and/or screen wells (see graphic in Figure 3-2 for general concept of these methods). The construction inspection of a deep infiltration facility and associated components are project-specific in coordination with the civil engineer, geotechnical engineer, hydrogeologist, and O&M representative of the Project Team.

Ecology Definition of Underground Injection Controls (UICs)

The Ecology UIC program defines a UIC as a well that is used to discharge fluids from the ground surface into the subsurface and is one of the following:

- A bored, drilled or driven shaft, or dug hole whose depth is greater than the largest surface dimension; or
- An improved sinkhole; which is a natural crevice that has been modified, or
- A subsurface fluid distribution system which includes perforated pipes that distribute fluids below the surface of the ground.
- Note that bioretention systems transporting water via a perforated pipe to a drainage system or to a receiving water are not considered UICs.

See Ecology's 2019 Stormwater Management Manual for Western Washington for more information.

Note that the terminology used herein for deep infiltration methods, pit drains, drilled drains, and screen wells, may differ from terms used by others in the industry (e.g. Ecology, hydrogeologists, geotechnical engineers, etc.). These terms were developed through the joint SPU and WTD UIC working group in fall of 2019.

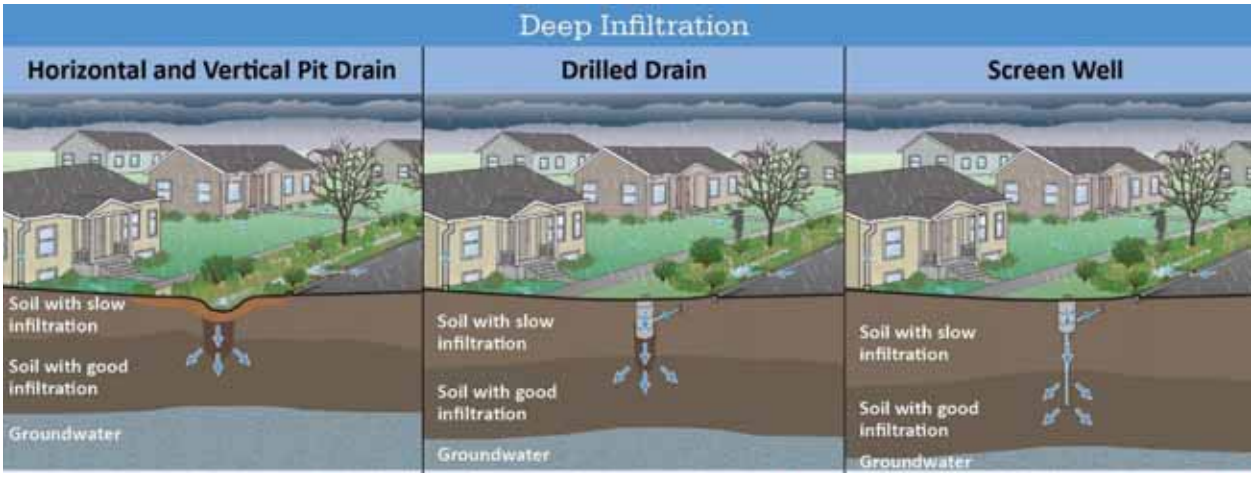

Figure 3-2: Examples of Deep Infiltration methods

3.6.1 Underground Injection Control Wells for Stormwater

Depending upon the design of the deep infiltration facility, it may or may not be defined as a "Class V Underground Injection Control" well (referred to as UIC in this section) for discharge of stormwater by Washington State Department of Ecology (Ecology). UICs may be used for discharging treated stormwater when it is designed to meet Ecology's requirements in accordance with the 2019 Stormwater Management Manual for Western Washington (SWMMWW), Volume I-4 UIC Program. A typical UIC may extend through the underlying low permeability soils and discharge treated stormwater runoff into deeper subsurface soils. Treated stormwater is discharged via a slotted well screen pipe or media backfilled trench located in permeable soils that are suitable for infiltration. Ecology defines a "deep UIC" as an infiltration facility that extends below an upper confining layer and discharges into the underlying vadose zone (SWMMWW, 2019, Volume I-4.15). The permitting and registering of UICs is through Ecology.

Prior to the construction of deep infiltration facilities, flow diversion measures (e.g. block drain curb cuts and plug inlets/pipes that will drain into deep infiltration facilities), bypasses must be in place and maintained throughout construction of upstream systems until drainage areas are stabilized. If sediment laden water enters the deep infiltration facilities during construction, it can severely compromise the facilities stormwater function and may require full rebuild of a new facility elsewhere.

3.6.2 Deep Infiltration Construction

The construction of a deep infiltration facility along with the inflow conveyance infrastructure such as aggregate layers, underdrain pipes, catch basins and maintenance access hole over the drilled drain/screen well is project specific.

The specifications will typically require that the contractor selected for deep infiltration construction including vertical pit drains, drilled drain, or screen well, shall be a licensed well driller in Washington State with experience in either water well construction or infiltration wells. Drilling deep infiltration facilities that are UICs requires a specific skill set that includes drilling while maintaining permeability of the soil formation. Deep infiltration facilities that are defined by Ecology as “Deep” UICs require a surface seal per WAC 173-160-231 which seals the annular space between the bore hole and the permanent surface casing. The contract specifications should also note that the contractor is to have experience working in the public right-of-way and in locations with minimal space or access (e.g. proximity to overhead and underground utilities).

Depth of the deep infiltration facility is estimated during design and presented in the bid documents. Final depth is determined during construction based on review of the soils excavated during the drilling/excavation by the Project’s hydrogeologist/geotechnical engineer for the design. Final facility depth, well screen placement, filter pack placement, well development, video inspection, and observations for deep infiltration testing for specific capacity shall be observed and evaluated during construction by the Project’s geotechnical engineer/hydrogeologist. After the deep infiltration facility is constructed, additional earthwork that occurs around and above the well head should also be observed by the Project’s geotechnical engineer/hydrogeologist. This earthwork phase of the project is when the deep infiltration facility is vulnerable to damage. Any changes to the UIC well MH and assembly shall be reviewed with the Agency’s Asset Manager, Project Engineer and Hydrogeologist.

In general, typically the contract specifications will require the Contractor to flush the system and perform video inspection of the UIC screen wells and drilled drains with well screens before acceptance. Final inspection of the deep infiltration facilities by the Project civil engineer, geotechnical engineer/hydrogeologist, and Construction Engineer should include inspection of all interior work of the UIC MH, well assembly, drop pipes, observation ports, and MH installation. Review project specific special provisions for requirements for deep infiltration facilities.

3.7 GSI Asset On-Boarding

To facilitate on-boarding asset ID’s and documentation and asset on boarding documents are developed during the Design Phase by SPU/WTD staff and finalized/verified in the construction phase to reflect as-built.

3.8 Construction Testing and Commissioning

Construction Management Teams' Field Inspectors (SPU's Resident Engineers) are to perform quality assurance testing and inspection of the Contractor's work in accordance to standards developed (contract specifications) during the design phase including GSI specific construction, inspection and commissioning specification.

Contractor is responsible for their quality control but where the contract documents reference testing that the SPU/WTD would conduct for quality assurance, CM team field inspectors to perform work. Examples of quality assurance testing could include testing of bioretention soil mix delivered to the site or sieve testing of the mineral aggregate material backfill to be used around the underdrain or additional gutter flow tests on drain curb cuts.

GSI assets will be commissioned to verify that a facility, including any operable assets meet SPU/WTD's project requirements.

For SPU-led CIPs, the steps may include:

- For most GSI assets, commissioning will consist of verifying work on any given asset ID has been completed in accordance with contract requirements.
- If there were deviation(s) from the contract requirements for the asset, work will consist of verifying these deviation(s) are noted for the asset and/or if it is an added element asset ID has been assigned.
- If needed revise resource allocation developed during the design phase requirements for labor and non-labor work including equipment and monitoring coordination with SPU's DWW System Management
- Review new or specialty assets (identified in the GSI Component Design Checklist for Asset Approval) in accordance with the contract requirements, or a by using a checklist developed by the Project Team during the design phase to assure the asset is ready to be turned over to O&M.
- Acquisition of new facility tools, keys, or spare parts.
- As a rule, the commissioning of GSI landscaping and bioretention plantings is done by the Contractor successfully completing the one-year warranty period for landscape establishment. The O&M Asset Management or CM team members team typically participates in quarterly inspections and authorizes payment to Construction Management. It is recommended to include the Landscape Architect of Record to assist the CM team and O&M Asset Management in the review.
- Street trees are commissioned three years following initial acceptance of their planting at any given a project. At the end of this commissioning phase, SPU transfers project street trees to SDOT Urban Forestry to own and maintain.

See SPU's CMQ manual for additional details, including Appendix H in CMQ.

For WTD-led CIPs, GSI assets will be commissioned to verify that a facility, including any operable assets meet the project specifications. (Note: The following is **placeholder** for WTD

confirmation. Review approach with WTD CM, asset managers and project managers for requirements).

- For most GSI assets, commissioning will consist of verifying work on any given asset ID has been completed in accordance with Contract requirements.
- If there were deviation(s) from the contract requirements for the asset, work will consist of verifying these deviation(s) are noted for the asset and/or if it is an added element asset ID has been assigned.
- If needed revise resource allocation developed during the design phase requirements for labor and non-labor work including equipment and monitoring coordination with WTD's asset management protocols.
- Review new or specialty assets (identified in the GSI Component Design Checklist for Asset Approval) in accordance with the Contract Requirements, or a by using a checklist developed by the Project Team during the Design Phase to assure the asset is ready to be turned over to WTD Asset Management for operations and maintenance.
- Acquisition of new facility tools, keys, or spare parts.
- The commissioning of GSI landscaping is done by the Contractor successfully completing the one-year warranty period (unless designated otherwise in contract) for landscape establishment. The O&M Asset Management or CM team members team typically participates in quarterly inspections and authorizes payment to Construction Management. It is recommended to include the Landscape Architect of Record to assist the CM team and WTD Asset Management in the review.
- "Commissioning" period for bioretention systems to be fully functional are generally two to three years after construction due to time it takes for bioretention plantings to become established.

See King County's Construction Management manual (WTD CM) for quality assurance protocols and further information.

3.9 Inspection/Quality Assurance

Perform inspection in accordance to standards specified in the contract documents that were developed during the design phase including GSI specific inspection.

For SPU-led CIPS, see SPU CMQ manual for additional details, including Appendix H in CMQ.

For WTD-led CIPs, see WTD CM for additional details.

3.10 Training

The project team, consultant and/or contractor shall prepare a training program for the new SPU/WTD facility in coordination with SPU/WTD Asset Manager. The program may provide an overview of the facilities and provide specific instruction on individual assets and maintenance. Training should be developed during the design phase and implemented in the construction phase. Project Team shall coordinate with the Asset Manager on identifying elements to cover in the training. Examples for training SPU/WTD Asset Management staff on GSI projects might include operation of an irrigation system with the irrigation contractor, UIC inflow testing with the hydrogeologist for the project, operation of a specialty access lid from the contractor's crew/manufacturer, non-standard elements that were designed for the project and/or other elements as determined by the Asset Manager.

3.11 GSI Construction Inspection Forms

GSI CIP projects are to be inspected by SPU/WTD staff or SPU/WTD designated licensed professional(s).

To help guide and facilitate GSI inspection at different stages of construction, templates for GSI construction inspection checklists are provided in Appendix C. During the Design Phase, if the templates are used for construction, the Project Team shall tailor them to specific CIP contract requirements based on the final bid contract documents.

Note: For SPU-led CIPs, SPU GSI asset management requests that the Project retain the Landscape Architect of Record for review of the bioretention plantings and associate landscape elements.

GSI Construction Inspection Requirements for Developer-led SIPs with GSI

SPU has developed GSI Construction Inspection Requirements including checklists for special inspectors of GSI that will become City assets when construction is done by a private developer as part of street improvement requirements. These materials can also be used as a guide for developing a project's construction inspection document for SPU/WTD inspectors. See www.seattle.gov/utilities/construction-and-development/dso/drainage-and-wastewater/gsi-construction-inspection for more information.

3.12 Design Changes during Construction

If changes are required to the design/permitted plans during construction due to unforeseen conditions or other, the changes shall be prepared by the Engineer of Record and/or Landscape Architect of Record, as applicable, and approved by SDOT SIP plan reviewer (WTD-led CIP) and SPU/WTD Project Manager. If the change will impact operations and maintenance (routine to long term), the Project Team must review the modifications with SPU's GSI AM/WTD O&M to obtain their approval. For changes that impact the construction contract, review modifications with SPU/WTD contract manager. If a field adjustment was made, CM staff shall work with the designers (e.g. EOR or LA) to assure O&M procedures for non-standard asset on project O&M manual perform per the design intent and functional needs are maintained.

Section 4

Public Engagement During Construction

Goals for community engagement during construction are to minimize impacts to people who live or work near the project and help them understand what to expect during construction.

Objectives to achieve that goal include:

1. Provide advance notice of work planned
2. Keep people apprised of progress and unforeseen developments
3. Provide multiple ways for people to ask questions, learn more and share concerns
4. Give reasonable and prompt responses to concerns and requests.

This section provides guidance and describes SPU/WTD community engagement approach before, during, and after construction of a GSI project. For more details, tools, and resources, refer to the King County WTD Community Engagement Guidelines or Public Engagement Toolkit and SPU's Public Engagement standards for the construction phase. For information on how to adapt this approach to project areas with limited-English proficient, please refer to the Equitable Outreach Toolkit. For sample outreach materials used during construction, see Appendix G or contact SPU/WTD Community Relations Lead (also referred to as Public Engagement Specialist).

4.1 Preconstruction and Planning

4.1.1 Review Construction Contract

During the design phase, the SPU/WTD Community Relations Lead on the Project Team will have helped develop and review a project's construction contract to ensure it reflects SPU/WTD's community engagement requirements and best practices. Prior to start of construction, the Community Relations Lead for the construction phase should also review the final construction contract and become familiar with requirements that could affect the community. For continuity with the community, it is recommended that the Community Relations Lead manage project communications during both design and construction phases of a project.

Key contract elements to review include:

- Noise variances and work hours

Public Engagement

The Community Relations Lead on the Project Team is to assist and provide input in developing communications requirements for the construction contract during the design phase. See GSI Manual, Volume III: Design for guidance.

- Requirements for keeping the site safe and clean always
- Requirements for minimizing dust
- Amount of time between completing major construction activities and finishing the punch list
- Requirements for street, bike and sidewalk closures and traffic management
- Any other public notification requirements or community considerations (i.e. avoiding work during community events or accommodations for deliveries/access that need to be maintained through construction to residents)
- Requirements for outreach events with the contractor (if applicable)
- Following any commitments SPU/WTD made to community members during planning or design

Community relations staff should also walk the project area to reconfirm potential community impacts and update (or develop if not done during design phase) a construction communications plan.

4.1.2 Preconstruction Communications

The construction communications plan will outline project specific objectives, strategies, and tactics to guide communications with project neighbors during construction. Examples of tools to announce the start of construction could include:

- Distribute flyers door-to-door or send a mailer to all neighbors explaining the project about a month before construction begins.
  Note: SDOT requires mailing a notice as part of the Street Improvement Permit (See SDOT's website at http://www.seattle.gov/transportation/stuse_sip.htm. See also Appendix G for sample *Notice of GSI Construction in the ROW Neighborhood* flyer).
- Update the project website and send an email update to the project listserv.
- Update project's Frequently Asked Questions for questions related to construction for the project website and communication materials.
- For larger neighborhood projects, consider sharing updates via neighborhood blogs, social media, or news outlets.
- If the project affects traffic, bike routes or sidewalks, consider how to reach people

Consistency in messaging

Terminology used with the community shall be consistent with previous outreach used during the design phase. For example, if "natural drainage system" was used with the public for describing the engineered bioretention cells, continue to use "natural drainage system" during construction. See also GSI program's template FAQ for community outreach for further information.

who travel through the project area, but do not necessarily live or work nearby. Variable message signs (large electronic sign placed along a main arterial), signs at intersections near the sidewalk to alert upcoming closures/detours and/or posters at transit stops are some of the ways to provide information.

4.1.3 Preconstruction Event

Before mobilization and ground disturbance work, it is important to introduce the contractor team, share information about upcoming work, and hear from the community the best ways to stay connected during construction. The Community Relations Lead should plan an open house or drop-in event onsite or at a neighborhood gathering place to help people understand what to expect (e.g. sequence, impacts, and communications) and obtain additional information about the community (access needs, delivery schedules, business hours, etc.) including reconfirming information from previous outreach in the design phase that informed the construction contract specifications. The preconstruction event could be as simple as attendance at a neighborhood group meeting or setting up a pop-up tent near the project site so neighbors can stop by and ask questions. If possible, community relations staff should bring snacks and refreshments (e.g. cookies, fruit, coffee, water) to encourage attendance at the event. Construction can be inconvenient and even frustrating for neighbors. Hosting an event before work begins helps to know the neighbors and better understand how to make construction as smooth as possible.

4.2 During Construction

The Community Relations Lead should lead the following activities during construction:

- Attend weekly team construction meetings and work closely with the project manager and on-site resident engineer to identify emerging issues and prepare for public updates.
- Visit the project site regularly, at least two times a month during heavy construction to identify community concerns or opportunities to share updates with the community.
- Work closely with the project manager and team to respond to questions and concerns in a timely manner.
- Maintain the project website with the latest information about current and upcoming work.
- Draft and send construction notices by email and mail or in-person before major milestones or disruptive work. See Appendix G for examples from past projects.
- Consider posting signs in high traffic areas (of all user types) or parks/community centers (if work is nearby) to share key updates. Information could include notifying customers of open businesses or warning people moving along the sidewalk, walking, biking, and driving of safety considerations/detours.

- Consider posting signs at the end of the improvements to inform about stages of construction (such as when facilities are in the plant establishment phase with no active construction, but systems are fenced off).
- Consider if there are other techniques that can be used to communicate construction phases for residents along a block. Figure 4-1 is an example how the project's contract specifications required different fencing color to depict milestones for end of active construction on a block. Use of different color fencing will require modifications to the City standard specifications so coordinate with the designers on the project team during the Design phase if it is included in the construction contract.

Figure 4-1: Example of how construction fencing type can communicate GSI construction milestones for outreach.

Notes for Figure 4-1: For this WTD project specifications, the orange construction fencing (left photo) was used to depict active construction. Then during bioretention plant establishment period (before stormwater flows into the cells) the fencing mesh was replaced with a green version (right photo) to reflect that major construction activity was done and now moving into construction maintenance for plant establishment. The placement of fencing was also adjusted during plant establishment to allow for access between cells.

4.3 Post-Construction Celebration (Optional)

Completing a capital improvement project with GSI is cause for celebration. The Project Team should consider having an event to thank the neighborhood for their patience with construction and celebrate the new public facilities and infrastructure including GSI. This could be a weekend event with project staff available to give tours of the project area and explain how the new facilities work. If it is a roadside bioretention project, consider developing plant guides to

showcase the plants featured in the facilities. Appendix G includes a sample of a model plant guide that was used on a past project with roadside bioretention. If the project includes permeable pavement, consider doing a demonstration of how water absorbs through the pavement by pouring a bucket of water onto the pavement.

4.4 Post-Construction Survey

At the end of construction, the Community Relations Lead should prepare and distribute a post-construction survey. Appendix G includes an example post-construction survey. They may conduct the survey online, by mail flyer, or in person. The Community Relations Lead should analyze survey outcomes and share them in the project closeout meeting (see Section 5). They may also share the outcomes with SPU/WTD's community relations team and GSI program to inform future projects.

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Section 5

Construction Closeout Procedures

5.1 Final Inspection Procedures

When the notice of Substantial Completion is submitted by the contractor, SPU/WTD CIP final inspection procedures are to be followed in accordance with each agency's standards along with documentation for stage gate. Typically, this work will be completed by agency staff but for SPU GSI projects the bioretention plantings review at substantial completion is recommended to be conducted by the Landscape Architect of Record and reviewed with SPU Asset Manager.

Project Gates

For SPU-led CIPs, closeout of a project is at Gate 5, see SPU Design Standards & Guidelines.

For WTD-led CIPs, Gate 4 is the briefing for Final Acceptance at start of the closing phase after implementation (e.g. construction) phase.

5.2 Update Project O&M Manual and Budgeting

For projects that have non-standard elements installed, during the Design Phase the Project Team is to develop an O&M Manual (also referred to by SPU as the "Blue Book"). At Project Closeout, the Construction management team shall review the O&M manual and confirm there have been no changes that could affect the maintenance for asset management. Update list accordingly if changes were made during construction and confirm approval with SPU/WTD asset management.

Teams shall also coordinate with asset management to update any documentation for budgeting and equipment for operations and maintenance. For SPU projects this would include updates to SPU's Operation and Maintenance Resourcing Spreadsheet and Basis for Estimate.

5.3 Update Green Stormwater Infrastructure Project Information Form

Upon completion of construction, if there were changes made to the design that affect the reporting on the GSI Project Information Form, the project team in coordination with construction staff shall update the document and submit to SPU for coordination in entering into City metric tracking database. Metrics on this form include elements specific to facilities maintain by SPU but also include project metrics (non-maintenance related) for reporting to City management on meeting City GSI goals for green infrastructure (e.g. manage 700 million gallons). The project metrics (part 4 on the GSI Project Information Form) for annual reporting to City management

are for both SPU and WTD GSI facilities installed in the City right-of-way. For more information, see www.seattle.gov/Documents/Departments/SPU/Engineering/GSIProjectInfoForm.pdf

5.4 Finalize Asset On-Boarding

SPU and WTD have different formats for preparing for asset management. See each agencies standards for asset management and on-boarding.

SPU-led CIP projects

SPU-led CIPs, as typical with all DWW projects, SPU's Construction Management Division (CMD) will confirm or update the asset on-boarding as prepared during design phase. Asset management implement onboarding of assets in GIS, extractions and GTE tables; and implement Maximo asset job plans, specification, routes, frequency as developed during the design phase, and where applicable modified during construction and launch PM schedule.

SPU Asset extractions are performed by the Asset Management team after projects are mapped in GIS, identifies hierarchy to distinguish between parent and child relationships. Assets not modeled in GIS, such as vertical and stand-alone assets, need to be identified and assigned separately through Maximo Data Administration. This detailed work requires careful consideration and may begin early in the project design phase and documented in the O&M project manual. Upon completion, coordination from a provisional asset model in GIS to connected assets is completed by the GIS team. This workflow process and representation are summarized in Figure 5-1 (excerpt from Figure 5f in SPU's AMP. See AMP for more info.).

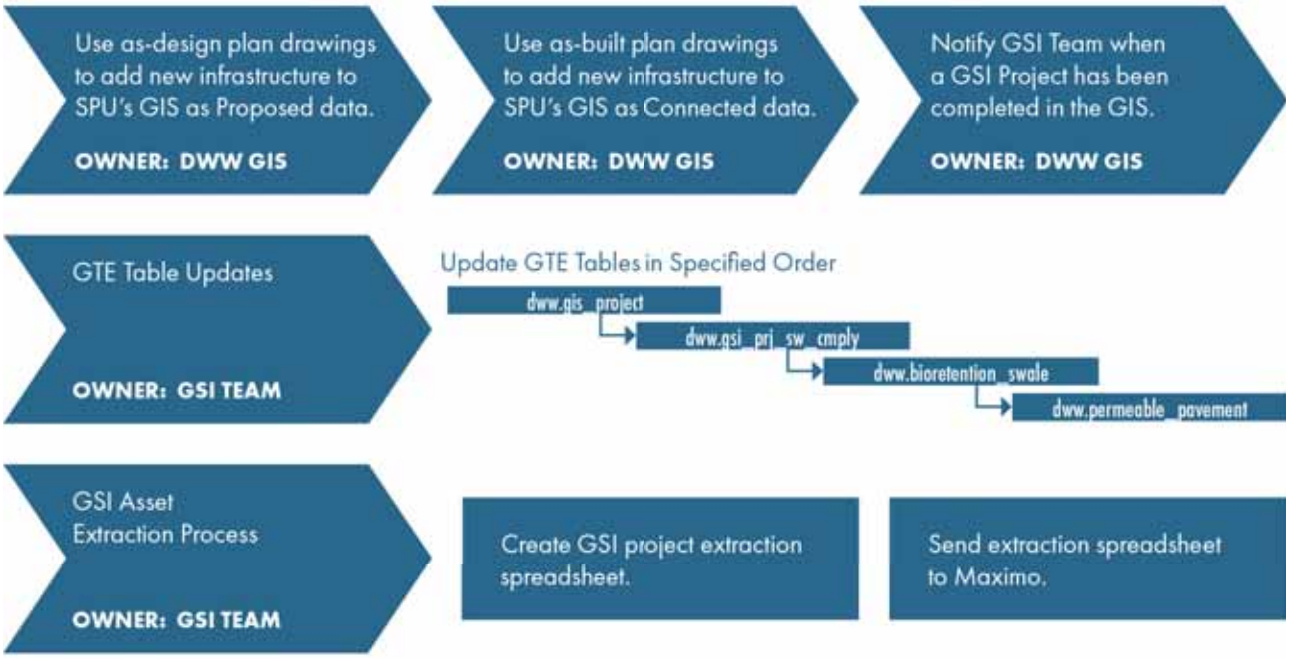

Figure 5-1: GIS Process Workflow for SPU's GSI Assets

Implement Project Routes developed during the design phase, if needed include any modifications that may have occurred during construction, for field crews to inspect and maintain project hardscape. Within each job route, DWW Systems Maintenance and U

SPU's Work Management – Maximo

SPU's Asset Work Management System, Maximo, is designed to manage both planned and unplanned maintenance activities, Mapped assets are synced in Maximo and routes are created, non-mapped assets can be created at any point during the process once the known data elements to be captured are identified. See Figure 5-2 for an overview of the work processes from GIS to Maximo. (Figure 5-2 is taken from figure 5h in SPU's GSI Asset Management Plan).

Work plans with associated job plans for each asset or groups of assets are built for both inspection and maintenance as defined by the project's O&M manual (also referred to by SPU AM as a project's "Blue Book"). Data collection and condition monitoring points shall be identified in the project's O&M manual and incorporated in appropriate job plans.

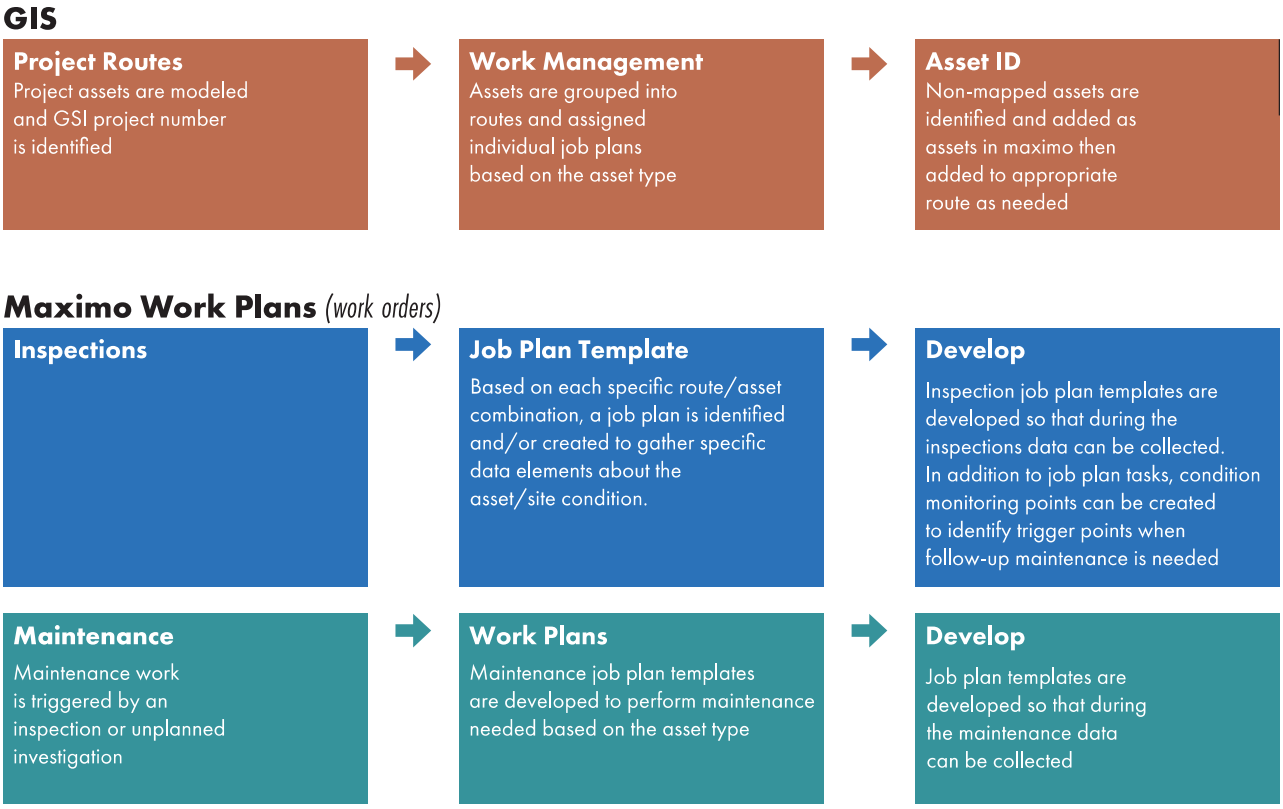

Figure 5-2: SPU AMP work processes from GIS to Maximo

Update GTE-maintained data tables. The GTE is updated only after a project is completed and has been moved to from the proposed layer to the Lifecycle = Connected layer in GIS. The GTE consists of three separate tables:

1. DWW.GSI_project
2. DWW.GSI_project_feature
3. DWW.bioretention_Swale

WTD-led CIP projects

WTD-led CIP projects installing GSI in City right-of-way that will become WTD assets shall follow King County WTD processes for asset on-boarding. If there has been a change since design, provide update catalogue cuts (if applicable), (e.g. modifications to the bioretention's irrigation system). The following are documents that may need to be updated to reflect any revisions made during construction for GSI facilities (if it affects what was documented previously at start of construction):

- Asset Components Tracking List for O&M Approval (see Volume III: Design)
- Updated CADD file for the as-built conditions for inclusion into WTD's database and GIS for tracking assets.
- WTD GSI assets in GIS shall also be coordinated with City GIS for tracking of systems in the right-of-way in City mapping.
- Project's O&M manual for elements that include deep infiltration facilities and/or deviate from SPU/WTD's GSI Manual, Volume V: Operations and Maintenance
- GSI Project Information Form

https://www.seattle.gov/Documents/Departments/SPU/Engineering/GSIProjectInfoForm.pdf

- Updates to Facility Plan (see SPU sample outline in Appendix E) if applicable including a commissioning final report and testing.

5.5 Conduct Construction Lessons Learned Meeting

As is typical for all CIPs (as described in SPU's CMQ), after active construction is completed (typically for SPU project's this is at Physical Completion unless the contract includes a contractor landscape establishment specification (included in WTD projects)), the project's construction management team and design team shall conduct a Lesson Learned meeting (see example in Appendix A). Input shall be gathered from team members including inspectors and O&M/Asset Managers. Information shall be documented in accordance with SPU/WTD standards for tracking lessons learned. Suggested discussion topics include:

- What worked well during the Construction Phase and why?
- What could have been done differently and why?
- Recommendations/suggestions for changes to and/or additions to:

- COS Standard Plans with GSI elements
- GSI details in the GSI Manual
- Volumes in GSI Manual (i.e. Design, Construction, O&M)
- Special provisions or COS specifications
- Procedures
- Protocols
- Construction checklists etc.

Following the team's closeout meeting, a meeting shall be held with SPU's GSI Projects Program staff to review results and provide copies of the closeout meeting discussion and lessons learned.

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Appendix A: Owner, Project Team and Inspector Orientation Meeting Template for Pre-Construction

- Powerpoint template for Internal Owner, Project Team and Inspector Orientation Meeting for SPU/WTD CIP Project (Contact SPU/WTD GSI Projects Project Manager for ppt template native file)
- Example SPU CMD Training Meeting from GSI CIP projects

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Seattle Public Utilities

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Project Name

Insert rendering/graphic of project's design if available.
If not, see GSI Program Outreach material resources.

Note to Users of this PPT/Outline : Text that is underlined & red is to be edited by project team. Once changed, return to black and remove underlining. Other text (not underlined) may be modified to fit project specific conditions. Users may elect to use different ppt template to cover similar material/topics.

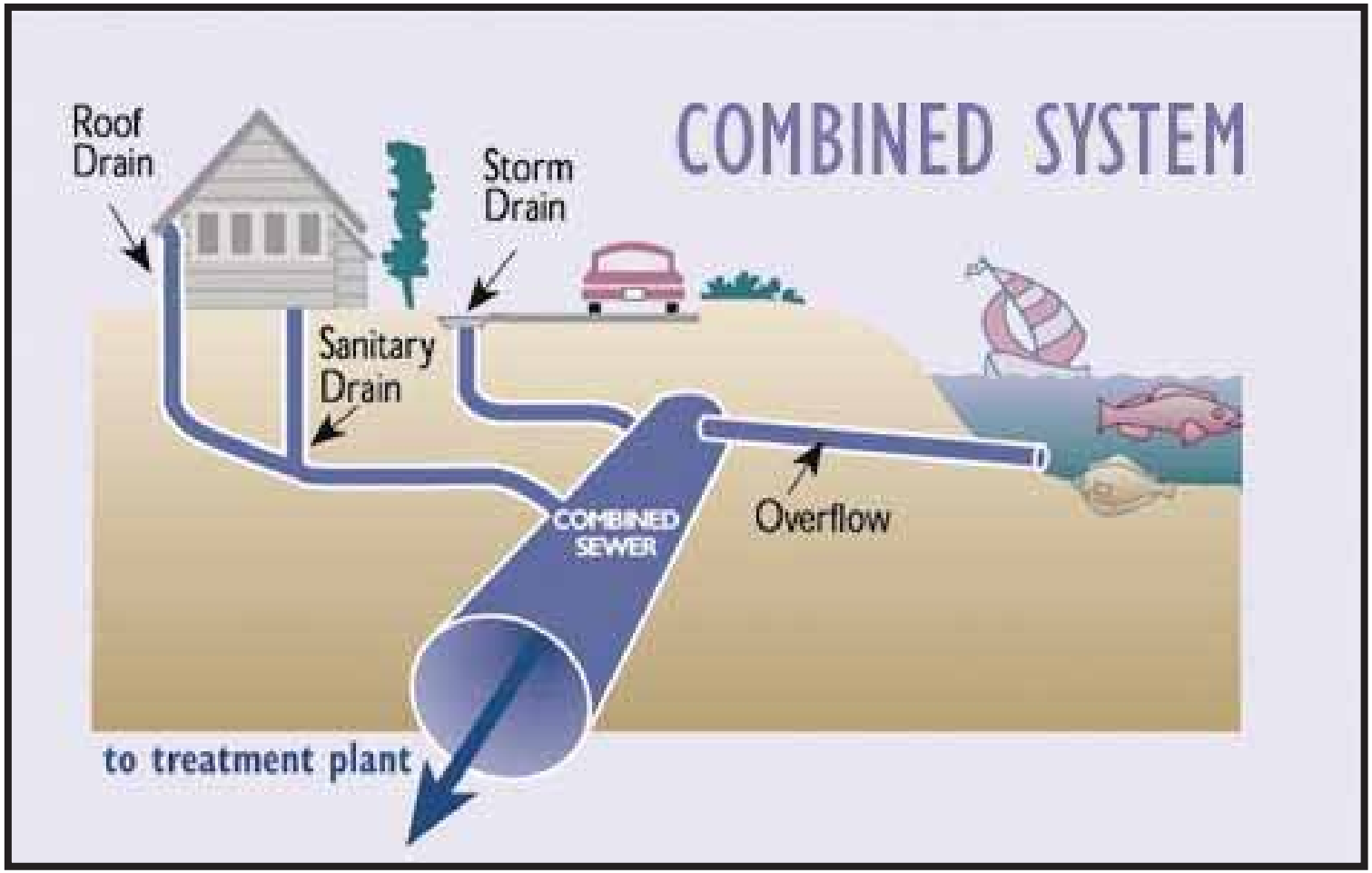
Internal GSI Inspectors/Project Construction Staff Pre-construction Meeting with Project Design Team for SPU/WTD CIP xx

Insert Date of Meeting

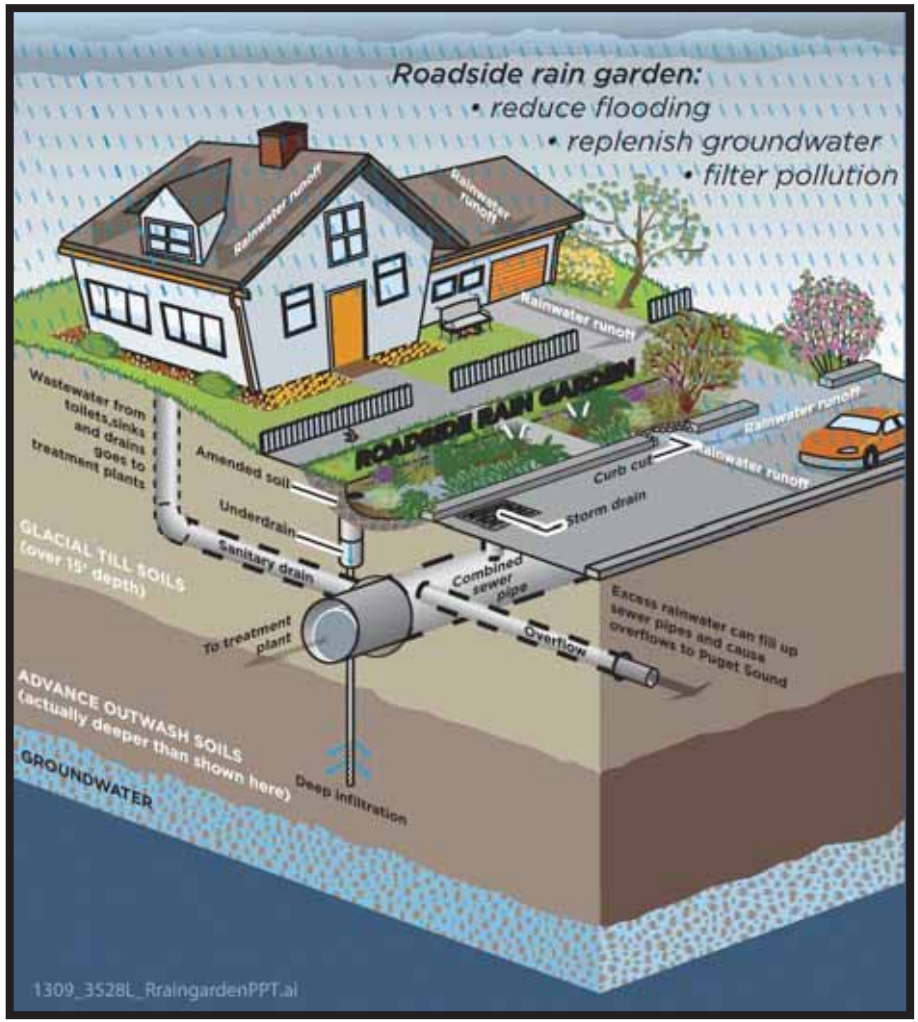
Topics to Cover

- Overview of Project
- Communication Flow Chart
- Coordination with other City Departments/Agencies
- Overview of GSI system elements
- Construction Sequencing, Milestones and Constraints
- Construction Protection Measures
- Submittals
- Inspection and Verification
  - Mock-ups
  - Checklists(list which checklists are applicable to your project)
    - Tree, Vegetation, Soil Protection
    - ??UIC Screen Well
    - ??Bioretention Subsurface & Underdrain
    - ??Vertical Walls
    - ??Irrigation
    - ??Bioretention Soil and Surface
    - ??Bioretention Planting
    - ??Bioretention Establishment and Maintenance (gutter flow test)
- Remedies for unforseen conditions or not meeting design

Project Goals:
Retrofit with GSI to Reduce CSOs
(use slide if applicable)

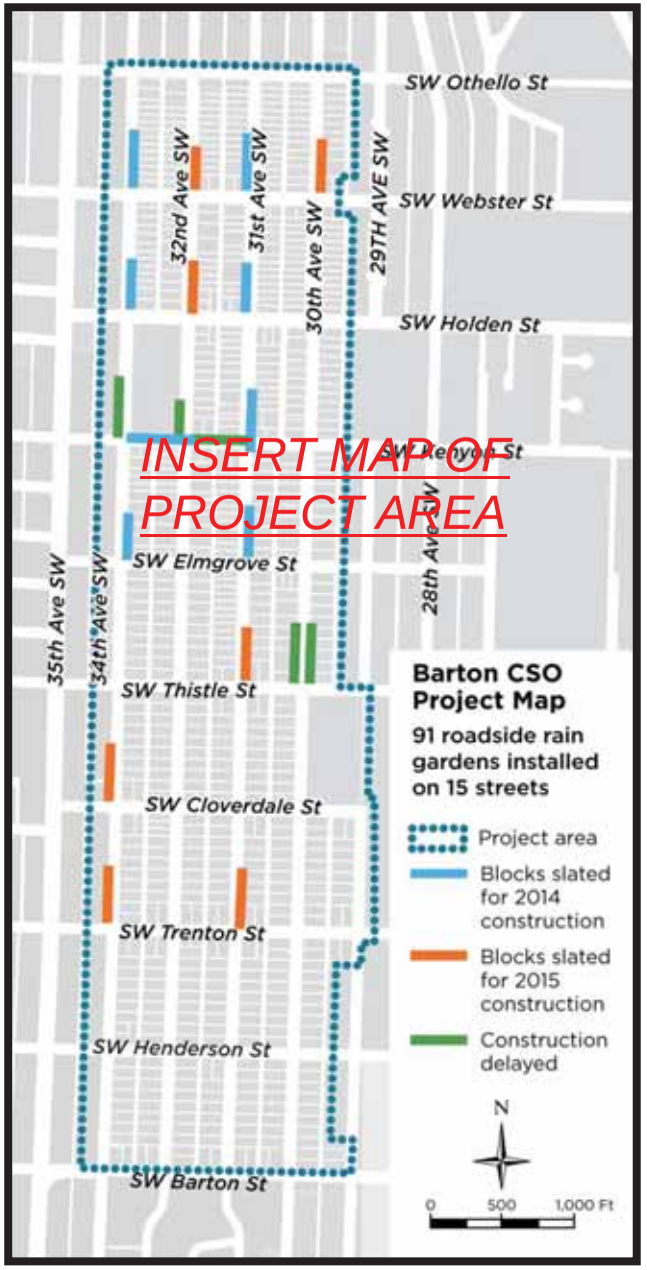


Project Goals: CSO control *(use slide if applicable)*



Project Area

Insert Brief Description about project area, size, # of streets etc.



Project Geologic Conditions

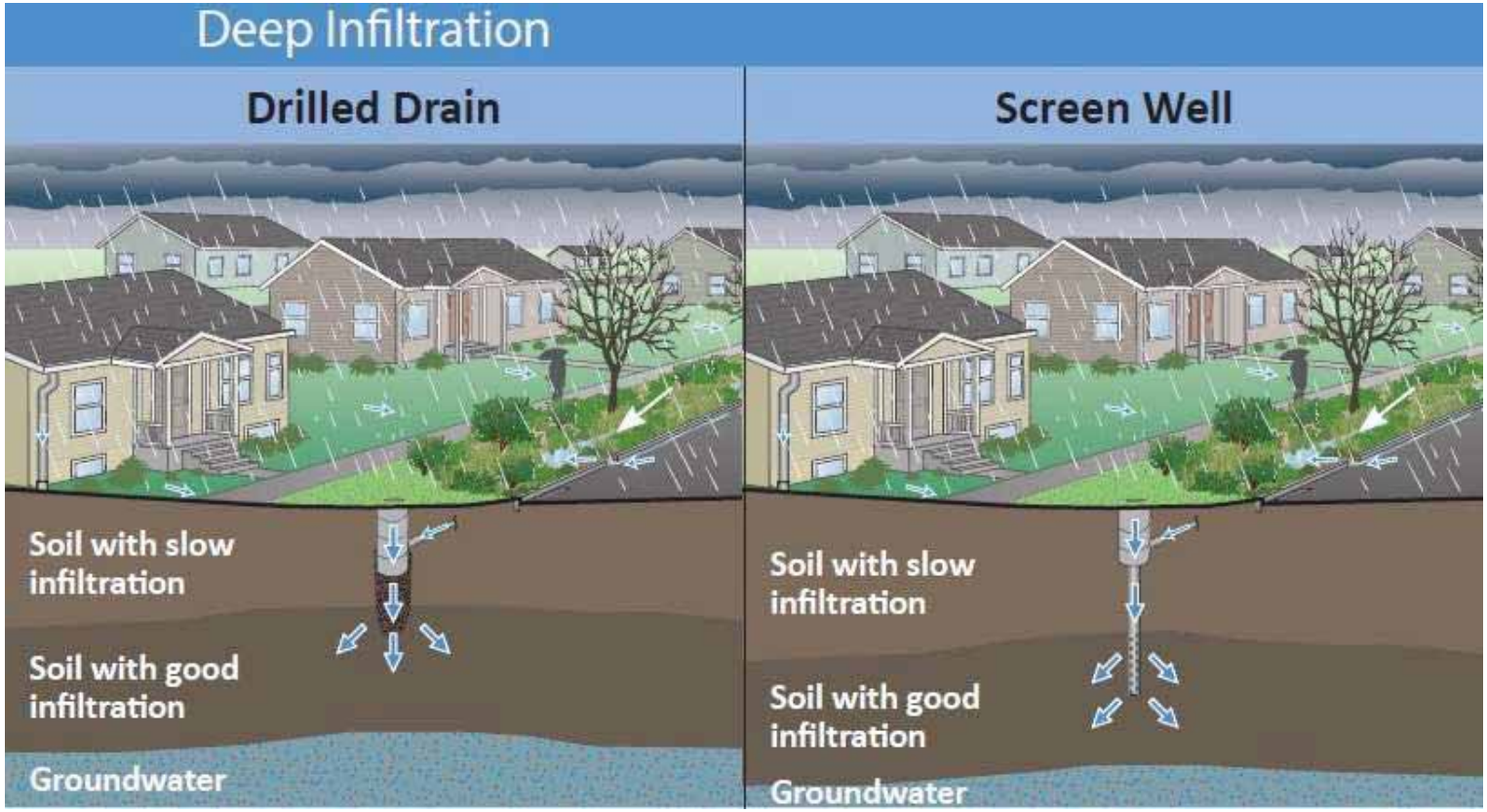
Identify soil conditions.

Insert graphic of soil profile if available.

May use be able to use information from public outreach that provided an overview on the soil conditions?

Project Overview: Bioretention with Deep Infiltration

Insert GSI program graphic for type of system being installed for project. Revise slide title accordingly.



Project Communication Flow Chart

Insert graphic of project communication flow chart for the construction phase this could be from the QAP/PMP etc

Coordination with Other City Departments and Agencies

- Ecology (UIC well registration)
- SDCI (service utility adjustments)
- SPU Water (water service adjustments
- King Couty (wastewater discharges)
- Emergency (Fire/Police)
- SDOT (street pavement restoration)
- PSE – gas service and mains relocates
- List other franchise utility purveyors

Overview of GSI elements

Provide overview by inserting graphics from public meetings/drawings showing GSI cross sections.

Bioretention: Details

Insert details from plans

Bioretention: Details

Insert details from plans

Bioretention: Planting Overview

Insert graphic identifying planting zones

Identify who and when LA of record is contacted to review plants , planting palette mock-up for bioretention cell etc.

Construction Sequencing, Milestones and Constraints

Insert graphic of project overall schedule, list milestones and constraints if applicable

Construction Sequencing

- Install and maintain TESC and vegetation protection measures
- Install and maintain flow diversion measures/bypass
- Protect subgrade from compaction and silt-laden runoff
  - Minimal construction traffic (including foot) in and out of bioretention cell area
  - Stabilize upslope construction area
- Place infrastructure, utility relocates, BSM, plants, mulch
- Plant establishment begins after all plants installed for bioretention cell, especially bottom zone plants. Flow diversion measures in place.
- Gutter flow test and assess if ready to receive runoff
- Operations and Maintenance

Preconstruction: Completed work and Work that Remains to be Completed

List work previously completed in support of the project and work to be completed in support of the project (under another contract). This is work that is outside of the scope of the awarded construction contract.

Following slide offers examples.

Preconstruction – Work by Others

✓ Franchise utility adjustments

✓ Tree transplant/removal

✓ Drilling

INSERT TEXT HERE

DURING CONSTRUCTION

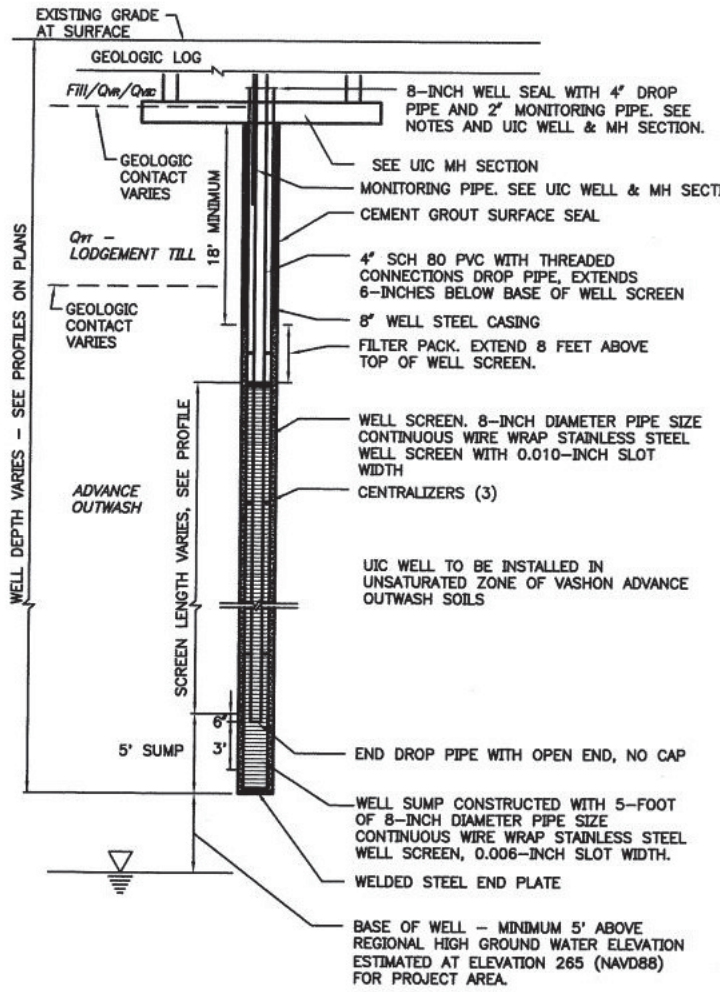
Construction – Scope Overview

(edit to match project)

- Existing trees & vegetation protection
- Temporary Sediment and Erosion Control (TESC) & Flow Diversion (ongoing)
- UIC Screen Well Drilling & Testing
- Side Sewer lines relocation (if needed)
- Underdrain installation (with water service adjusted if needed)
- Irrigation Installation
- Bioretention soil placement
- Pavement restoration, drain curb cuts, MHs, CB etc.
- Landscape/plant placement & installation
- Gutter flow test
- Punchlist
- Removal of TESC/flow diversion measures
- Maintenance (1 year/3 mos))

UIC Screen Well

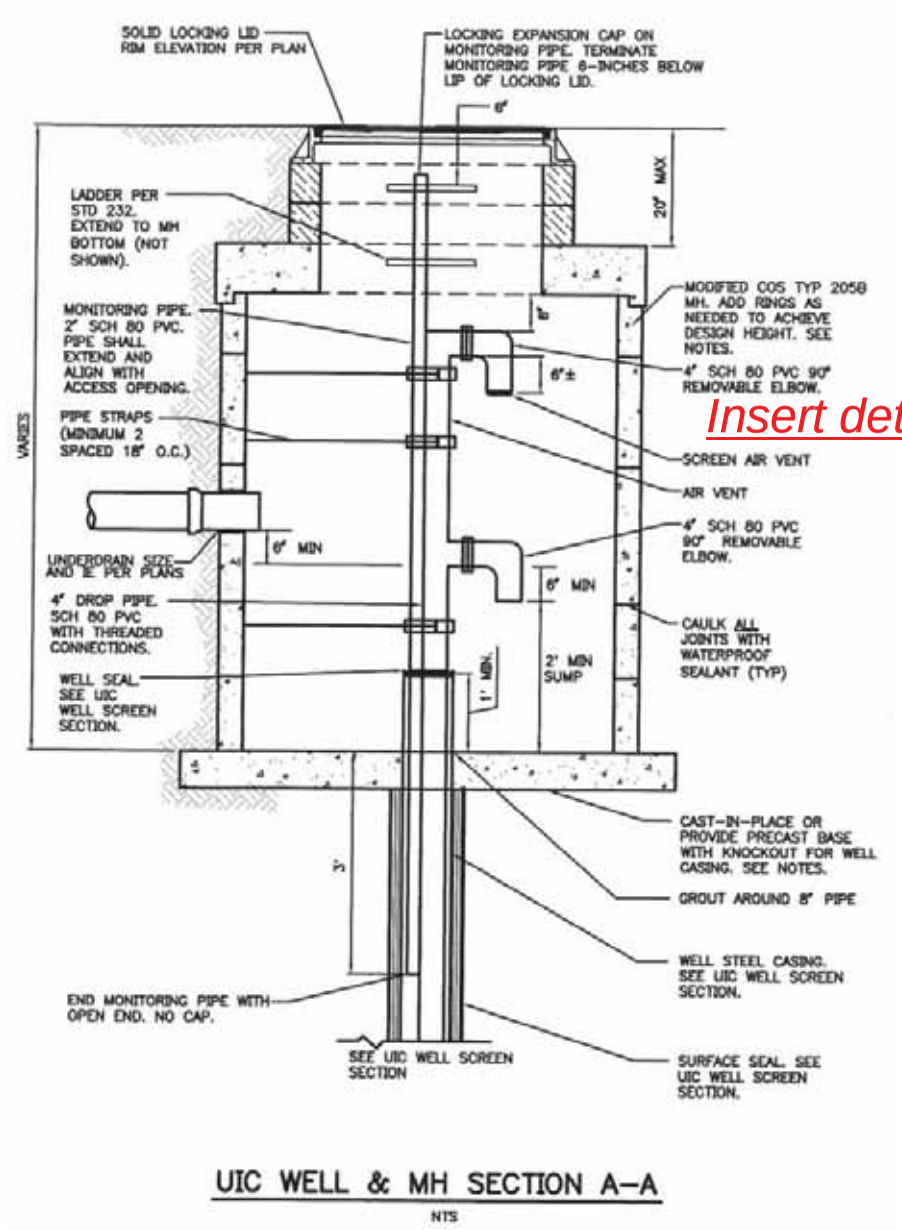
Insert detail from construction drawings



UIC WELL SCREEN SECTION

NTS

UIC Well MH & Assembly



UIC WELL & MH SECTION A-A

NTS

Insert details from construction drawings

UIC Well Flow Testing

Identify requirements from construction documents

Existing Tree, Vegetation & Soil Protection

- Why are we saving trees?
  - Mature Trees have a drainage value
  - Mitigation requirement
- Contractor's Arborist valuation posted within xy feet of major improvements
- Vegetation & soil protection
  - Chain link, (color black/orange) fencing
- Trees on private property overhanging construction limits need to be protected and may need to be pruned

Protection of Existing Trees

- Critical Root Zone (CRZ) Fencing
  - Tree protection fence to be moved or relocated only with the approval of *Contractor's/Owner's/SDOT UF's Arborist (check specs for what applies)*
  - *Contractor's/Owner's/SDOT UF's Arborist (check specs for what applies)* shall be present to observe construction in CRZ
  - Fenced area to be kept clear of building materials, waste, excess soil
- SDOT to be notified if tree roots larger than *XY"* are to be cut.
- Trenchless construction (if part of contract)
  - Boring under tree to avoid open cut trench through CRZ

TESC & Flow Diversion

- Protect adjacent properties
- Protect public waterways and sewer
- Protect installed work
- Protect filtration systems including swales, soils and porous pavement
- Stockpiles of backfill materials are protected from contamination and stormwater runoff.
- Plug pipes daylighting into swale
- TESC and flow diversion measures are **maintained** throughout swale cell construction and plant establishment.

TESC & Flow Diversion

- Public catch basins downstream from site have CB protection
- Pipes that daylight into swale are blocked so stormwater does not enter
- Upstream CBs open to divert flow

Insert plan view of example street from construction drawings

Flow Diversion: Block Drain Curb Cuts

- Swales must be protected until established
- Block off drain curb cuts to protect swales soils
  - Stormwater contamination
  - Allow for establishment and stabilization of landscaping

Protect Subsurface Soils – Underdrain Trench & Liner

- Flow Diversion
- Cover exposed soil from erosion when not actively working
- Protect Import Soils
  - BSM Type?, COS Mineral Agg Type 26, Polishing layer?

(In photo examples: Clear white plastic is temporary. Black plastic to be trimmed for underdrain trench and bioretention cell with liner.)

Protect Subsurface Soils-infiltration

- Flow Diversion
- Excavate to subgrade at time of placing soils for bioretention cell
- Cover exposed subgrade if not actively working
- No equipment/vehicles driving over exposed subgrade to protect infiltration
- Protect BSM soils
  - Cover stockpiles
  - Protect once placed in the cell
  - Compaction shall not exceed ??%

This slide is intended for shallow infiltration and from full reconstruction of road.

Subsurface - Sewer, Water Relocation

- Side Sewer (RSSC)
- Water service & meter (next slide)
- Confirm adjusted depth & location Gas Main/Service complete under separate contract

Show detail from plans for adjusting side sewers and water services

Adjustment of Water Service & Meter

- Coordination with SPU Water Department

Insert detail from plan showing how service is to be adjusted.

Subsurface Construction – Underdrain within Bioretention Cell

Show details from plans

Subsurface Construction – Underdrain outside of Bioretention Cell

Show construction details from plans of underdrain trench.

Discuss bedding and backfill material etc.

CB's Daylighting pipes into Cell

- Minimal riser height requires careful installation
- Check existing elevations & rim elevation to ensure gutter flow
- Lid's labeled "Property of King County" *(for WTD project)*

  Show construction detail from project plans.

Irrigation *(if applicable)*

- Irrigation installation, soil placement and plant installation are integrated and not linear
- Coordination of irrigation equipment with staked tree locations

Show construction detail from project plans

Watering *(if applicable)*

- Existing trees
- New trees
- New plants
- Turf
- Etc.

- Any additional text here

Bioretention Soil & Surface

Topics

- Protection – TESC & Flow Diversion
- Placement
- Mock-ups (list if applicable)
  - Swale Grading
  - Drain Curb Cuts
  - Presettling Cell
  - Precast concrete pad
  - Planting palettes
- Materials delivered are in accordance with approved submittals

Placing of Bioretention Soil

- ✓ TESC & Flow Diversion measures in place
- ✓ Confirm subgrade (or bedding/backfill for underdrain) has not been contaminated from construction sediment, silt etc.
- ✓ Slope sides of trench – no vertical cut at back of curb to avoid undermining road.
- ✓ Bioretention soil is mixture of mineral aggregate and compost that cleanses water as it filters through.
- ✓ Confirm material is from City's preapproved source/approved submittal
- ✓ Ongoing QA testing of BSM to confirm its in compliance

Placing of Bioretention Soil

- ✓ Compaction shall not exceed 85% when not within 2’ of pavement edge
- ✓ No bioretention soil under paved areas
- ✓ Minimize walking on soil once placed – it will compact
- ✓ Water shall not pond for more than 24 hours in cell. It should drain down after rain. If you see ponding water after a rain, soil may need to be replaced

Bioretention Cell Grading

- ✓ Check level areas at back of curb and face of walk.
- ✓ Check side slopes
- ✓ Check bottom width

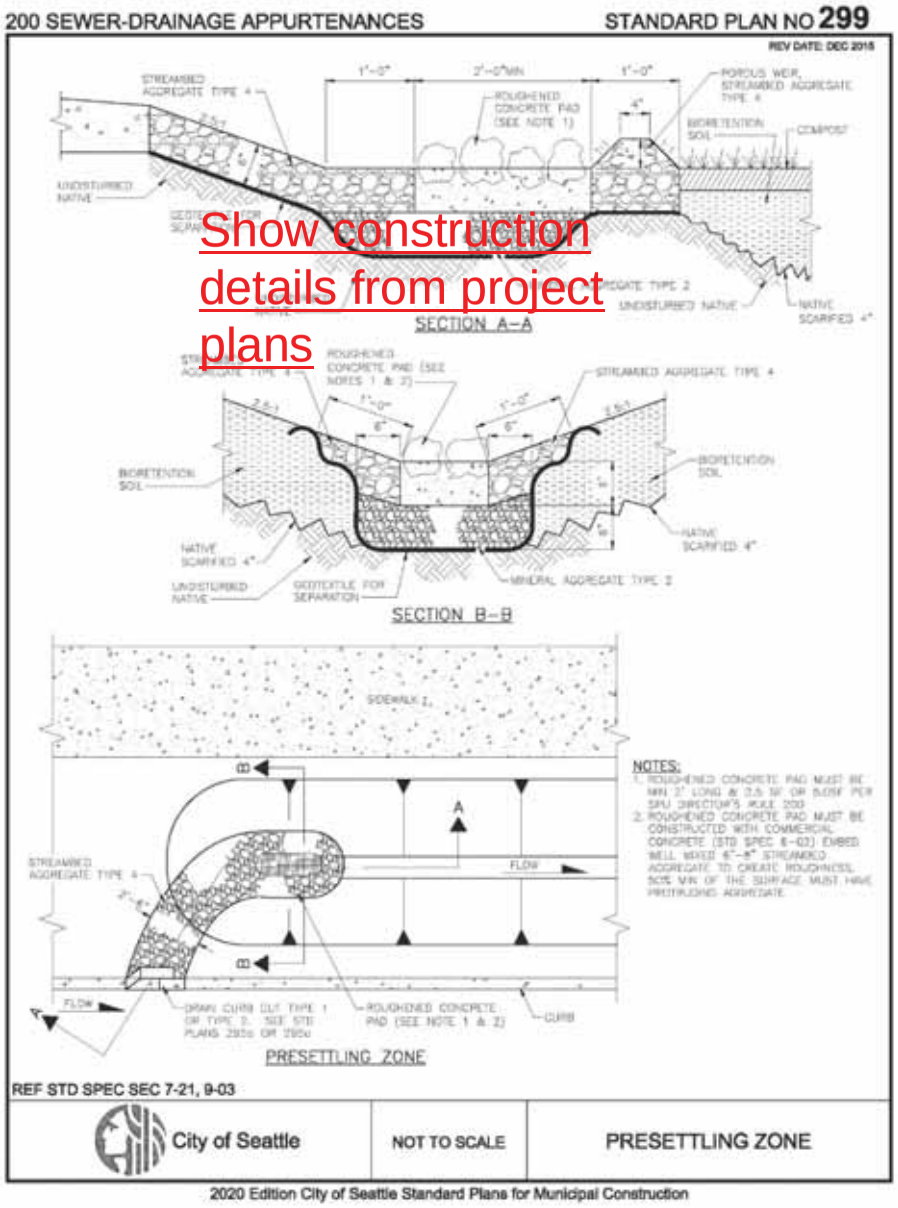
Bioretention Cell Grading

Show construction details from project plans.

- Any additional text here
- Any additional text here

Presetting Zones within Bioretention Cells

- Any additional text here



Show construction details from project plans

Presetting Zone for Cells

Show construction details from project plans

Drain Curb Cuts

- Flow Test on mock-up of each drain curb cut type

Show construction detail from project plans

- ✓ Check for depth and width.
- ✓ Check for slope in gutter pan and into the cell
- ✓ Check for bypass – gutter flow water flowing past curb cut
- ✓ Check for depressions (ponding water after the flow test).

Drain Curb Cuts

Landscape / Plant Installation

- Plant palette mock-ups
- Tree and accent shrub staking
- SDOT coordination
- Plant material review
- Planting installation, especially depth
- Mulch installation

Planting Palette Mockups

Show construction detail from project plans

Plant establishment period before water is introduced into cell *(if applicable)*

- Does not start until all plants in cell are installed including bottom zone of cell
- Plants need time to grow before they can do their job
- Review for blockage of drain curb, CBs with pipes daylighting into cell and other inlet structures.
- During this period, final concrete restoration work will be completed
- ***Green*** construction fence replaces orange fence (review if this is defined in project specs). Protects plants and for public's reference.

System Gutter Flow Test

- Conduct gutter flow test to ensure water flows into system and does not bypass drain curb cuts & flows freely into cell
  - Run water from quick coupler in upstream gutter on both sides of street, check each drain curb cut and CB with pipes daylighting to cell. Check if need to adjust depression of drain curb cut by grinding.
- Punchlist (SDOT, SPU, WTD)

Seattle Public Utilities

Questions? Just Ask.

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

This ppt template including photos were compiled by MIG|SvR, 2020 for SPU/WTD GSI Program Management contract.

Green StormWater Infrastructure Construction (GSI) With Lessons Learned from the Delridge and Ballard NDS Projects

June, 2017

Prepared by Steve Colony, PE, CCM

Seattle Public Utilities

What will be Covered

- An overview and introduction to Bioretention Cells in Seattle
  - GSI = Green StormWater Infrastructure
- The Ballard and Delridge GSI Project
  - Delridge: Cells with underdrain out falling into UIC Wells – 30’ to 40’ deep dry wells
  - Ballard: Cells with direct subsurface connections to infiltration trenches -- ~15’ long and ~10’ deep
- Lessons Learned

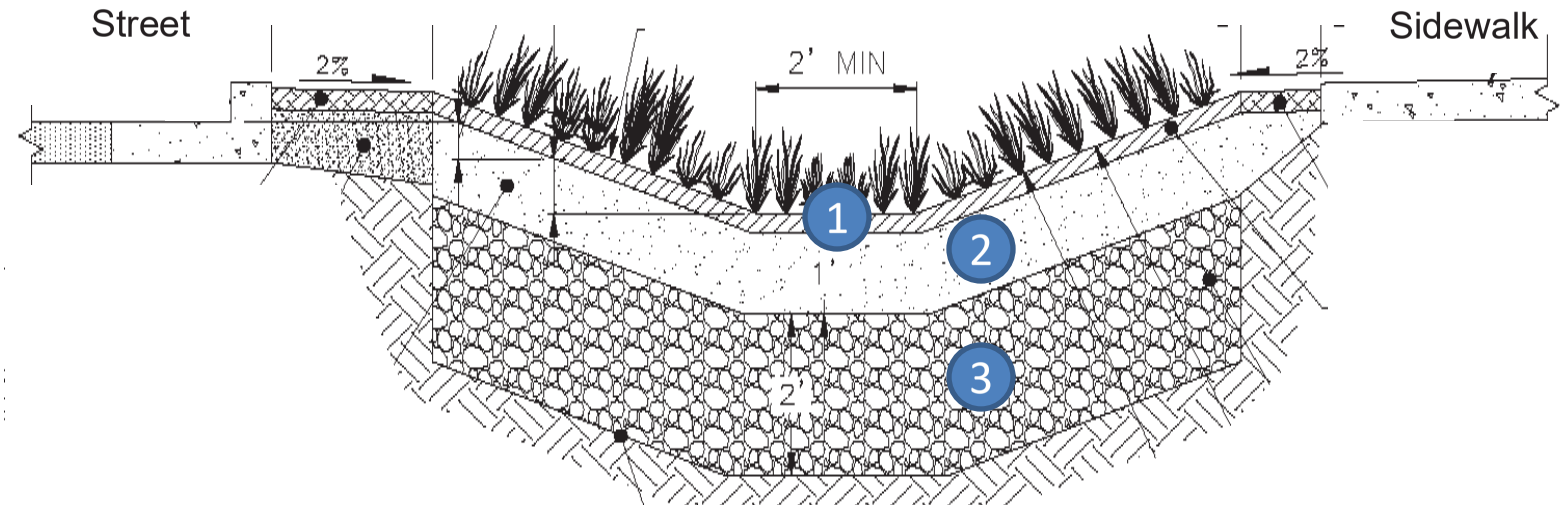
Seattle Public Utilities

Seattle is Recognized as a Leader in GSI Construction

Steve Colony presenting to a delegation of Chinese Landscape Architects at Delridge

Seattle Public Utilities

Bioretention Cell



- Small disperse treatment units
- Shallow landscaped depression constructed with an engineered soil mix and plants that promote the infiltration, storage, and slow release of stormwater flows.
- Stormwater treated via filtration, adsorption, and biological processes

1. Vegetation and mulch
2. Compost/soil/sand mix for plant growth
3. Sub filtration media may be used:
   - Sand
   - Type 26 or Peas gravel
   - Underdrains

Seattle Public Utilities

General Sequencing

- Review Contract
- Review Contractor's GSI Installation Plan 7-21.3(1)A
- Hold a pre-installation meeting with Contractor
- Install and maintain TESC measures
- Install and maintain flow diversion measures/bypass
- Rough excavate BR cell
- Protect subgrade from compaction and silt-laden runoff
- Install infrastructure, utility relocates
- If required Install underdrains and walls
- Install intakes, curb cuts and the like
- Final grade and place BR soil, plants, mulch
- Plant establishment

Seattle Public Utilities

TESC & Flow Diversion

- Protect adjacent properties
- Protect public waterways and sewer
- Protect installed work
- Protect BR cells, BR soil, and plants
- Protect stockpiles of backfill materials from contamination and stormwater runoff.
- Plug pipes daylighting into swale
- Maintain TESC and flow diversion measures throughout BR cell construction and, when required, plant establishment. Ideally have stable cells before introducing storm water

Seattle Public Utilities

Protect Subsurface Soils- Prevent Overcompaction

- **Critical for infiltration facilities**
- No soil placement, or soil amendment during wet or saturated conditions
- Operate equipment adjacent to (not in) facility
- No equipment/vehicles driving over exposed subgrade (at final grade) to protect infiltration
- Minimize construction traffic (including foot) in and out of bioretention cell area

Seattle Public Utilities

Bioretention Cell Grading

- Install level areas at back of curb and face of walk.
- Grade to design dimensions and slopes
- Where required scarify bottom and sides in accordance with 7-21. 3(2)B
- Assure that subgrade (or bedding/backfill for underdrain) has not been contaminated from construction sediment, silt etc.

Seattle Public Utilities

Bioretention Soil & Surface

- Protection – TESC & Flow Diversion
- Subgrade has been approved
- Materials delivered are in accordance with approved submittals

Soil Placement at Delridge

Seattle Public Utilities

Placing Bioretention Soil

- Do not place if cell is frozen or excessively
- Where required scarify subgrade surface prior to placement
- Place BR soil loosely
- Avoid overcompaction
- Install using a conveyor belt or other approved method

Seattle Public Utilities

Flow Diversion: Block Curb Cuts

- Protect BR cells until ready to be put into service
- Block off drain curb cuts to protect BR cell soil
  - From stormwater contamination
  - Allow for stabilization of landscaping

Seattle Public Utilities

Deep Infiltration System

Ballard Infiltration Trench
*Subsoil permeable near surface
* Wider than deep

Delridge UIC Well Drilling
*Deep permeable layer
*Requires WA licensing

Seattle Public Utilities

Confirming Sites Will Infiltrate

Ballard Pit Infiltration Test

Delridge UIC Flow Test

Seattle Public Utilities

Getting water to Wells or Pits

Ballard Type 26 direct flow to Pit

Delridge Piped underdrain to UIC well

Seattle Public Utilities

Silva Cells, Unique to Ballard

- Silva Cells provided more surface area for biofiltration beneath the CW
- CW supported on a plastic grid, Silva Cells

Public Utilities

CW Install on Silva Cells

Seattle Public Utilities

Delrdige Walled Cells

Provides more bottom area for infiltration than sloped cells

Seattle Public Utilities

Weirs

Steel Plate Weirs at Ballard

PCC Weirs at Delridge

Seattle Public Utilities

Completed Cells

Ballard

With Bio Filtration Beneath CW

Delridge

Double Walled Cell

Seattle Public Utilities

Some Lessons Learned

- Construction experience with GSI work
- Over compaction of subgrade and Soils
- Silting up of Subgrade
- Keeping water out during Construction
- Payment: Most cell are paid by LS or EA – hard to track excavation or soil by unit costs

Seattle Public Utilities

Future GSI Work for SPU CMD

- SPU GSI CIP Contracts
- Areas where SPU CMD may have a role:
  - SPU GSI installed in partnership with SDOT
  - CAPO GSI installed by private developers
  - King County GSI

Seattle Public Utilities

Seattle Public Utilities

Questions? Just Ask.

Seattle Public Utilities

Appendix B: GSI Bioretention Construction Kick-off Meeting with Contractor Template

- Contact SPU/WTD GSI Projects Project Manager for Powerpoint File to edit and adapt for specific project.

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Seattle Public Utilities

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Project Name



Preconstruction Meeting Overview on GSI elements

Insert Date of Meeting

Text that is underlined & red is to be edited by project team. Once changed, return to **black** and remove underlining. Other text (not underlined) may be modified to fit project specific conditions.

x/xx/xxxx

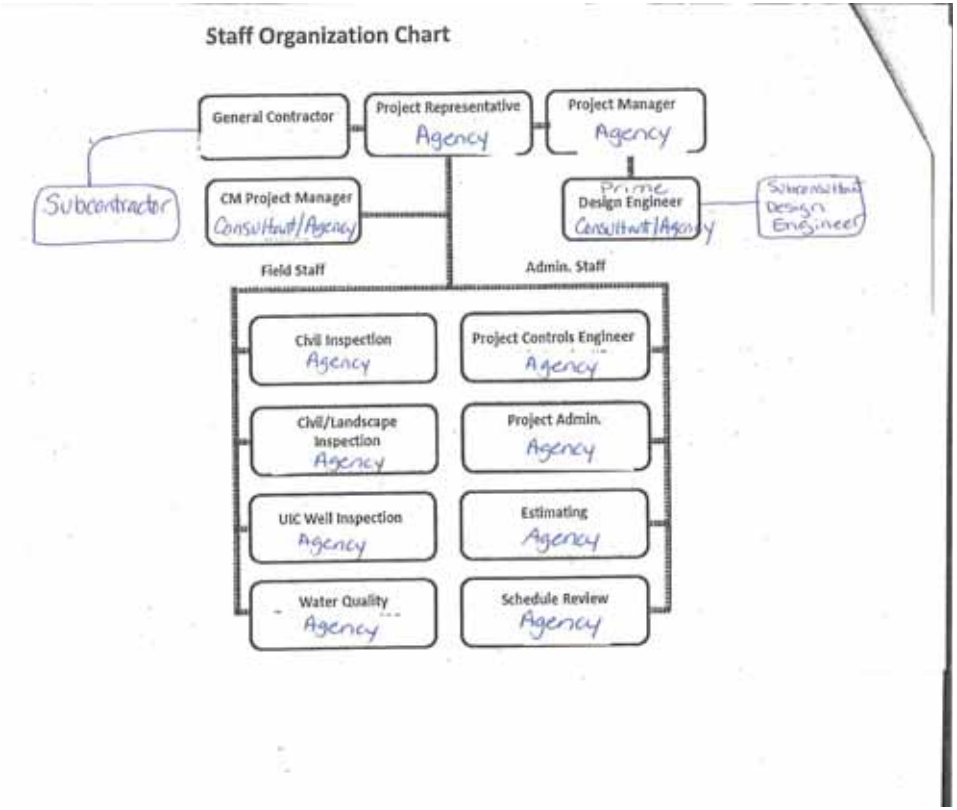
Line of Communication

Insert flow chart of project chain of communication.

- All direction to the contractor comes from Project representative.
- Subconsultants=>Prime Consultant=>Agency Engineer =>Agency's Construction Project Representative=>Prime Contractor=> Subcontractors
- Then reverse

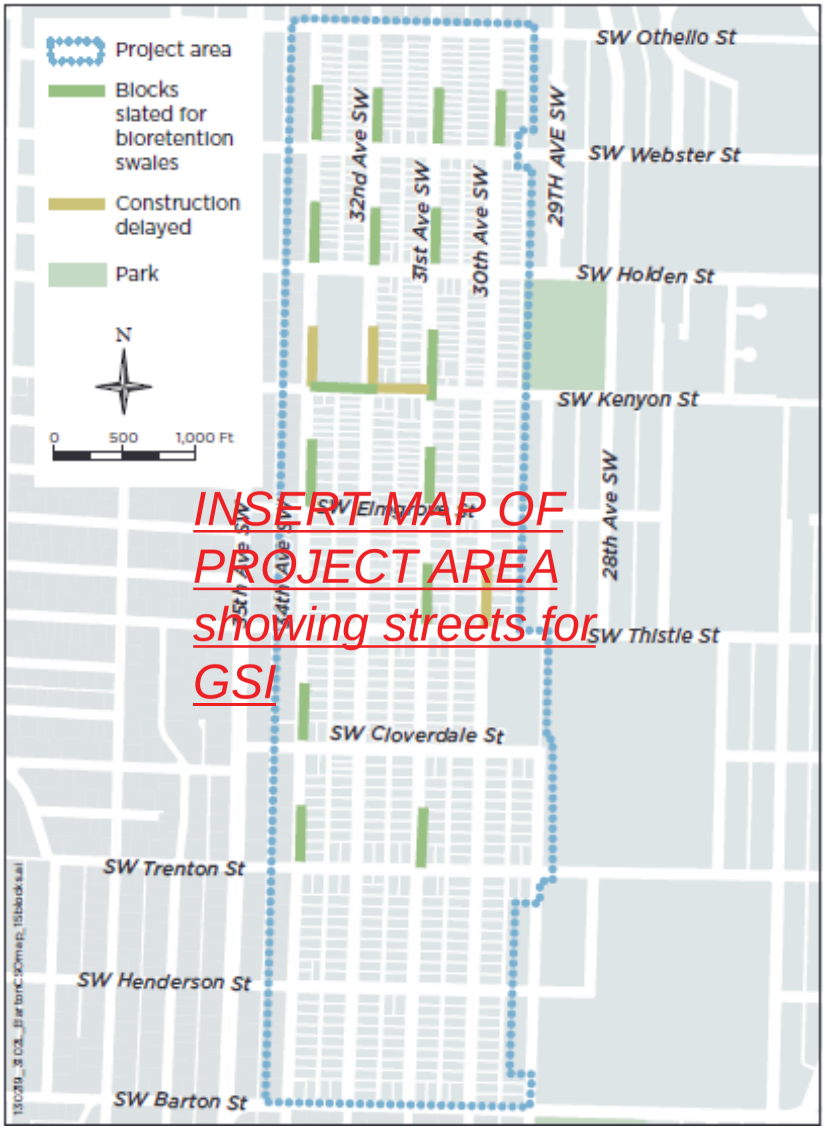
Communication Flow Chart

Create flow chart based on project specs and construction management for each agency standards. Titles/Roles may differ per project or agency.



Project Scope

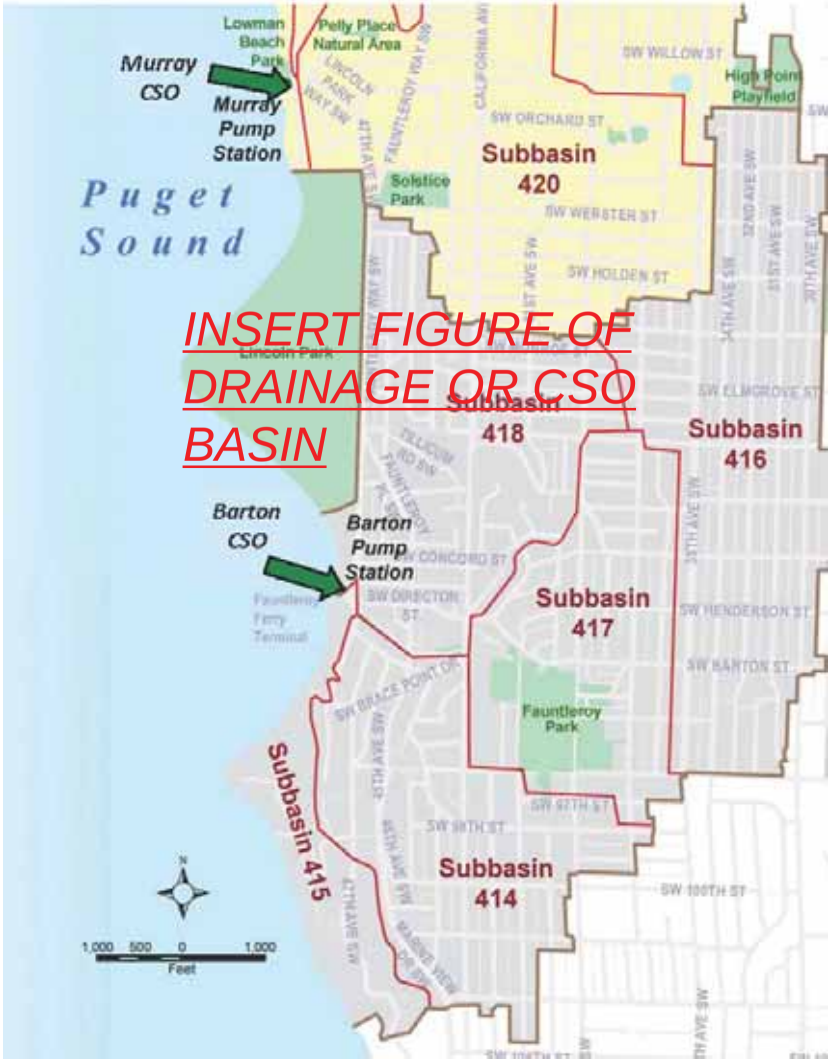
- *Bioretention swales with ???? (Describe Project)*
  - Demolition includes tree removal
  - Landscaping & irrigation
  - Street restoration (road, sidewalks, curb ramps)
  - Miscellaneous service utility adjustments
  - Other



Why This Project is Needed

- *State regulatory requirements (Ecology, MS4, Creek protection, CSO consent decree etc.)*

- *Note current conditions and facts for context (e.g. currently exceeding regulatory requirements by how much?)*



Project Area

- *Discuss general conditions of project area – this can be taken from public outreach materials*

Insert figures and images from outreach materials as desired.

Soil Conditions Drive Design

Identify soil conditions.

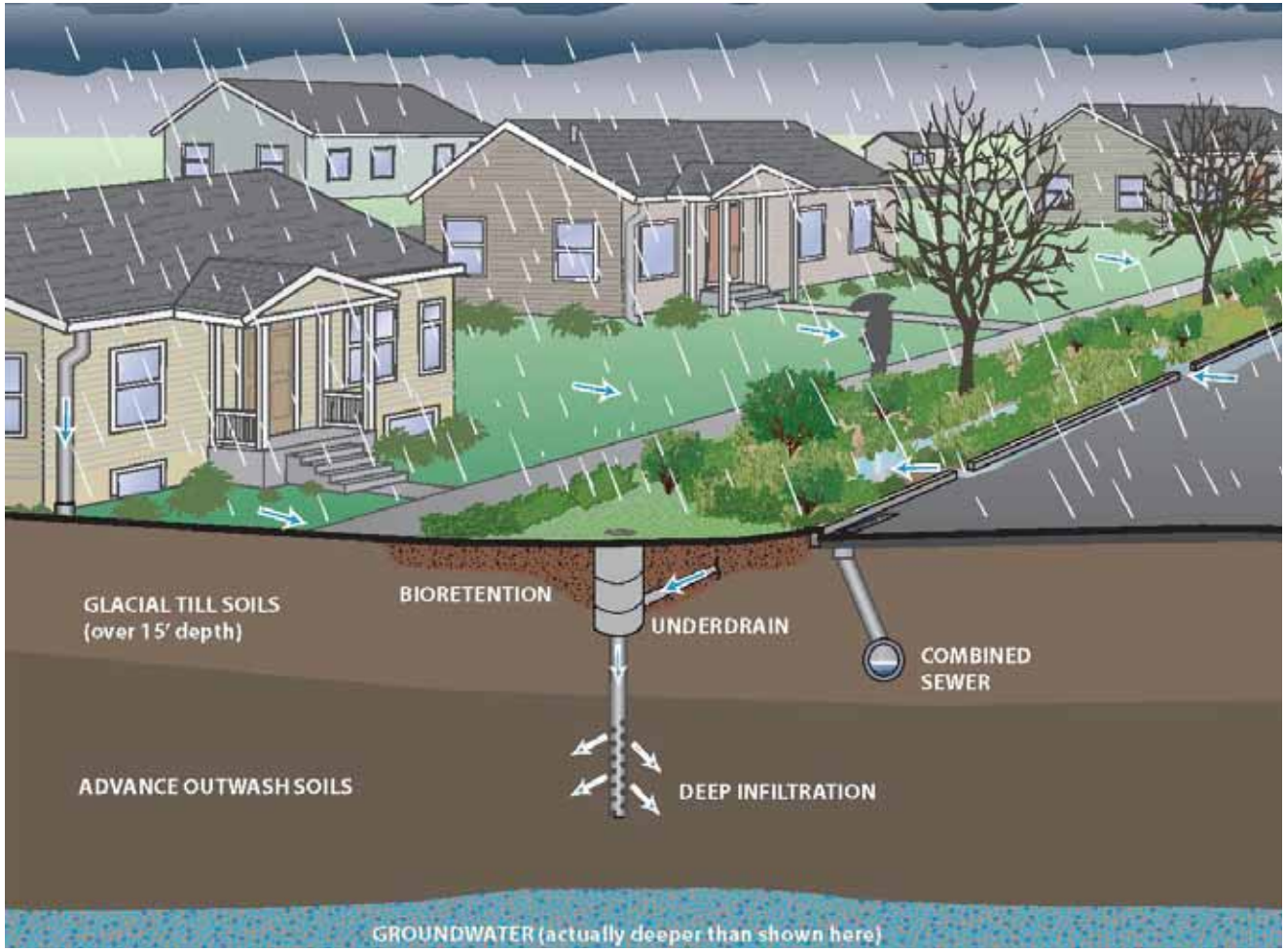
Insert graphic of soil profile if available.

Recommend applying bullet points, images, etc. from public outreach.

Green Stormwater Infrastructure (GSI) Design Elements

Insert applicable figure for project type (e.g. from public outreach materials).

- *List GSI elements*
- Bioretention swales
- Underdrain
- Underground Injection Control (UIC) wells

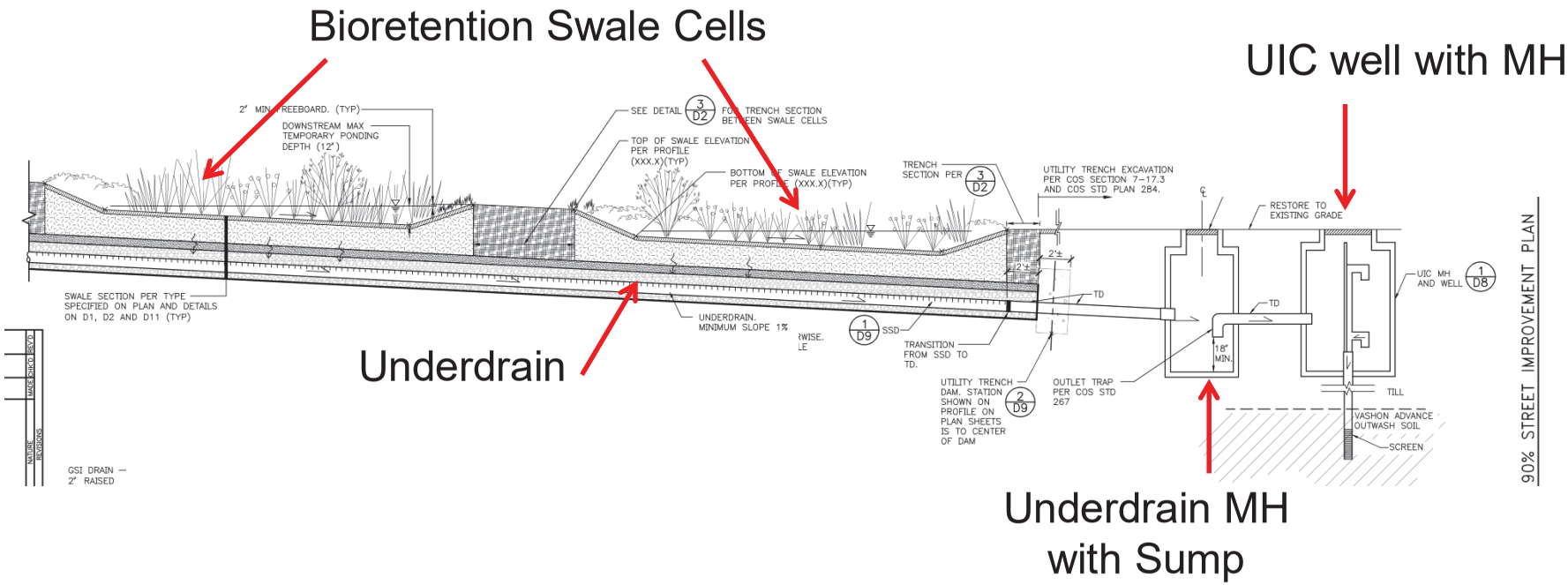


Construction Elements

- *List the elements – Recommend following scope of work in the construction specifications. Below is an example:*
- UIC wells – drilling and construction
- Earth work – Excavation, grading, bioretention soil placement, fine grading.
- Storm Drainage – Under drains, catch basins, clean outs, maintenance holes.
- Landscape – bioretention soil placement, plants, trees, lawns, mulch and irrigation
- Service utility adjustments
- Road and Concrete work -- Panel restoration, concrete curbs, sidewalks, curb ramps, driveways, pervious paths
- Clearing and grubbing, demolition, disposal

GSI Design

Insert graphic from construction drawings – example below



- Maximum temporary ponding depth – *??* inches
- Swales drain within 24 hours
- Overflow to *??*

GSI Design – more details

- *General statements about details*
- Swale side slopes not to exceed *xy*:1
- Minimum bottom width - *??* inches
- Swale length varies *??* To *??* feet
- Swale crossings located for access to homes
- Limited use of curb bulbs
- Minimal impact to on-street parking

Insert typical bioretention details from construction drawings

Anticipated Construction Sequencing

Modify Sequence to reflect construction specifications and contractual milestones. Below was for a specific project.

- Submittals
- Tree Removal
- UIC wells
- GSI Season 1
  - 8 streets
  - Mock up, construct improvements, punchlist, plant establishment, gutter flow test, remove upstream structures, substantial completion.
- GSI Season 2
  - 7 streets
  - Mock up, construct improvements, punchlist, plant establishment, gutter flow test, remove upstream structures, substantial completion

Milestones and Constraints

- *If there are milestones and constraints in the construction contract specifications, summarize them.*

- Consent Decree

Work to be performed by others

- *Describe work under separate contract, managed by the Owner, where applicable (e.g. such as PSE gas, tree transplanting, etc.)*
- *Describe work by others that the Contractor must coordinate as part of the construction contract (e.g. water adjustments and services by SPU, etc.)*

Working With the City

This slide is for WTD CIP projects

- SDOT Pre-construction meetings
- SDOT submittal review
- Street Use fees
- City's inspection of hardscape and non-GSI utilities

Working With KCWTD

This slide is for WTD CIP. Insert applicable text here. Examples follow:

- Pre-construction Meeting
- Submittal review
- Elements inspected by WTD
- WTD construction management consultant

Outreach With the Residents

- Coordinate with *SPU/WTD (select one agency)* to provide advance notice of construction activities and progress updates throughout the construction duration
- Contractor will work to ensure residential access and continued deliveries, services, and recycling/yard waste/garbage pick-ups
- *(Apply this bullet if a WTD project)* King County will maintain a construction hotline. Contractor will be available 24/7 to address concerns and complaints.
- Provide input about construction schedule and activities for community/neighbor project updates/flyers/newsletters etc.

Noise

- During Construction
  - Short-term noise increase related to construction
  - Construction noise in compliance with City of Seattle Municipal Code (SMC) 25.08
  - Potential noise mitigation measures to comply with SMC
    - Mufflers
    - Sound attenuation barriers
- After Construction
  - None

Anticipated Schedule

Activity	Milestone Date
Advertise To Bid	Month Year
Bid Award	Month Year
Notice to Proceed	Date
Submittals	Time Period
Construction	Time Period
Work by others (such as PSE)	Time period

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Appendix C: GSI Construction Inspection Checklist Template

- GSI Construction Inspection Checklist Template

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Intent of Checklist:

This checklist is based on the GSI design and construction requirements for the SPU/WTD *project name* (*SPU/WTD project number*). Improvements are represented on Street Improvement Permitting Plans (SIP) for SDOT Project Number *xxxxxx*.

The checklist is intended to highlight items critical to the performance of GSI facilities constructed in Seattle public right of way that need to be verified first hand by SPU/WTD Construction Management staff or their designated representative. This list is not all encompassing for what is denoted in the specifications. See project contract documents for specifics. Information about the project construction provided by checklists, such as this one, and notes will be stored in the project files, to help SPU/WTD evaluate performance of the facilities over its design life.

This checklist is specific to GSI facilities and does not include other items that will be inspected and maintained by the City of Seattle or King County (e.g. street restoration, sewer mains maintained by SPU/King County, etc)

Inspection of mock-ups is included in the checklists.

Index **Page**

Note to users of this template: Project teams are to modify this template based on project scope and specifications and current COS Standard specifications. Project designers are to coordinate development of this inspection checklist with SPU/WTD Inspectors who will be observing the construction. It is intended to be used as a guide for Inspectors but does not replace or override project contract specifications. Sections are stand alone for different stages of construction.

UIC Screen Well Checklist (Page 1 of 1)

Street Name (& intersecting streets): SIP Sheet#:

UIC Well #: Date: Inspector, Agency:

Item	N/A		Yes	No	Comments
Material submittals have been submitted & approved.					
Materials delivered are in accordance with approved submittals.					
Contractor has approved plans and specifications, including approved shop drawings on site.					
Tree and vegetation protection in place.					
UIC Well subsurface construction is in accordance with plans and specs and any changes from plans are documented and include casing length and screen length.					
UIC well is drilled at location per plan such that the MH for the UIC well (including alignment of MH access opening) is installed per plan.					
UIC well has been developed per specs.					
Inflow testing has met the minimum flow capacity requirement per specs.					
Post-inflow test, any fine sediment accumulated in the well shall be cleared.					
Post-inflow test, video survey of well has been performed and DVD received.					
Temporary UIC well protection monument installed per specs. Temporary pedestrian detour provided and approved by SDOT if applicable.					
UIC Well Maintenance hole installed per plans & specs.					
• Licensed well driller has conducted the adjustment of UIC well casing height &installed a temporary well cap.					
• Placement and testing of structure backfill conducted per specifications. Structural fill type is appropriate. Lift thickness, number of passes, equipment type, soil moisture is documented. Field density tests performed.					
• Installation of permanent well seal, drop pipe, pipe straps, air vent pipe, screen, and monitoring port pipe has been completed.					
• MH access opening is aligned with ladder & per plan.					
Video survey of completed wells has been performed after UIC MH placed and any debris and sediment have been removed.					
Records and drawings have been submitted.					
• Professional survey of top of casing elevation, northing and easting coordinates has been completed.					
• Well log, daily drilling reports, video records, record drawing of completed well, and copies of all records and reports submitted to Ecology for each individual well installation have been received.					

Tree, Vegetation and Soil Protection Checklist (Page 1 of 1)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector, Agency:

Item	N/A	Yes	No	Comments
Staked layout of tree protection fencing has been reviewed.				
Tree, vegetation and soil (TVS) protection, including fence per specifications, in place in ROW and at back of sidewalk adjacent to the work zone.				
• TVS protection fence is at edge of critical root zone (CRZ) or edge of area to be protected and fence corners are anchored in accordance with specifications.				
• Area within and adjacent to TVS protection fence is protected from construction staging/stockpiling, grading, excavation and contamination unless approval is obtained from the Project Representative.				
• Project Representative may order the work stopped if unauthorized use of protected areas is occurring.				
• The roots and canopies of trees on private property overhanging the project work areas are protected.				
Trees and vegetation are protected against cutting, breaking or skinning of roots, skinning or bruising of bark, and compaction of root zones and breaking of branches.				
3” depth arborist wood chips placed within the dripline of dec. trees and the CRZ of coniferous trees to be saved except for trees within ex. lawn to remain.				
Flexible tree limbs and overhead branches are tied back under supervision of Contractor’s Arborist if they may be damaged during construction.				
SDOT Urban Forester is notified when the first major pruning of existing trees will be required.				
Project Representative has approved tree pruning.				
Roots are protected per specifications.				
Project Representative and SDOT Urban Forester is notified when roots 2” and larger shall be required to be cut.				
See specifications for loss or injury to trees.				
Trenchless construction excavation pits are outside fenced area.				

Bioretention Subsurface Construction Checklist (Page 1 of 5)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector; Agency:

Item	N/A	Yes	No	Comments
Material submittals have been submitted and approval obtained.				
Materials delivered are in accordance with approved submittals. • COS Aggregate Type 26 – min. of one gradation test (ASTM D422) of imported material per block • COS Aggregate Type 6 – min. of one gradation test (ASTM D422) of imported material per block • Liner • Trench Dam backfill				
Contractor has approved plans, COS Standard Plans and Contract specifications on site.				
Tree, vegetation and soil protection in place (see separate checklist)				
TESC and flow diversion measures in place prior to excavation of bioretention cells				
• Public storm drain catch basins downstream from site have CB protection				
• Stockpiles of backfill materials are protected from contamination and stormwater runoff and stored away from landscape, bioretention & porous pavement areas.				
• Curb cut openings to cells are blocked so stormwater does not enter cells.				
• Pipes that daylight into cell are blocked so stormwater does not enter cells.				
• UIC Well Maintenance Hole inlet is plugged.				
TESC and flow diversion measures are being **maintained** through construction & plant establishment.				

Bioretention Subsurface Construction Checklist (Page 2 of 5)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
Excavation: Bioretention cell and non-cell excavation meets detail dimensions on plans.				
• Survey control provided for earthwork.				
• No construction materials & heavy equipment shall drive, park or be stored within cell or between cells in landscape areas.				
• Trench excavation meets detail dimensions.				
• Depth of cell and non-cell areas is sufficient to accommodate the required depth of bioretention soil, mulch/compost & ponding.				
• Excavation within 6-inches of final native soil grade shall not be permitted if the Project Site soil is frozen, has standing water, or has been subjected to more than ½" of precipitation with 48 hours (COS 7-21.3(2)A).				
• No potentially contaminated material (based on visual observation or odor) is present.				
• Any over-excavation required due to unsuitable soils is documented.				
Bioretention Trench subgrade prepared per plans				
• Trench bottom smooth, uniform and free of sharp rocks and other point load causing materials.				
• Subgrade soils at the trench base have been documented by the geotechnical rep.				
Liner is installed per plans.				
• Liner installation is coordinated with tree and irrigation installation				
• Prepared excavation sides and bottom smooth, uniform and free of rocks and other point load causing materials				
• Subsurface conditions for liner need is documented by geotechnical rep.				
• Beginning and end of liner (length)per plan				
• Anchor liner at start/end per plan				
• Fully lined cells: Liner location is in accordance with plans (at cell and between cells). See sheet D6.				
• Liner penetrations are noted on record drawings.				

Bioretention Subsurface Construction Checklist (Page 3 of 5)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
Utilities adjusted/relocated per plan				
• Gas Main/Service (by PSE)				
• Side Sewer work per plans and specs.				
o Contractor schedule and coordinated side sewer work with homeowners.				
• Water service, meter locate per plans &specs.				
o Contractor schedule and coordinated water service work with SPU (3 week notice) o Contractor schedule and coordinated work with homeowner.				
Catch basins and pipes discharging directly to cells installed per plans				
• Placement and testing of trench and structure backfill conducted per specifications. Backfill type is appropriate. Lift thickness, number of passes, equipment type, soil moisture is documented. Field density tests performed.				
• Lid denoted with appropriate engraving				
• Existing adjacent elevations in gutter and CB rim elevation reviewed to confirm gutter flow will enter into CB.				
• Structure is plugged until flow diversion (to cell) is no longer required.				
• Trench for pipe discharging to cell is in accordance with plans.				
• Pipe invert elevations at cell are per plans				
• Pipe is cleaned and tested per COS Section 7-17.3(4).				
MH for underdrain installed per plans				
• Structure is at location per plan with access lid opening at intended location per plan.				
• Placement and testing of structure backfill conducted per specifications. Structural fill type is appropriate. Lift thickness, number of passes, equipment type, soil moisture is documented. Field density tests performed.				
• MH Lid with appropriate engraving on lid.				
• Structures with sumps and downturn elbow are per plans. Until deep infiltration facility is to become operational, bypass is provided to divert water collected in underdrain MH with sump from discharging into deep infiltration facility.				
• MH for underdrain is channeled per plans.				

Bioretention Subsurface Construction Checklist (Page 4 of 5)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
Underdrain System installed per plan.				
• Start/end of slotted underdrain pipe per plan				
• Slotted underdrain pipe is placed with slots as noted in plans				
• Start/end of solid underdrain pipe per plan				
• Cleanout for underdrain pipe installed at location per plans with appropriate engraving on lid.				
• Underdrain pipe bedding material installed per plan, including appropriate mineral aggregate type.				
• Prior to placement of bedding confirm no construction sediment or debris has been deposited into partially constructed cell. Sediment, debris and contaminated material shall be removed and replaced to re-establish subgrade for placement of underdain pipe bedding.				
• Aggregate for sand filter layer, if applicable, has been installed per plan.				
• Bioretention soil placed per plan (see Bioretention Soil & Surface Construction Checklist)				
• At driveways, for utility trench crossings (e.g. solid underdrain pipe) one density test per driveway in conformance with COS Section 2-11.3(2).				
• Utility trench dam for underdrain installed at location and details per plan.				
• Solid underdrain pipe installed by trenchless construction, if applicable, is within specified horizontal and vertical variances.				
• Solid underdrain pipes have been tested in conformance with COS Section 7-17.3(4). Testing to be done prior to pavement restoration for utility trench.				
• Underdrain system (slotted and solid pipes and MHs) from start to point of connection at deep infiltration facility are cleaned. All cleaning done prior to bringing deep infiltration facility on-line.				

Bioretention Subsurface Construction Checklist (Page 5 of 5)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
Utility trenches in paved areas				
• Pipe bedding and backfill per plans				
• Conductive warning tape installed				
• Density tests performed of utility trench backfill in paved areas per COS Section 2-11.3(2).				
Subgrade preparation and depths for planting areas outside of cells is per plans				
• Planting beds outside cells – depth from finish grade per detail.				
• Tree planting pit within existing lawn areas depth and width per detail.				
• Restored planting bed – depth from finish grade per detail.				

Bioretention Irrigation Construction Checklist (Page 1 of 1)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
Materials delivered are in accordance with approved submittals.				
Tree, vegetation and soil protection in place				
TESC and flow diversion measures in place and working properly				
Contractor has approved plans and specifications on site.				
Irrigation pre-installation conference completed per specifications.				
Static pressure at point of connection for irrigation has been provided prior to start of work.				
Prior to installation of irrigation confirm coordination with bioretention soil installation has occurred. Adjustments of head locations will need to occur after installs of soil, shrubs and trees.				
Staked layout of proposed trees and accent shrubs with tree bubblers has been reviewed.				
SDOT confirms approved tree layout staking				
Irrigation equipment (boxes) are located a minimum of 3' from staked tree locations. Irrigation bubblers are installed 2' min. from tree trunks and accent shrubs and spray heads are 4' min. from tree trunks when spraying towards trees.				
Staked layout of irrigation system has been approved. No irrigation heads located in front of curb cuts.				
Trenching near existing trees per specifications. • Project Representative and SDOT Urban Forester are notified when tree roots 2" and greater in diameter are to be cut.				
Irrigation pipe sand bedding is per plans and free of rocks.				
Detectable marking tape (COS Section 9-15.11) installed above irrigation wires.				
Main and lateral line and valve pressure testing is observed.				
Irrigation system reviewed for coverage.				
All adjacent pavements and landscape areas are clean and free of debris.				

Bioretention Soil & Surface Construction Checklist (Page 1 of 4)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
Mock-up of cell grading for each cell type cross section has been approved prior to grading all cells of that type				
Mock-up of Presettling Cell Grading for each type approved prior to completing other cells of that type				
Mock-up for drain curb cuts approved. Mock-up shall include each curb cut type included in the plans and for each condition (e.g. existing pavement, new pavement • Review of mock-up shall include a flow test to confirm water from gutter will flow into the cell.				
Materials, as included in the plans, meet specifications and approved submittals • Bioretention soil source and mix – tests and samples current and provided for material to be used within 90 days prior to installation • If source material in mix changes then testing data and new samples were submitted prior to use. • Bioretention soil is not excessively wet • Mulch • Geotextile • Boulders • Cobbles				
Contractor has approved plans & specs on site including COS standard plans & specs.				

Bioretention Soil & Surface Construction Checklist (Page 2 of 4)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
Tree, vegetation and soil protection in place.				
TESC and Flow Diversion measures in place and are being maintained during bioretention cell construction & establishment				
• Adjacent property runoff interceptor in place and free of significant debris.				
• Public storm drain catch basins downstream from site have CB protection				
• Stockpiles of backfill materials are protected from contamination and stormwater runoff and stored away from landscape, bioretention & porous pavement areas.				
• Curb cut openings to cells are blocked so stormwater does not enter cells.				
• Pipes that discharge into bioretention cell are blocked so stormwater does not enter cells.				
• Bypass measures provided to direct stormwater flows from flowing into trench				
• No flow is draining into downstream deep infiltration facility through underdrain system.				
Drain curb cuts are installed per plan such that stormwater flow will enter from gutter as intended and will also be the overflow point for the cells.				
• Mock-ups approved				
• Elevation at existing gutter is consistent with plans prior to placement of drain curb cut. If differs notify Design Engineer for review.				
• Drain curb cut installed at location per plan and outside of the concrete panel joint.				
• Cobbles installed per plans.				
• Correct drain curb cut type installed per plan.				
• No plants, irrigation heads located in flow path of drain curb cut from gutter to bottom of bioretention cell.				
Root barrier installed at locations per plan for new street trees.				

Bioretention Soil & Surface Construction Checklist (Page 3 of 4)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
Bioretention Soil placement in cells				
• Mock-up of bioretention cell grading for each cell type has been approved.				
• Staked layout of boulder locations, if applicable, has been approved.				
• Prior to placement of bioretention soil confirm coordination with irrigation installation has occurred.				
• Testing of bioretention soil was conducted within last 90 days prior to placement of the soil. If testing was not conducted within last 90 days then contractor to submit test results for approval prior to using material.				
• Bioretention soil has been visually checked to match approved submittal sample, is uniform with no clumping of materials, and is free of plastics and other inert objects.				
• Prior to placement of bioretention soil confirm no construction sediment or debris has been deposited into partially constructed cell. Contaminated material and (including sand filter layer if applicable) shall be removed and replaced to re-establish subgrade for placement of bioretention soil (COS Section 7-21.3(2)A2 Item 5).				
• Bioretention soil was not placed on surfaces that were frozen, containing frost or ice, during the rain or wet conditions (COS Section 7-21.3(2)A4, Item 3).				
• Install bioretention soil mix to the layer thickness noted on the plans (COS Section 7-21.3(2)A4).				
• Bioretention soil compaction does not exceed 85% when placed in bioretention cell (outside of area adjacent to the roadway edge as indicated plans) (COS Section 7-21.3(2)A4).				
• Finish grade for the bioretention cell section (with allowance for mulch) shall be in accordance with the grades and dimensions on the plans and the approved mock-up				
• Dimension for level graded areas along curb and sidewalk to top of cell slope are per plan				
• Side slope for bioretention cell section type have not been exceeded				

Bioretention Soil & Surface Construction Checklist (Page 4 of 4)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
Weir, if applicable, are installed per plans				
• Mockup approved				
• Weir materials and grades are installed per plan.				
Presettling cell without pipe discharge is installed per plans				
• Cell is consistent with approved mock-up				
• Materials placement at dimensions per plan				
• Materials type per plan (i.e. cobbles, concrete pad or boulders etc)				
Presettling cell with pipe discharge				
• Cell is consistent with approved mock-up				
• Materials are installed per plans				
• Pipe is installed per plans and at correct elevations				
Areas outside of Bioretention cells: Soil preparation is per plans				
• Verify can penetrate 8-inches (tilling) and soil was amended				
Pervious concrete paths				
• Prior to pour confirm castings are per plan and coordinated with path location.				
• Installed at locations per plan.				
• Installed pervious concrete paths are protected from construction activities.				

Bioretention Planting Checklist (Page 1 of 1)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
Materials, including plants, delivered are in accordance with approved submittals.				
Tree, vegetation and soil protection in place				
TESC and flow diversion measures in place and working properly				
Contractor has approved plans & specs on site.				
Landscape pre-installation conference completed per specifications.				
Mock-up of bioretention cell planting for each plant palette type has been approved prior to planting all bioretention cells of that type (list types in plan) Palette Type ? Palette Type ? Bulb & Intersection Palette				
Staked layout of proposed trees have been reviewed and approved by SDOT.				
Staked layout of proposed shrubs have been reviewed and approved.				
Staked layout of proposed trees and accent shrubs meet minimum clearance requirements from sidewalk, roadway edge/back of curb, utilities.				
Bioretention soil reviewed for settlement and sediment prior to plant installation or placement of mulch (COS Section 7-21.3(2)A5).				
Bioretention cell planting type and plant density per plans and approved mock-ups.				
Trees installed so that top of the root crown is in accordance with COS Section 8-02.3(6)B Item 3.				
SPU/WTD/SDOT has reviewed installed tree locations.				
Shrubs, groundcovers, perennials and emergent root balls are planted entirely in soil.				
Planting methods have not caused compaction.				
No plants have been installed within flow path of primary drain curb cut .				
If plant substitutions are proposed, these have been reviewed by the lead Landscape Architect and O&M.				
Mulch type and depth installed per plans. Mulch is pulled back ??" from trunks and feathered from stems of installed plants per plans.				
Mulch finished elevation is 1" inch below walks, curbs, pavements and driveways after settlement in accordance with COS Section 8-02.3(4) Item 9.				

Initial inspection of planting complete prior to start of plant establishment period.				
Sod, if applicable, installed per plans with top of sod installed flush with adjacent curbs and sidewalks.				
All adjacent pavements and landscape areas are clean and free of debris.				
Vegetation protection fence is in place after planting work completed in accordance with specifications.				

Bioretention Establishment & Maintenance Checklist (Page 1 of 4)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
City Punchlist items have been addressed and SDOT approval obtained.				
SPU/WTD Punchlist issues have been addressed.				
Log of community interactions submitted daily, if applicable, as they occur.				
GSI Establishment and Maintenance schedule has been submitted prior to start of landscape installation in accordance with the specifications.				
Adjacent areas kept clean and protected.				
Plant protection fence, in included in the specifications, is in place around plantings except bioretention cell crossing zones. Fence is not to be removed without approval.				
Tree watering bags, if applicable, have been installed in areas outside of irrigation and filled at least once a week.				
Landscape receives supplemental water as needed between October and March.				
Automatic irrigation system, if applicable, supplies approx. 1” of water per week between April and September.				
Restored lawn and beds outside of automatic irrigation system have been watered using quick coupler.				
Irrigation system, if applicable, has been repaired and adjusted as needed.				
Litter removed from bioretention cells weekly.				
Litter, organic debris and any obstructions removed from curb cuts, grates, inlets and outlets weekly, prior to forecasted rain events and within 2 days of all major storm events.				
Plants within 2’ of curb inlets adjusted for improved flow.				
Review for erosion once a month and within 4 days following a major storm event. Erosion cuts over 3” wide have been repaired.				
Plants damaged by erosion have been replaced or replanted.				

Bioretention Establishment & Maintenance Checklist (Page 2 of 4)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
Review for sediment accumulation once a month. All visible sediment has been removed manually..				
Vegetation damaged by sediment accumulation and removal has been replaced.				
Compost, mulch or cobbles removed during sediment accumulation removal have been replaced.				
Notify Project Representative if ponding lasts up to 72 hours. Bioretention cells to drain out within 24 hours after storm event has stopped.				
Sediment is less than 6” deep in structures with sumps (COS Section 8-01.3(10)B).				
Sediment is less than 1” deep in underdrain maintenance hole, underdrain maintenance hole with sump, UIC well in maintenance hole, catch basins and inlets.				
There is no sediment or weeds in pavement cracks at catch basins.				
All sediment and debris has been removed from structures at the end of the maintenance period.				
There is no water, sediment or debris accumulation in the underdrain maintenance hole with sump.				
Pipe inlets and outlets are unobstructed and in sound condition.				
Tree stakes are in good condition.				
Walks, planting beds and lawn areas are free of litter and organic debris.				
Vegetation overhanging sidewalk and pervious concrete paths has been trimmed.				
Dead and dying plants have been reported and are replaced per specifications				
Extra staking installed to secure plants pulled by birds/wildlife.				
Pervious concrete paths (if applicable) have been swept once a month between December and August and 2 to 3 times a month between September and November.				
Snow has been removed from pervious concrete paths.				

Bioretention Establishment & Maintenance Checklist (Page 3 of 4)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
Materials have not been stockpiled directly on pervious concrete paths.				
Bare areas greater than 18” in any direction have been replanted in the stoppable groundcover crossings.				
Lawn height, if applicable, is less than 3” otherwise for establishment it is to be mowed (see COS Section 8-02.3(15)).				
Lawn, if applicable, has been mowed at least one time.				
An Insect Pest Management (IPM) program is being followed for insect and pest control. Herbicides, pre-emergent herbicides and insecticides are not applied without approval.				
Weeding is completed per specifications once a month and as needed to prevent weeds from going to seed.				
Mulch has been replenished if settlement is more than 2”.				
Mulch has been replenished to required thickness (COS Section 8-02.3(12) Item 6) or as specified in specs (e.g. 2” depth) immediately after April and October weeding.				
During Plant Establishment (which starts after all plantings are installed and ground disturbance activities completed), TESC and Flow Diversion measures (i.e. block drain curb cuts and plugged pipes daylighting into bioretention cell) in place and maintained to avoid stormwater runoff from street from entering cells.				

Bioretention Establishment & Maintenance Checklist (Page 4 of 4)

Street Name (& intersecting streets): SIP Sheet#:

Date: Inspector:

Item	N/A	Yes	No	Comments
Gutter Flow Test conducted after plant establishment to check inflow points into cells				
• If settlement has occurred within cells, then add material in accordance with specifications (See WTD's Barton Section 02310, para 3.05) prior to conducting flow test.				
• Gutter Flow Test for each street is conducted and approved and checked for each inflow (drain curb cuts, CB grates, pipes etc) point into cell.				
• Test include running gutter flow along all streets sections that include cells or infrastructure that discharges to cellss.				
• If street did not pass gutter flow test, then corrections done and gutter flow test to be conducted again.				
Final walk through to review bioretention facilities, UIC screen wells, pervious concrete paths, plant materials, plant bed conditions and water is completed at end of maintenance period.				
Irrigation:				
• Irrigation Contractor has provided SPU/WTD with all equipment and tools for Substantial Completion.				
• Field meetings with SPU/WTD personnel to ensure familiarity with system operations, maintenance, spring activation and winterizing procedures.				
• Irrigation training sessions, as applicable, for SPU/WTD personnel have been completed.				
• Irrigation watering schedule, if applicable, has been provided.				
Record drawings submitted and approved.				

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Appendix D: GSI Project Close Out Checklist Template

- This section is a placeholder. Contact SPU/WTD Construction and Asset Management for Agency specific procedures.

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Appendix E: GSI Facility Manual Outline

- GSI Facility Manual Outline Example

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Outline example provided by SPU.

GSI Facility Manual
Table of Contents

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Appendix F: GSI Commissioning Specifications Sample

- GSI On-Boarding and Commissioning Flow Chart Sample*
- Example Flow Chart for Gray
- Example Commissioning Specifications for Gray

*Contact SPU Asset Management and Commissioning for sample.

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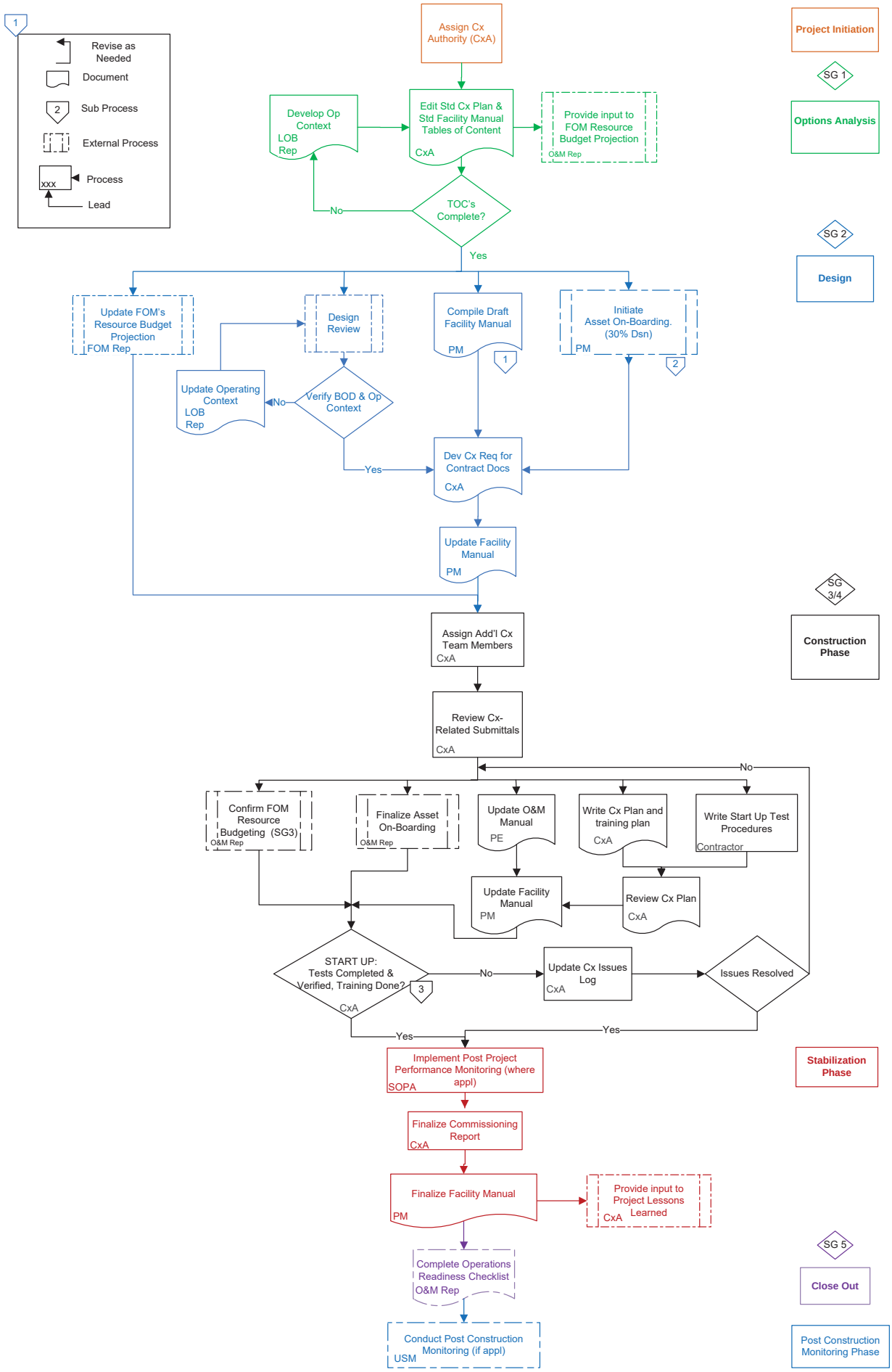
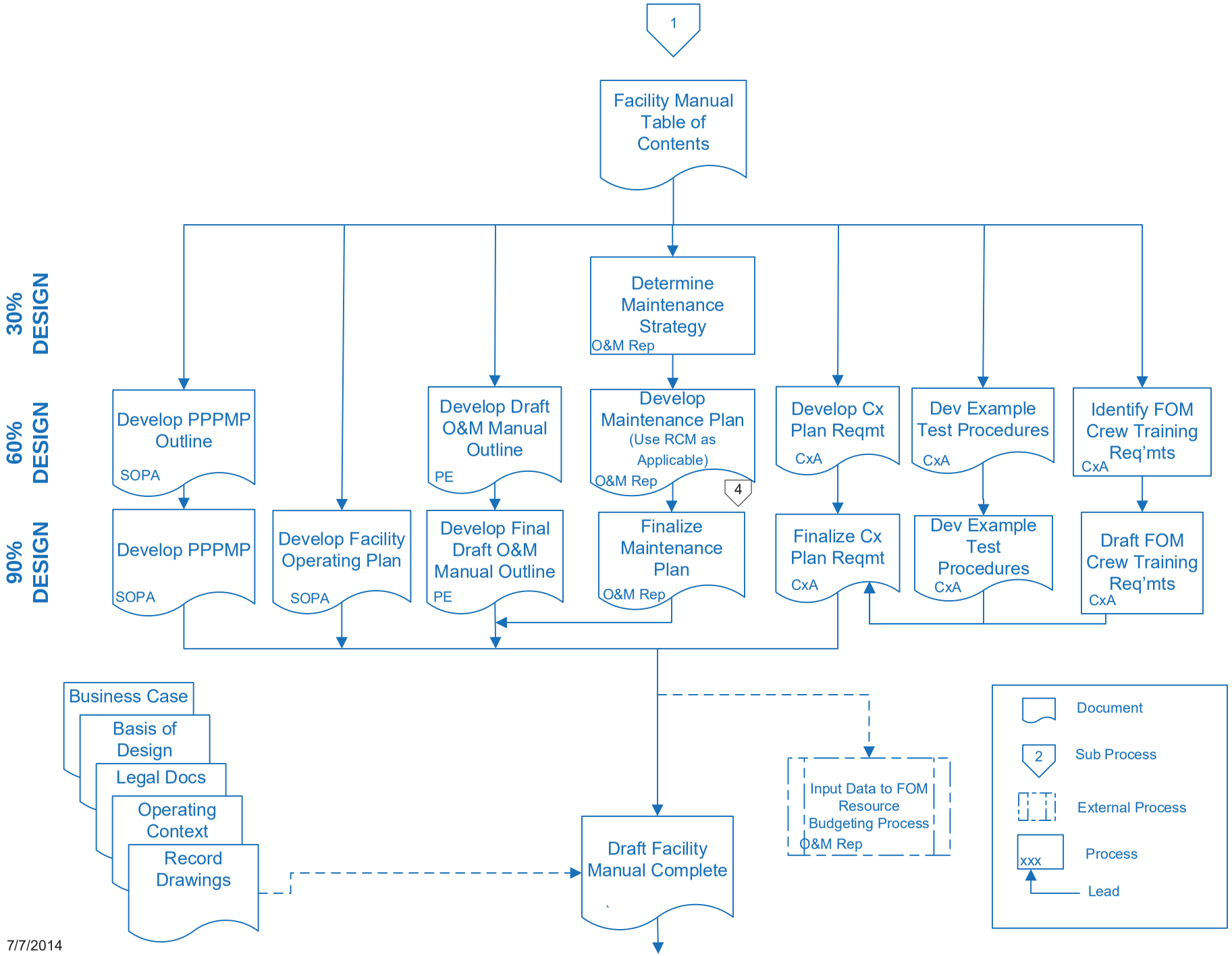
DRAFT Infrastructure Commissioning (Cx) Work Flow

Project Initiation to Stage Gate 5

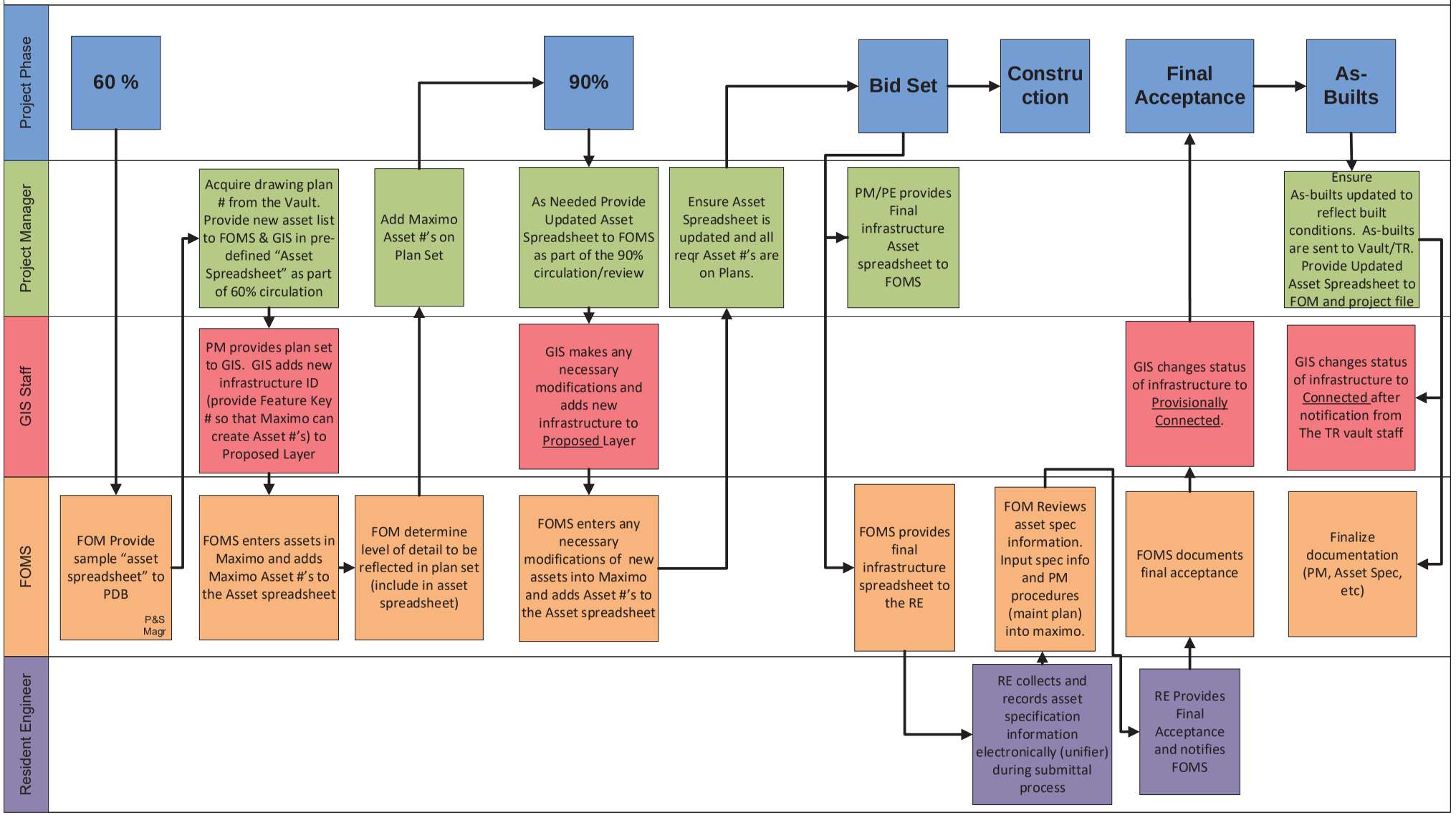


Prepare Draft Facility Manual
Sub Process - Draft



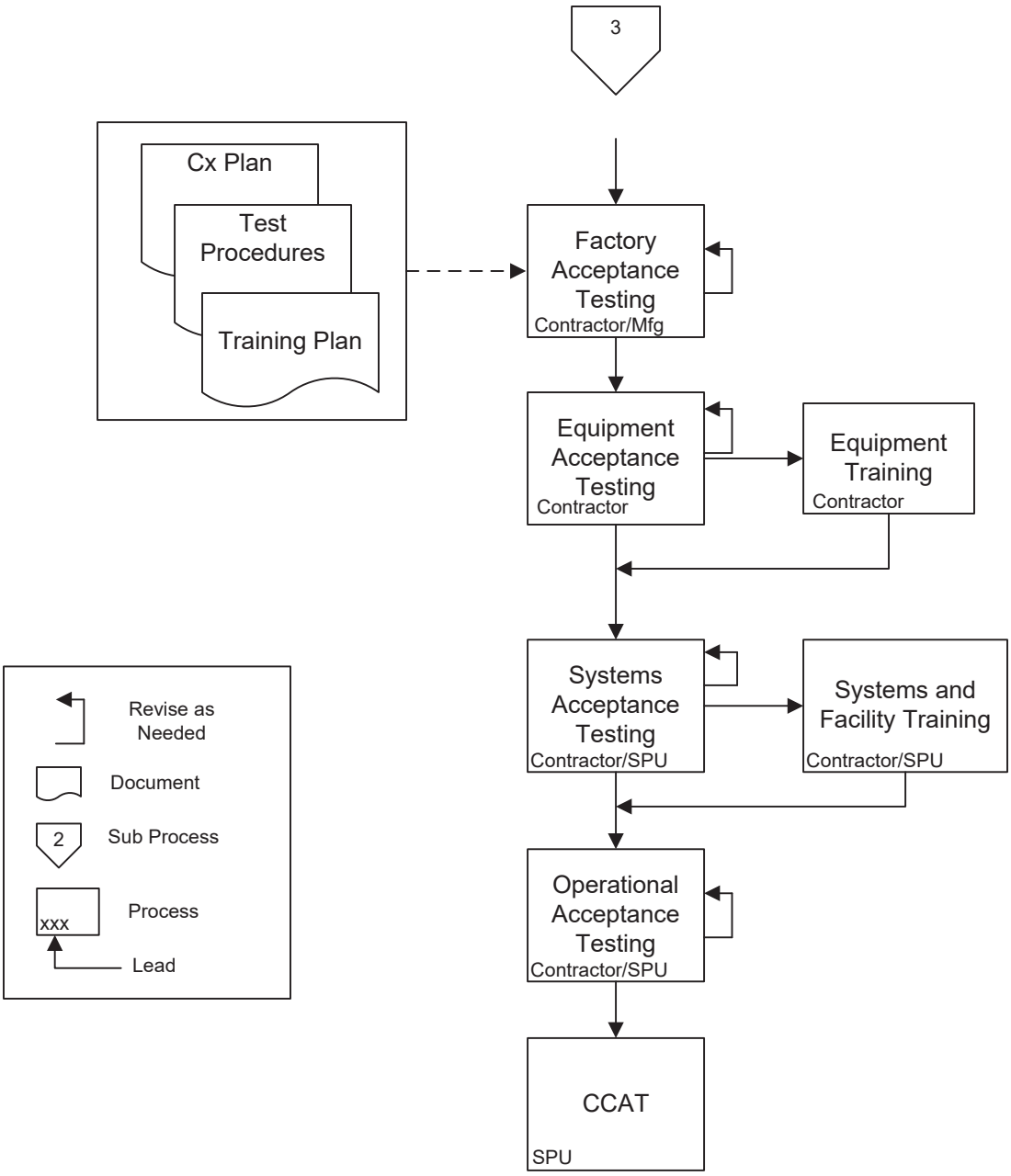
7/7/2014

New Asset Documentation, Maximo and GIS – Starting at 60% Design

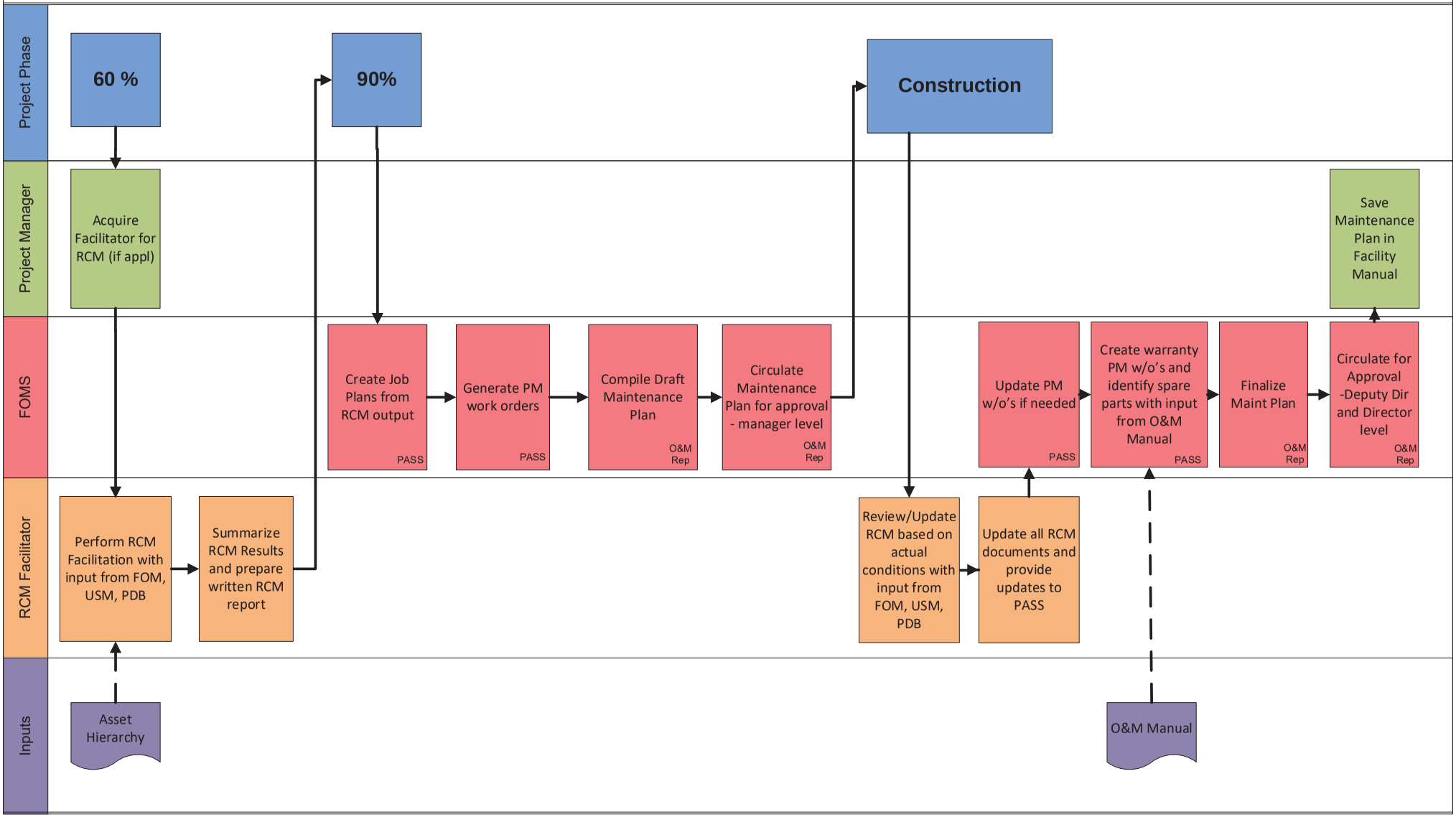


Feb 10, 2014

Direct and Verify Tests, Conduct Training
Sub Process - Draft



Develop Maintenance Plan – Starting at 60% Design



May 20, 2014

7/7/2014

SPECIFICATION SECTION 01 75 00

COMMISSIONING / FACILITY START-UP

PART 1 - GENERAL

1.01 SUMMARY

A. This Specification Section includes general requirements for the commissioning process:

1. Owner will retain a Commissioning Authority to plan and coordinate the commissioning process.
2. Contractor shall cooperate and collaborate with the Owner in the commissioning process.
3. The primary objective of commissioning is to affect an orderly handover of the completed CSO facility, guaranteeing its operability in terms of performance, reliability, safety, and documentation. Commissioning will assure facility operation with full control and monitoring of flows at and between _____, and enable compliance with Ecology permit requirements.
4. Commissioning is intended to achieve the following specific objectives according to the contract documents.
    a. Verify that all applicable equipment and systems are installed in accordance with the contract documents and manufacturer's recommendations.
    b. Verify and document proper integrated performance of equipment and systems, including the SPU SCADA system.
    c. Verify that Operations and Maintenance documentation is complete.
    d. Verify that SPU's operating personnel receive all training as specified in the Contract Documents.
    e. Document the successful achievement of the commissioning objectives listed above.
5. Commissioning activities shall be scheduled in a logical sequence, proceeding from installation and testing of individual equipment components to the implementation and testing of functional sub-systems and the overall facility/system as a whole.

B. Related Sections: Sections include but are not necessarily limited to:

Division 00 Procurement and Contracting Requirements

Division 01 General Requirements

Division 22 Plumbing: for commissioning of plumbing systems, assemblies, equipment and components

Division 23 Ventilating: for commissioning of ventilation systems, assemblies, equipment and components, including balancing and testing

Division 26 Electrical: for commissioning of electrical systems, assemblies, equipment and components

Division 27 Communications: for commissioning of communication systems, assemblies, equipment and components

Division 28 Electronic Safety and Security: for commissioning of electronic safety and security systems, assemblies, equipment and components

Division 32 Irrigation

Division 40 Process Integration: for commissioning of mist and grease filters, instrumentation and controls including valves and gates.

Division 43 Process Gas and Liquid Handling, Purification and Storage Equipment: for commissioning of pumps

Division 44 Pollution and Waste Control Equipment: for commissioning of odor control equipment

Division 46 Water and Wastewater Equipment: for commissioning of-tipping buckets

1.02 QUALITY ASSURANCE

A. Contractor shall install testing equipment and apparatus with experienced personnel trained in the trades and professions required to assure competent workmanship.

B. Contractor shall supervise the installation of specific equipment testing items specified to be accomplished by factory-trained installation specialists furnished or certified by the equipment manufacturers.

1.03 CONTRACTOR REQUIREMENTS

A. Testing, training, and start-up are requisite to the satisfactory completion of the Contract.

B. Complete testing, training, and start-up within the Contract Time.

C. Allow realistic durations in the Progress Schedule for testing, training, and start-up activities.

D. Furnish labor, power, tools, equipment, instruments, and services required for and incidental to completing all testing activities.

E. Provide technical representatives of equipment manufacturers with at least three years of experience for assembly, installation and testing guidance, and operator training.

F. Contractor/vendor supplied training and operational testing or start-up of equipment shall not be scheduled for Mondays, Fridays, Utility observed holidays, or the day immediately before or after Utility observed holidays, unless otherwise approved in advance by SPU.

1.04 DEFINITIONS

A. Commissioning: A systematic process of ensuring that all component systems perform interactively according to the design intent with actual verification of performance. It encompasses the traditionally separate functions of system documentation, equipment startup, testing, training and inspection. It includes making critical adjustments until the facility and SPU personnel are ready for normal and emergency operations.

B. Commissioning Authority (CxA): Person appointed by SPU to oversee and coordinate the commissioning team through all project phases to complete the commissioning process.

C. Commissioning Plan: The plan that documents the organization, schedule, allocation of resources, roles and responsibilities, training plan and materials, testing requirements and procedures to ensure that all component systems perform interactively according to the design intent and SPU's operational needs.

D. Commissioning Team: The group of individuals identified in the Commissioning Plan, who are responsible for developing and implementing the commissioning process.

E. Contractor's Facility Startup Plan: The plan prepared by the contractor to outline and schedule the work that will be performed to meet the requirements of the Contract Documents. This includes the procedures which will be followed in the Systems Acceptance Testing the Operational Acceptance Testing processes.

F. Equipment Operations and Maintenance Manuals: See **Specification Section 01 77 19 - Contract Closeout Requirements** for details.

G. Facility Startup: Marks the start of testing required to successfully transition the facility from the Construction Phase to the Stabilization Phase.

H. Factory Acceptance Testing (FAT): Testing of equipment at the supplier's facility to confirm equipment performance prior to shipment of the equipment to the job site. An example would be a pump test, or a control panel test. This test may require SPU's representative's presence or proper documentation depending on the requirements of the detailed equipment specification sections.

I. General Contractor Commissioning Agent (GC CxA): Person appointed by the General Contractor to work with the Commissioning Authority to oversee the commissioning process. The GC Cx is the go to person for the General Contractor in regards to all commissioning activities required of the General Contractor.

J. Manufacturer's Field Service Report: An Owner provided form. This report documents that the equipment has been properly installed and is ready for operation. In addition, the report documents baseline conditions of motor amperage and voltage for each phase, vibration readings, rotation, alignment and all other specified tests to ensure that the equipment has been installed properly. The warranty period will not start until the final Manufacture's Field Service report is submitted, acceptable operation of the equipment has been demonstrated, and SPU has assumed control of the equipment or facilities. The affected equipment is identified in the individual equipment specifications.

K. Operating Context: The circumstances in which a physical asset or system is expected to operate throughout its life cycle. Refers to internal and external factors (e.g. environmental standards, safety hazards, repair time, spares etc.) affecting asset/system/equipment/facility operation.

L. Operational Acceptance Testing (OAT): Includes testing of the entire project for a specified duration (e.g. 7 day 24 hours/day), including all systems and their interactions to ensure it operates as designed and at performance standards as defined in the contract specifications. Successful completion of Systems Acceptance Testing is a prerequisite for this activity. Testing is conducted using the product (e.g. water, wastewater, refuse) and demonstrates operations in all control modes (Manual, Remote, and Automatic), under various conditions including emergency shut down and restart, and may include uninterrupted running of the equipment for a specified number of days.

M. Systems Acceptance Testing (SAT): This test verifies the proper operation and interaction of equipment sub-systems, ancillary systems, and SCADA control and logic. Each system shall be tested for a specified duration of time (e.g. 7 day 24 hours/day). If any system malfunctions during the test period, the item or equipment shall be repaired and the test restarted at time zero with no credit given for elapsed time before the malfunction. Normally, this test occurs with clean water. The Manufacturer's Field Service Report is provided in the Contract Documents as a certification record of proper installation and operation. This document must be signed by the Manufacturer's Representative prior to the end of the SAT. Equipment O&M manuals are submitted before completion of this phase. After successful completion of all Systems Acceptance Tests, the project is ready for the Operational Acceptance Testing.

N. Systems, Equipment, and Components: Where these terms are used together or separately, they mean systems, equipment, and components as constructed or installed.

1.05 COMMISSIONING TEAM

A. General: Owner will retain a CxA to organize the commissioning team and plan as required to meet Owner's requirements for the Project.

B. Contractor Participants:

1. General Contractor Commissioning Agent (GC CxA) as designated by the General Contractor to work with the Commissioning Authority to oversee the commissioning process.

2. Individuals as appointed by the Contractor having authority to act on behalf of the entity this individual represents to implement the commissioning process through coordinated action.

3. Contractor's commissioning team shall include, but not be limited to, Project superintendent, GC CxA, subcontractors, installers, suppliers, and specialists as requested by the CxA.

C. Owner Participants:

1. Commissioning Authority (CxA): The CxA is the designated entity that will plan and coordinate the commissioning team to implement the commissioning process.

2. Facility users, operations and maintenance personnel as designated by Owner.

3. Designers (in-house and consultants) whose disciplines are affected by the commissioning process.

1.06 SPU'S COMMISSIONING PLAN

A. The Commissioning Plan is written by the Commissioning Authority and documents the commissioning process. The Commissioning Plan provides a contact list for key personnel associated with the commissioning process, as well as their roles and responsibilities of the commissioning team.

1.07 CONTRACTOR'S FACILITY STARTUP PLAN

A. To maintain continuity throughout the Startup process a Contractor's Facility Startup Plan must be provided by the General Contractor for review and approval. The Contractor's Facility Startup Plan is a complete outline and schedule showing dates and dependencies of the work that will be performed to meet the equipment Startup requirements of the Contract Documents.

B. The Contractor's Facility Startup Plan must be submitted for review not less than 21 days prior to the planned Startup of any piece of equipment or system. The plan shall address all operating requirements set forth in the Contract Documents.

C. The plan will provide at least the following details of the Startup process:

1. Provide a schedule for the following activities:
    a. Equipment Installation
    b. Manufacturer's Field Services (Equipment testing, separately depicting individual pieces of equipment or groups of equipment that will be tested concurrently)
    c. Equipment vendor provided operator training
    d. Submission of equipment operation and maintenance manuals
    e. Conveyance pipeline pressure testing
    f. Schedule and written description for storage leak test. Indicate source of water
    g. Factory Acceptance Testing
    h. Loop testing plan, checklists and sample forms
    i. Instrumentation Calibration and Certification
    j. Programmable Automatic Controller and Controller Testing
    k. System Acceptance Testing, depicting each system test separately
    l. Operational Acceptance Testing, depicting testing of the entire facility
    m. Acceptance Test Report preparation
    n. Owner Reviewed Startup Test Report
2. Provide equipment test procedures with test logs for each item of equipment and each system. Include testing of alarms, control circuits, capacities, speeds, flows, pressures, vibrations, sound levels, and other parameters as specified in the contract documents.

3. Provide summary of shutdown requirements for existing systems, which are necessary to complete Startup of new equipment, and systems, if applicable.
4. Revise and update Contractor's Facility Startup Plan based upon review comments, actual progress, or to accommodate changes in the sequence of activities. Potential changes to be discussed at the weekly project meeting and shown on the 3-week look-ahead schedule.
5. Mechanical equipment testing and startup procedures and checklist showing all mechanical equipment and the required factory and field testing, manufacturer's services, certifications, startup activities, spare part delivery, O&M Manuals, training and other submittals.
6. Electrical equipment testing and startup procedures and checklist showing items to be tested, tests to be performed, O&M Manuals, training and other submittals.
7. Schedule, procedures, checklists and sample test forms for instrumentation and control system testing, inspection, calibration, I&C system start-up and I&C system commissioning.
8. Loop testing plan, checklist, and sample test forms.
9. Schedule and written description for storage leak test. Indicate source of water.
10. Description of equipment and controls to be tested as a System. Indicate source of water.
11. Description of System Test(s) including equipment controls and instrumentation included in each test. Indicate source of water.
12. Description of Acceptance Test, including schedule of activities and proposed operating parameters during Acceptance Test.
13. List of activities that require coordination with the Owner, including Owner furnished supplies, shutdown of existing systems requests, and training of Owners' personnel.

1.08 SYSTEMS TO BE COMMISSIONED

A. Systems to be commissioned shall include the following:

1. Mechanical
2. Electrical
3. Instrumentation and Control
4. Telemetry/Communications
5. Security
6. Conveyance
7. Flow Control
8. Monitoring
9. Storage tank flushing/cleaning
10. Plumbing
11. Ventilation

12. Odor Control
13. Gas Monitoring/Detection
14. Landscape irrigation

B. Equipment to be commissioned shall include the following:

1. Valves
2. Gates
3. Actuators
4. Sensors
5. Gauges
6. Pumps
7. Motors
8. Ventilation
9. Fans
10. Ducting
11. Filters
12. Odor Control
13. Motor Control Center
14. Panelboard
15. Switches
16. Uninterruptible Power Supply
17. Lighting
18. Tipping Buckets
19. Plumbing
20. Hatches/Doors
21. Programmable Automation Controller (PAC) hardware
22. Network Interface Unit (NIU)
23. Telemetry system accessory

1.09 ROLES AND RESPONSIBILITIES

A. Owner's Responsibility:

1. Owner will provide the project requirements to the CxA and Contractor for information and use:
    a. Project requirements may include Basis of Design documentation prepared by Designers for use in the commissioning process.
2. Owner will provide water for testing.

3. The Owner will provide control system programming and will participate in testing the control system as specified in **Specification Section 40 98 00 – Control Panels and Enclosures**.
4. Owner will assign operation and maintenance personnel as appropriate to participate in the commissioning process.
5. The Owner will review and approve the Contractor's Facility Startup Plan and Schedule submitted by the Contractor.
6. The Owner shall review and approve the O&M manuals submitted by the Contractor.

B. Contractor's Responsibility:

1. Ensure a General Contractor Commissioning Agent (GC CxA) is available for commissioning meetings as requested by the CxA. This person must be authorized to make decisions relating to the commissioning process.
2. Provide a Contractor's Facility Startup Plan that lists individual equipment and systems and provides a startup sequence demonstrating all operating requirements set forth in the Contract Documents. The Contractor's Facility Startup Plan will demonstrate all permissive, monitoring, control and alarm functions. The Contractor's Facility Startup Plan will be provided not less than 21 days prior to the planned initial equipment or system startup. The Contractor's Facility Startup Plan must meet the requirements of the Contract Documents.
3. Coordinates the Contractor's Facility Startup Plan by developing test plans, forms, reports and procedures to be implemented by the sub-contractors and equipment vendors.
4. Facilitate the coordination of the commissioning work required by the Commissioning Plan and Contract Documents. Ensure commissioning work is being included in the master project schedule.
5. Ensure all subcontractors, vendors and Manufacturer's Representatives and Testing Agents execute their commissioning responsibilities according to the Contract Documents, Commissioning Plan and Schedule.
6. Ensure representatives of subcontractors and manufacturers are available for commissioning meetings when required.
7. Complete a Manufacturers Field Service Report form for each piece of mechanical equipment and ensure compliance with the Contract Documents.
8. Ensure all equipment and systems are properly maintained when operated during testing and commissioning.
9. Ensure a manufacturer's representative is available during equipment Startup Testing activities as required by the Contract Documents.
10. Ensure construction staff are available to address electrical and mechanical issues which arise during the commissioning process.
11. Coordinate SPU equipment training process and required notifications to the RE.
12. Ensure equipment O&M Manuals meet all contract document requirements to expedite the approval process.

13. Ensure all spare parts and materials are delivered to SPU's representative and documented as required.
14. Submit final test results, training material and other documentation to the CxA for inclusion into the Final Cx Report.
15. Ensure red-lined conforming drawings are submitted to RE/HDR monthly in order to be completed and ready for distribution to SPU at construction completion.

C. Commissioning Authority CxA's Responsibilities (for reference only):

1. Plan and coordinate the commissioning process.
2. Provide the commissioning plan.
3. Organize and lead the commissioning team; and organize the commissioning team meetings.
4. Inform all parties on the status, integration, and performance of systems within the facility.
5. Develop examples of the project-specific construction checklist and commissioning test procedures.
6. Review contractor provided Construction Checklist to ensure it meets the Contract Document requirements.
7. Verify the execution of commissioning activities by reviewing equipment submittals, the Construction Checklists, training materials, O&M data, commissioning schedule, tests procedures and test reports to verify compliance with Owner's project requirements.
8. Prepare and maintain the Commissioning Issues Log.
9. Monitor the status of the Construction Checklist to ensure all requirements of the commissioning process are achieved.
10. Recommend the involvement of the facility operations personnel in the commissioning process, and coordinate training of operating personnel on each system.
11. Review the Contractor's Facility Startup Plan and Schedule of Activities, recommend approval to the Resident Engineer (RE) and include the Startup Plan as an Appendix in the Commissioning Plan.
12. Witness and verify the SAT and OAT testing process as needed and recommend final acceptance to the RE.
13. Review and comment on the equipment O&M manual submittals.
14. Prepare the final Commissioning Report and recommend acceptance of the facility to the PM.
15. Provide technical expertise to oversee and verify correction of deficiencies found in the commissioning process.
16. Assist with resolution of commissioning related disputes.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Provide and use test equipment in accordance with equipment manufacturer's recommendations.

B. All industry standard test equipment required for performing the specified tests shall be provided by the appropriate contractor and approved by the CxA. Any proprietary vendor specific test equipment or software shall be provided by that vendor or manufacturer.

C. Any portable or hand held setup/calibration devices required to configure the control system shall be made available to the control vendor at no cost to the Owner.

D. The test instrumentation used in the commissioning process shall meet the following standards:

1. Be of sufficient quality and accuracy to test and/or measure system performance within the tolerances required.
2. Be calibrated at the manufacturer's recommended intervals with the calibration tags permanently affixed to the instrument.
3. Be maintained in good repair and operating condition throughout the duration of use on this project.

PART 3 - EXECUTION

3.01 GENERAL

A. Prerequisites: The following shall be completed before commencing the Systems Acceptance Testing:

1. Furnish all technical information required by the Contract Documents.
2. Provide all safety equipment, emergency shower and eyewash units, fire extinguishers, gas detectors, protective guards and shields, emergency repair kits, safety chains, handrails, gratings, safety signs, spare parts, and valve and piping identification required by the Contract Documents. Devices and equipment shall be fully functional, adjusted, and tested.
3. Manufacturer's Field Service Report forms have been accepted.
4. All System tests including leakage tests, mechanical tests, electrical tests, instrumentation and control tests, and all adjustments have been completed and approved by the Engineer.
5. Approval of the Contractor's Facility Startup Plan and the procedures for the System Acceptance Testing and Operational Acceptance Testing processes.
6. Functional verification of the individual instrumentation loop (analog, status, alarm, and control) from the field devices to the workstation display screen at SPU's Control Center.
7. Contractor shall coordinate verification by Engineer of the Owner-provided equipment prior to Acceptance Testing.

8. Adjustment of the pressure switches, flow switches, temperature switches, RTD monitors, pressure regulating valves, and other control devices to the setting determined by the Engineer or the equipment manufacturer.

9. Functional verification of the individual interlocks between the field mounted devices and the motor control circuits, control circuits of controllers, and packaged system controls.

B. Supplies: The Contractor shall furnish:

1. Fuel

2. Oil

3. Grease

4. Other necessary materials that are not specifically listed for the Owner to furnish

C. Record of Testing and Startup: The Contractor shall maintain the following during all testing and startup and submit originals to Engineer prior to acceptance:

1. Lubrication and service records for each mechanical and electrical equipment.

2. Hours of daily operation for each mechanical and electrical equipment.

3. Equipment alignment and vibration measurement records.

4. Logs of electrical measurements and testing logs.

5. Instrumentation calibration and testing logs.

6. Testing and validation of SCADA inputs, outputs, logic functions, status indications, and alarms. Contractor shall coordinate testing and validation by Engineer of Owner-provided equipment used for testing and startup.

7. Factory and field equipment settings.

8. Log of problems encountered and adjustments made.

9. Other records, logs, and checklists as required by the Contract Documents.

3.02 SYSTEM ACCEPTANCE TESTING (SAT)

A. After individual equipment items have been tested and certified as required by the Technical Specifications, tests of systems comprised of single and multiple equipment items with appurtenant equipment and instrument and controls shall be conducted. Equipment shall be tested as part of a system to the maximum extent possible.

B. The Contractor shall demonstrate both the manual and automatic modes of operation to verify proper control sequences, software interlocks, proper operation of software logic and controllers etc. System testing shall include the use of water or other process media, as applicable, to simulate the actual conditions of operation.

C. Systems testing activities shall follow the detailed test procedures and checklists in the Contractor's Facility Startup Plan. Completion of system testing shall be documented by a report.

D. System test the utility, safety equipment, and other support systems.

E. Furnish the Engineer with a written notice confirming the start date of System Acceptance Testing at least 10 days prior to commencement.

F. The Owner's staff will observe Systems Acceptance Testing.

G. Arrange for manufacturer's representatives to revisit the Site as often as necessary to correct malfunctions to the Engineer's satisfaction.

H. Each system shall be tested for a continuous, 7 day, 24 hour/day period. If any system malfunctions during the test period, the item or equipment shall be repaired and the test restarted at time zero with no credit given for elapsed time before the malfunction.

3.03 OPERATIONAL ACCEPTANCE TESTING (OAT)

A. The Contractor shall start up the facility and operate it at rates directed by the Engineer without malfunction for a continuous 7 day, 24 hour/day acceptance test period. If any equipment item, subsystem, or system malfunctions during the test period, the item shall be repaired and the test restarted at time zero with no credit given for elapsed time before the malfunction.

B. Defects in material or workmanship that appear shall be promptly corrected. Time lost for wiring corrections, control point settings, or other reasons that interrupt the test may, at the judgment of the Engineer, be cause for extending the test period an equal amount of time.

C. Operational Acceptance Testing shall not begin until leakage tests, instrumentation and control tests and adjustments, electrical tests and adjustments, equipment field tests, and system tests have been completed to the satisfaction of the Engineer.

D. The Contractor shall furnish the services of manufacturer's representatives, if necessary, to correct equipment malfunctions.

E. During acceptance testing, the Contractor shall lubricate and maintain equipment in accordance with manufacturer's recommendations, and clean or replace filter elements.

3.04 TRAINING

A. See individual Specification Divisions 02 through 48 and **Specification Section 01 77 19 - Contract Closeout Requirements** for training requirements.

B. Provide minimum of (40) hours of on-site equipment training to Owner's personnel following testing of installed equipment. Provide minimum of (40) hours of on-site system training following System Testing.

C. Ensure that the training schedule is clearly identified on the Commissioning schedule. Session beginning and ending times shall be coordinated with the Resident Engineer and indicated on the Commissioning schedule.

PART 4 - MANUFACTURER'S FIELD SERVICE REPORT FORM

MANUFACTURER'S FIELD SERVICE REPORT

Note to Contractor and Manufacturer's Representatives:
This field service report is by necessity, generic in nature. An electronic PDF Fillable Form version of this report will be furnished upon request to the Engineer. This report documents that all requirements of the individual equipment specifications have been met. In addition, the report documents baseline conditions of motor amperage and voltage for each phase, vibration readings, rotation, alignment and all other applicable tests required to insure that the equipment has been installed properly. Further the report documents that the equipment Operations and Maintenance Manual meets the specification requirements. The warranty period will not start until the final service report is submitted, acceptable operation of the equipment has been demonstrated, and the Owner has assumed control of the equipment or facilities. The affected equipment is identified in the individual equipment specifications.
Field Service Report Definitions:
Initial Service Report - Required for construction preparation. Equipment delivered to site is in good condition and conforms to specification requirements. Anchor bolts, hardware and ancillary items (piping, flanges, conduits, fuel/power supply) are compatible with equipment.
Interim Service Report - Required for equipment installation onto base or foundation. Piping connections, electrical and control connections or structural attachments are complete. For equipment stored on-site over four weeks, interim service report will document that manufacturer's long-term storage procedures have been incorporated and equipment has not been damaged, nor coatings deteriorated.
Final Service Report - To be completed when equipment can be started, electrical amperage and voltage draw measured, cold and hot alignments performed, vibration testing and monitoring performed and the equipment is found to be in compliance with Manufacturer's operating parameters and the requirements of the individual equipment specifications. Upon successful operation of the equipment and acceptance by the Owner, the equipment warranty will commence.

Project Name _____

Report Type and Status
Initial Service Report submitted (date) _____

Interim Service Report submitted (date) _____

Final Service Report submitted (date) _____

Warranty Start (date) _____

Note: warranty can only start at the time of substantial completion for beneficial use or when partial utilization of specific areas of the project are substantially complete

Equipment Data

Name _____
Serial Number _____
Specification Section _____
Manufacturer _____
Representative _____
Current year replacement cost: _____

Installation Overview

Comments, if necessary, can be added below by reference to the numbered sentences.

1. The above referenced equipment/material/supplies have been inspected, checked, and properly adjusted. Yes _____ No _____

2. The above referenced equipment/material/supplies were placed upon properly prepared or suitable substrate. Not applicable _____ Yes _____ No _____

3. The above referenced equipment/material/supplies are free from any undue stress imposed by any connected piping, anchor bolts or any other load. N/A _____ Yes _____ No _____

4. The above referenced equipment/material/supplies were operated under design conditions. If not provide operating conditions in comments. N/A _____ Yes _____ No _____

5. The above referenced equipment/material/supplies have been installed in accordance with the manufacturer's recommendations and the Procurement Documents, require no corrective work, and are hereby approved. Yes _____ No _____ (*If not, explain in item 6*)

6. The above referenced equipment/material/supplies are acceptable to the manufacturer as installed, provided the following corrective action(s) are performed:

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

   Corrective Actions completed (date):_____

7. Additional Comments

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

Installation Inspection Checklist

Item	Acceptable (Yes/No)	Readings	Units
Mechanical			
Anchor Bolts		-	-
Grout		-	-
Rotation Direction		-	-
Alignment (visual)		-	-
Alignment Measurement [1]		Attach report	-
Bearings [1]		-	-
Belts		Belt tension	pounds-force
Lubrication Levels		-	-
Mechanical Seal or Packing		-	-
Vibration [1,2]		Attach report	-
Infrared Thermography [1,2]		Attach report	-
Electrical (at design load)		P 1 / P 2 / P 3	
Current		/ /	amps
Voltage		/ /	volts
Infrared Thermography[3]		Attach report	
Miscellaneous			
Seal Water Flow Rate			gph
Seal Water Pressure			psi
Sound Level [1] (4 feet away)			dB

Notes:
1. If required by the individual equipment specification. Attach test reports.
2. Provide test procedures for Engineer's review and approval prior to testing.
3. All motors, disconnects, VFDs, MCCs, switchgear and panelboards if not identified in Specification Section 16000.

Equipment Warranty

Equipment Warranty provided with Owner's name and Equipment ID Yes _____ No _____

Operations and Maintenance Staff Training

1. T raining and instruction have been performed in accordance with the requirements of the Contract.
N/A _____ Yes _____ No _____
2. Final training completed on (date): _____

Certification
I hereby certify that I, _____, am a duly authorized representative of the manufacturer, that I am empowered by the manufacturer to inspect, approve, and operate this equipment, and that I am authorized to make recommendations required to assure that the equipment furnished by the manufacturer is complete and operational, except as modified herein. I also certify that all information contained herein is true and accurate.

By: Authorized Representative _____

For: Manufacturer _____

Date _____

Acknowledgments
By: Authorized Representative _____

For: Manufacturer _____

Date _____

By: Contractor Representative _____

For: Contractor _____

Date _____

By: Owner Representative _____

For: Owner _____

Date _____

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Appendix G: Public Outreach

- SDOT's "Notice of Construction in the Public Right of Way Neighborhood Flyer"
- Examples for SPU's Notice of Upcoming Construction Project
  - Ballard Phase II NDS 2016
  - Delridge NDS 2015
- Examples during construction from King County Barton Project Outreach Materials:
  - "Tree Planting Tips" flyer to residents for tree transplanting.
  - "Construction to start on your block as early as (Day), (Date)" flyer to residents
  - "Crews to conduct roadside rain garden flow testing on August 28" flyer to residents for construction testing notification
  - "Rain garden construction starting as early as Wednesday, May 6" flyer to residents for construction notification
  - Plant identification guides for roadside rain garden (bioretention) plant palettes for residents to use to identify what was installed along their block:
    - "Airy Palette"
    - "Blended Palette"
    - "Curb Bulb and Intersection Palette"
    - "Framed Palette"
    - Map for "Roadside rain garden plant palette tours" during post construction celebration event
  - Pre-Construction Survey
  - Post –Construction Survey
  - Maintenance Flyer

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See SDOT website for latest version of this flyer for SIP projects:
http://www.seattle.gov/transportation/stuse_sip.htm

NOTICE OF CONSTRUCTION IN THE PUBLIC RIGHT OF WAY
NEIGHBORHOOD FLYER

GENERAL CONTRACTOR: _____

SDOT Project #:_____

Purpose:	The purpose of this flyer is to notify you that _____ (General Contractor's name) will be starting the Street Improvement portion of the work for the project located at _____ (project address) the work is scheduled to begin on or about _____ (proposed start date).
Details of work to be performed:	The Street Improvements to be constructed in the public right of way include: _____ _____ _____ _____ _____ (description of work to be performed in the right of way)
Vehicular and pedestrian traffic impacts:	Expected closures and estimated dates of closures: (sidewalk, street, alley, etc.)
General Contractor Contact Information:	Please contact _____ (General Contractor's name) at _____ (General Contractor's 24 hour contact phone number) With any questions or concerns that you have regarding the work to be performed in the right of way.
FOR SDOT USE ONLY:	
SDOT Approval:	Approved for distribution to all neighbors impacted by the construction of the permitted Street Improvements. Flyer must be distributed a minimum of two weeks prior to construction. _____ (SDOT SIP Project Manager signature) _____ (Date)

Revised 3/10/10
Effective 4/5/10

Seattle Public Utilities

NOTICE OF CONSTRUCTION WORK

April 1, 2016
Ballard Natural Drainage Systems

PROJECT DESCRIPTION

Seattle Public Utilities (SPU) is planning to construct natural drainage systems (rain gardens) in the planting strip along several blocks in the Loyal Heights neighborhood of Ballard. About two-thirds of Seattle is served by a combined sewer system designed to carry sewage from inside homes and businesses along with polluted runoff from streets and rooftops in a single pipe—a "combined sewer." When the area experiences heavy rain events, the pipes can become overloaded with stormwater and the mixture of polluted runoff and raw sewage can overflow into lakes, streams, and Puget Sound.

The mixture of polluted runoff and raw sewage may harm fish, wildlife, and swimmers in the areas where overflows occur. In 2012, during a year of high-rain, Ballard deposited 54 million gallons of raw sewage and polluted rainwater into Salmon Bay when the combined sewer system reached capacity and overflowed. By keeping polluted runoff out of the sewer system with natural drainage systems, we can leave more room in the pipes for sewage and help prevent these overflows.

SCHEDULE

Work will begin on April 18, 2016 and take approximately 7-8 months. Anticipated work hours are Monday through Thursday 7:30 a.m. to 6 p.m.

LOCATION

Work will take place in several locations along 17th , 19th, and 26th avenues northwest, and Northwest 75th, 77th and 80th streets. The contractor plans to start work on Northwest 75th Street between 22nd and 23rd avenues northwest and continue east to 19th Avenue Northwest. Work along Loyal Heights Elementary school will not start until June 27 to coincide with summer break and the school's upcoming improvement plans. To view the work planned closest to your home, see the enclosed maps or visit www.seattle.gov/cso/ballard.

YOU CAN ANTICIPATE THE FOLLOWING

- Parking restrictions during work hours.
- Temporary sidewalk and traffic lane closures.
- Temporary service interruptions to water and sewer.
- Constructions materials and equipment in street.
- Increased construction traffic, noise, dirt, and vibrations.
- Access to homes and driveways will be maintained.

FOR MORE INFORMATION, CONTACT

Grace Manzano, Project Manager, (206) 233-1534 or grace.manzano@seattle.gov
Robert Case, Resident Engineer, (206) 512-7044 or robert.case@seattle.gov

MEET THE TEAM

Before we start construction, join the Ballard Natural Drainage Systems Resident Engineer Robert Case at a drop-in session to learn more about the work on-site and ask any questions you may have about work near your home

- **WHEN:** 10 a.m. – noon, Saturday, April 16, 2016
- **WHERE:** Intersection of NW 75th Street and 21st Avenue NW on the sidewalk

Seattle Public Utilities

NOTICE OF UPCOMING WORK

October 27, 2015

Delridge Natural Drainage System Construction along 17th Ave SW

PROJECT DESCRIPTION

SPU is planning to construct a natural drainage system along several blocks of 17th Ave SW in the South Delridge neighborhood. Natural drainage systems are designed to capture (and clean) polluted runoff at its source.

SCHEDULE

Work is expected to begin in November and will continue through the spring of 2016. Work hours are Monday through Friday, 7:00 am to 6:00 pm, with occasional extended hours and weekend work if certain activities require. Advanced notice will be sent via the project listserv if work is anticipated for the weekend.

LOCATION

Several locations along 17th Avenue Southwest between SW Kenyon Street and SW Henderson Street. The contractor plans to begin work near SW Henderson Street and 17th Ave SW between SW Henderson Street and SW Trenton Street. Construction will then proceed north to SW Kenyon Street.

ANTICIPATED IMPACTS

A limited number of residents will experience infrequent outages to their water, sewer, and electricity services during construction. Impacted residents will be informed of these outages well in advance. In addition, you can expect:

- Increased truck and construction vehicle traffic
- Temporary traffic disruptions during work hours
- Temporary parking restrictions
- Noise, dust and vibrations

FOR MORE INFORMATION, CONTACT:

Jason Sharpley, Project Manager at (206) 615-0030 or jason.sharpley@seattle.gov
To learn more about the project and to sign-up to receive project updates, please visit:
www.seattle.gov/util/delridgends

For interpretation services please call (**206) 615-0030.**
如需要口譯服務，請撥電話號碼 (206) 615-0030
통역 서비스를 원하시면 (206) 615-0030으로 전화하세요.
Para servicios de interpretación por favor llame al (206) 615-0030
Về dịch vụ phiên dịch xin gọi (206) 615-0030.
Para sa serbisyo ng tagapagpaliwanag, tumawag sa (206) 615-0030.

King County

Barton Combined Sewer Overflow (CSO) Control Project

Tree Planting Tips

Here are some tips to ease the transition.

1. **Call before you dig**

   Call 1.800.424.5555 to locate underground utilities at least 2 days prior to digging.

2. **Pick a spot**

   Pick a spot appropriate to the mature size of the tree. Plant the tree at least 5 feet from underground utilities.

3. **Measure**

   Measure the height from the root flare (the area where the first major roots extend out from the trunk) to the bottom of the rootball to determine how deep a hole to dig for the tree.

4. **Dig**

   Dig a hole 2-3 times wider than the rootball to the depth determined in Step 3.

5. **Check your work**

   Make sure the root flare is at least one inch above the soil line and that the tree is standing upright. Fill the planting hole about 1/3 full with native soil and gently tamp the soil around the rootball to remove air pockets. Completely fill the planting hole with soil and gently tamp again.

6. **Mulch**

   Remove the grass from about 2 feet around the tree trunk to protect the trunk from mowers and weed trimmers. Add a 2-4 inch thick layer of mulch around the tree base. Do not let the mulch touch the trunk (it will lead to decay).

7. **Water**

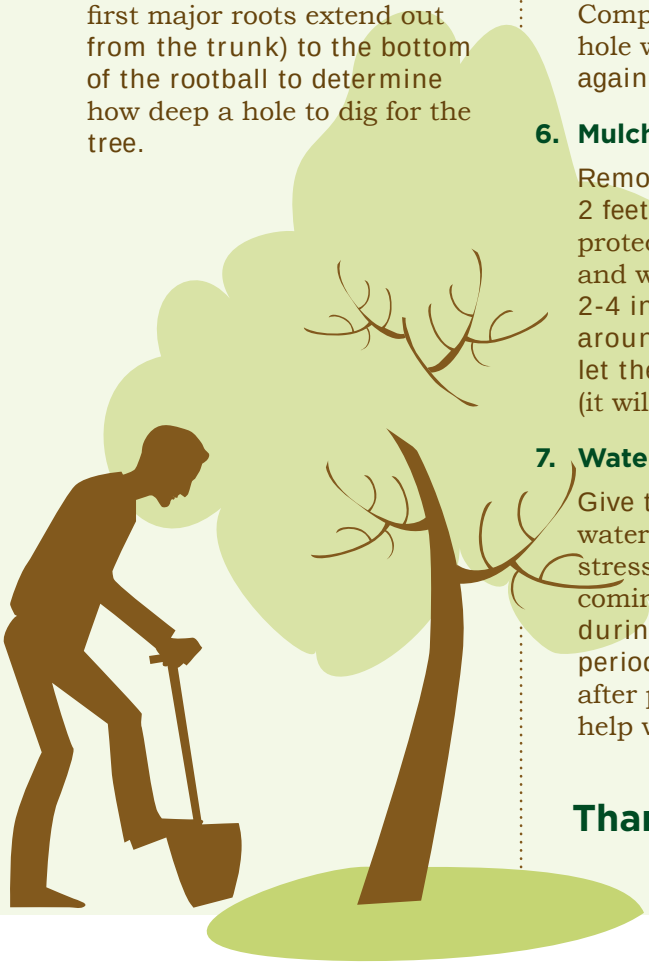
   Give the tree a good drink of water to help it overcome the stress of planting. And keep it coming! Water the tree weekly during the summer drought period for at least three years after planting. A tree bag can help with this.

8. **Stake (if needed)**

   Staking is recommended for trees 2 inches in diameter or greater. Use use 8-foot tall stakes approximately 2 inches in diameter, inserted at the edge of the rootball, approximately 2 feet deep. We recommend using 'chainlock' ties. Nail the ties to the stake and loop each tie around the tree loosely to provide 1-inch slack for trunk growth. Remove ties and stakes after one year.

9. **Fertilize (if needed)**

   Apply a slow release organic fertilizer per the manufacturer's directions if the leaves turn yellow or the tree is not growing.



For additional tree planting tips:

seattle.gov/trees/planting.htm

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Thank you for giving this tree a new home.

Making Our Streets Work Like A Forest

King County is constructing bioretention swales on 15 blocks in the Sunrise Heights and Westwood neighborhoods. The project will reduce the amount of untreated sewage and stormwater that is released into Puget Sound at the Barton Pump Station. When the swales are completed in 2015, street runoff will be diverted away from storm drains and into the swales. The swales will help our city's drainage system work more like a forest by slowing and cleaning polluted stormwater runoff and allowing it to soak slowly into the ground.

Barton by the Numbers

15
Blocks getting swales

24
Trees to be transplanted

95
New trees planted in the swales and planting strips

5,000
New plants per block

75,000
Total number of new plants

Questions?

For more information about the Barton CSO Control project:

Kristine Cramer
206-477-5415

Kristine.Cramer@kingcounty.gov

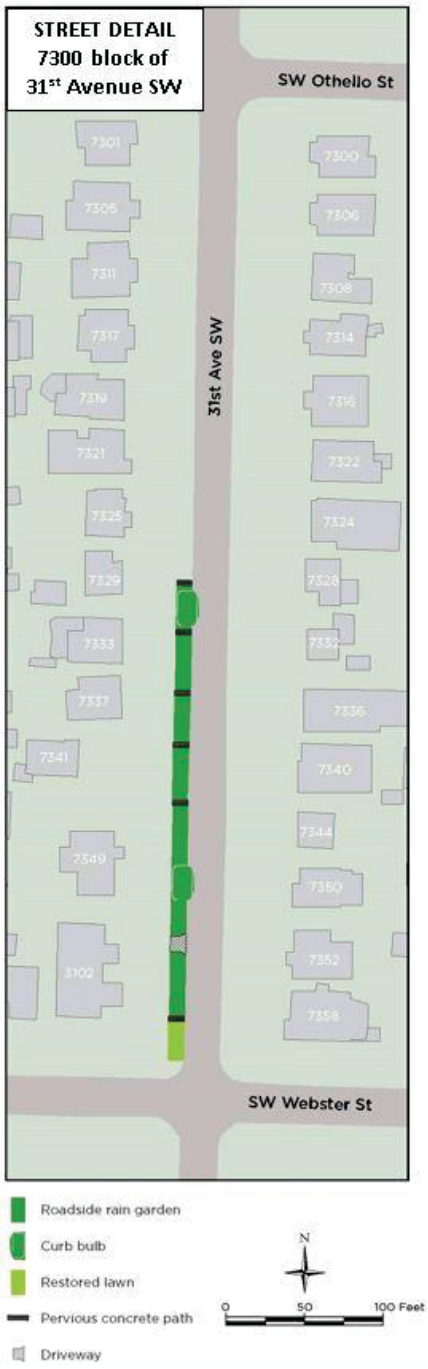
kingcounty.gov and search for "Barton CSO"

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Construction to start on your block as early as (Day), (Date)

Watch for posted parking restriction and road closure notices 72 hours in advance of work

King County's contractor, Goodfellow Brothers, Inc. will soon be on-site to construct roadside rain gardens (swales) for the Barton Combined Sewer Overflow (CSO) Control Project. Starting as early as (Day), (Date), construction crews will begin work on the 7300 block of 31st Avenue SW.



What to expect

See reverse for more detail on work activities

- Crews on your street for approximately two months.
- Work hours Monday through Friday, 7 a.m. to 5 p.m. Advance notice will be provided for any work outside those hours.
- Noise and activity typical of a construction area.
- Construction materials and equipment on the street.
- Local and emergency access will be maintained at all times, although there will be times when local access will need to be coordinated with the construction crew.
- Uninterrupted delivery of mail and packages and uninterrupted waste management pick up.
- Some water service relocations. Seattle Public Utilities will work with individual residences on any service interruptions.
- All work to occur in public right-of-way.
- Parking restrictions and traffic revisions that will vary depending on construction activity. **Signs will be posted 72 hours in advance of parking or street closures.**

Questions? Concerns?

Call: 24-hour construction hotline **206-205-9184**

Email: Kristine.cramer@kingcounty.gov

Web: **www.kingcounty.gov**, search "barton cso-gsi"

ALTERNATIVE FORMATS AVAILABLE
206-477-5371 or 711 (TTY Relay)

FUNDED IN PART BY: DEPARTMENT OF ECOLOGY State of Washington

Construction Sequence

Expect to see about two months of active construction on your block with less frequent activity for maintenance and testing in the subsequent months. The first month of construction will have the most parking and access restrictions. During active excavation of the planter strips, the street will be closed to through traffic during the day but reopened at night, including for parking. The second month of active construction focuses on soil placement and landscaping, and one way traffic control will be in place. Parking will be restricted during the day but reopened at night.

We will post updates to the project website every Monday with more detail about current construction activities. Visit www.kingcounty.gov and search "barton cso-gsi"

Month One (Approximate timeframe)

Activity	Construction Impacts
Relocate utilities	Crews will work in the roadway during the day. During this work, expect local access only until 5 p.m. daily; you will also see some sidewalk closures and parking restrictions during the day.
Restore the street	Crews will work in the roadway during the day. During this work, expect local access only until 5 p.m. daily; you will also see some sidewalk closures and parking restrictions during the day.
Install drain pipes and form swales	Crews will excavate and install drain pipes and form swales. To ensure safety near the work zone, expect to see street and sidewalk closures next to the area under construction. Local access will be maintained. The street and sidewalk will reopen at 5 p.m. daily. Expect increased truck traffic as crews haul soil out of project area.

Month Two (Approximate timeframe)

Activity	Construction Impacts
Install irrigation systems and place soil	Expect some short street and/or sidewalk closures during the day while equipment and soil is brought in. Expect increased truck traffic as soil is brought to the site.
Planting	The street and sidewalks will be open during this work.

After month two, you will see construction fencing around the swales while plants begin to grow. In the fall, expect to see a water truck and water storage tank on site while we make sure that the swales drain water as intended.

About the Barton Combined Sewer Overflow (CSO) Control Project

King County is installing roadside rain gardens to divert stormwater runoff away from the combined sewer system. Once in the rain gardens, storm water will filter through soil to a drain pipe, which will take the water to a deep well where the water will slowly soak in deep underground. Keeping storm water out of the sewer system will reduce combined sewer overflows in Puget Sound during storms. The roadside rain gardens will be located in the planter strip between the curb and sidewalk. For more information:

24/7 Construction hotline: 206-205-9184

Leave a message, and a project team member will return your call.

Email: Kristine.cramer@kingcounty.gov **Web:** **www.kingcounty.gov**, search "barton cso-gsi"

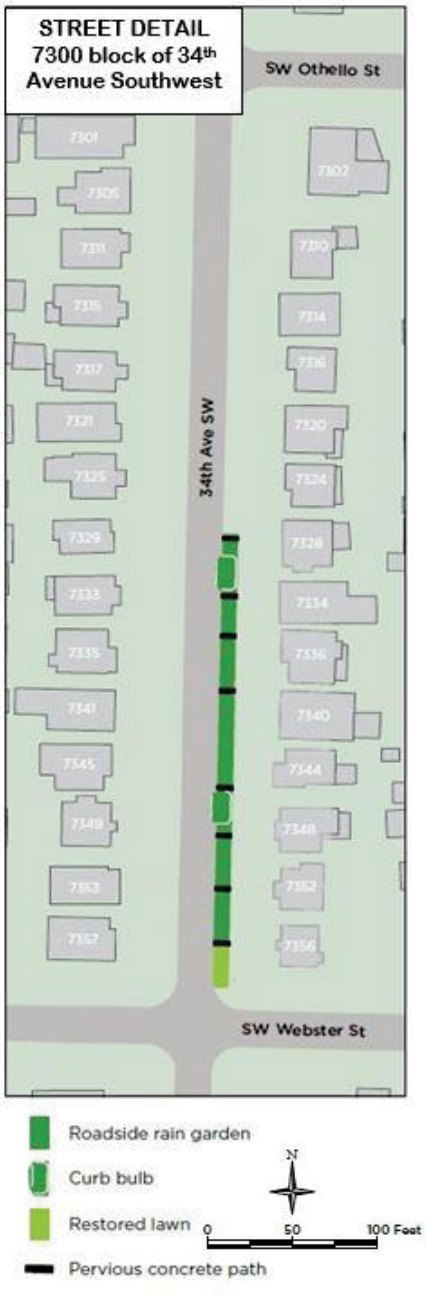
ALTERNATIVE FORMATS AVAILABLE
206-477-5371 or 711 (TTY Relay)

FUNDED IN PART BY: DEPARTMENT OF ECOLOGY State of Washington

Crews to conduct roadside rain garden flow testing on August 28

Street will be open, parking restrictions near work area

On Thursday, August 28, crews will conduct rain garden flow tests on the 7300 block of 34th Avenue SW. These tests are to make sure water flows into and drains out of each rain garden as intended. The rain gardens are part of the Barton CSO Control Project to reduce overflows of stormwater and sewage into Puget Sound during heavy rains.



What you should expect:

- Flow tests to take about half a day to complete.
- Flow test equipment on the street.
- Crews will remove green protective fencing from around the rain gardens as early as September 5.
- Ongoing maintenance by King County once work is complete.
- Regular updates to the project website at the beginning of each week with more detail about current construction activities. Visit www.kingcounty.gov and search "barton cso-gsi".

Crews conducting rain garden flow test

24/7 Construction hotline: 206-205-9184

Leave a message, and a project team member will return your call

Email: Kristine.cramer@kingcounty.gov

Web: www.kingcounty.gov, search "barton cso-gsi"

ALTERNATIVE FORMATS AVAILABLE
206-477-5371 or 711 (TTY Relay)

FUNDED IN PART BY: DEPARTMENT OF ECOLOGY State of Washington

Rain garden construction starting as early as Wednesday, May 6

Parking restrictions, daytime street closures with local access only for next 2-3 weeks

Starting as early as Wednesday, May 6, King County's contractor, Goodfellow Brothers, Inc. will begin excavation work to construct roadside rain gardens on the 7300 block of 30th Avenue SW. These rain gardens are part of the Barton CSO Control Project to reduce combined sewer overflows (CSOs) of raw sewage and untreated stormwater into Puget Sound near the Fauntleroy ferry dock.

Construction Schedule

Expect to see active construction for approximately the next month on your block with less frequent activity for maintenance and testing in the subsequent months. During the last weeks of construction, expect to see fewer parking and access restrictions as work transitions to irrigation systems, soil placement and planting.

We will post updates to the project website at the beginning of each week with more detail about current construction activities. Visit www.kingcounty.gov and search "barton cso-gsi".

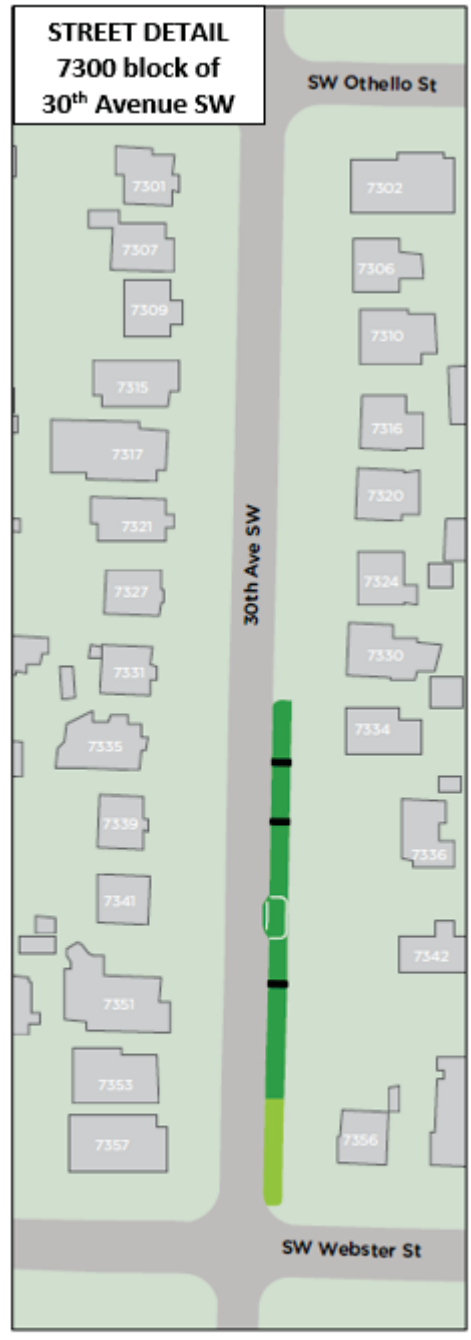
Activity	Timeline	Construction Impacts
Excavate for rain gardens and install drain pipes	Approximately one month	To ensure safety near the work zone, expect to see street and sidewalk closures adjacent to the area under construction. **Local and emergency access will be maintained.** Streets and sidewalks will reopen daily at 6 p.m. In some cases, parking may need to remain closed overnight.
Install irrigation and place soil		Expect some short street and/or sidewalk closures during the day while equipment and soil are brought in.
Planting		Streets and sidewalks will be open during this work.
Plant establishment period	Approximately two months	You will see construction fencing around the rain gardens while plants begin to grow. Streets and sidewalks will be open during this work.
Flow Testing	One-two days	After the plant establishment period, expect to see crews running tests in the street to make sure water flows into and drains out of each rain garden as intended.
Operations and maintenance	Ongoing	Expect to see crews performing maintenance activities after testing is completed. Streets and sidewalks will be open during this work.

ALTERNATIVE FORMATS AVAILABLE
206-477-5371 or 711 (TTY Relay)

FUNDED IN PART BY: DEPARTMENT OF ECOLOGY State of Washington

King County

Barton Combined Sewer Overflow (CSO) Control Project



During construction, you should expect:

- Work hours Monday through Friday, 7 a.m. to 6 p.m. Advance notice will be provided for any work outside those hours.
- Construction materials and equipment on the street and some material storage in the right-of-way planter strips.
- Noise and activity typical of a construction area.
- Local and emergency access will be maintained at all times, although there will be times when local access will need to be coordinated with the construction crew.
- Uninterrupted delivery of mail and packages and uninterrupted waste management pick up.
- All work to occur in the public right-of-way.

About the Barton Combined Sewer Overflow (CSO) Control Project

King County is installing roadside rain gardens in the Sunrise and Westwood neighborhoods to divert stormwater runoff away from the combined sewer system. Roadside rain gardens will be constructed in the planter strip between the curb and the sidewalk. During rain events, stormwater will filter through the rain garden soil to a drain pipe, which will take the water to a deep well for slow infiltration underground. Keeping stormwater out of the sewer system will reduce combined sewer overflows (CSOs) of raw sewage and untreated stormwater into Puget Sound near the Fauntleroy ferry dock.

24/7 Construction hotline: 206-205-9184

Leave a message, and a project team member will return your call.

Email: Kristine.cramer@kingcounty.gov

Web: **www.kingcounty.gov**, search "barton cso-gsi"

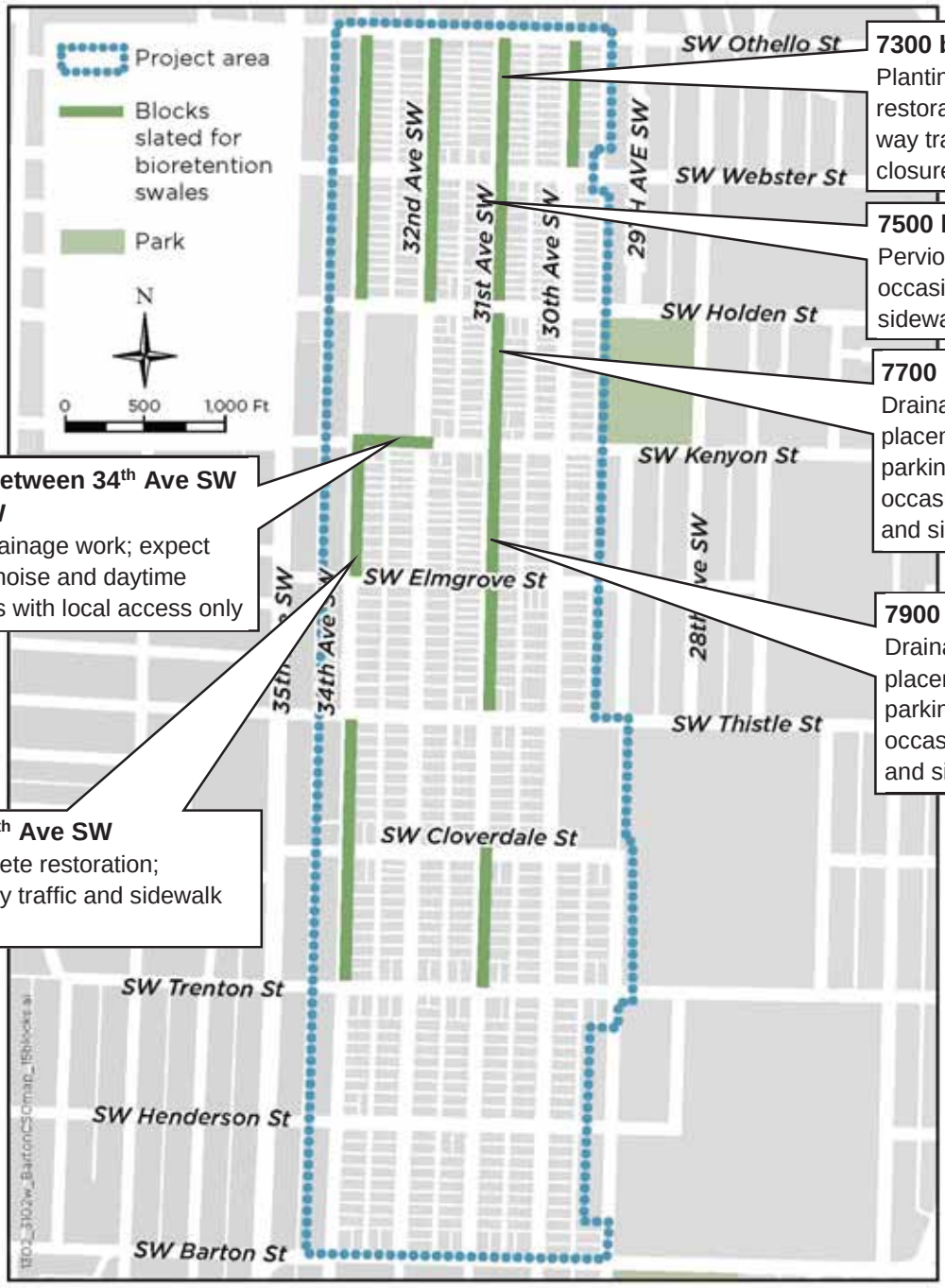
ALTERNATIVE FORMATS AVAILABLE
206-477-5371 or 711 (TTY Relay)

FUNDED IN PART BY: DEPARTMENT OF ECOLOGY State of Washington

King County

Barton Combined Sewer Overflow (CSO) Control Project

June 9, 2014



7300 block of 31st Ave SW
Planting and concrete restoration; occasional one-way traffic and sidewalk closures

7500 block of 31st Ave SW
Pervious pathway work; occasional one-way traffic and sidewalk closures

7700 block of 31st Ave SW
Drainage work and soil placement; expect daytime parking restrictions, occasional one-way traffic and sidewalk closures

7900 block of 31st Ave SW
Drainage work and soil placement; expect daytime parking restrictions, occasional one-way traffic and sidewalk closures

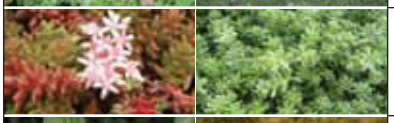
SW Kenyon St between 34th Ave SW and 32nd Ave SW
Excavation and drainage work; expect loud construction noise and daytime parking restrictions with local access only

7900 block of 34th Ave SW
Planting and concrete restoration; occasional one-way traffic and sidewalk closures

* Yellow well casings will be cut down with only a cap remaining after crews test water flow.

Airy Palette

The airy plant palette was installed in roadside rain gardens on streets with tall walls, fences, or trees. Characteristics of plants in the airy palette include light-colored foliage, medium-sized leaves, and cheerful and bright colored flowers.

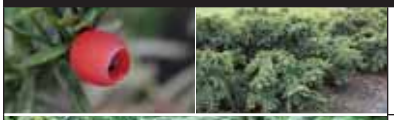
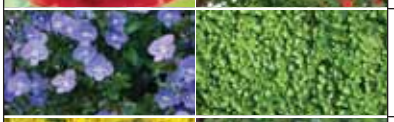
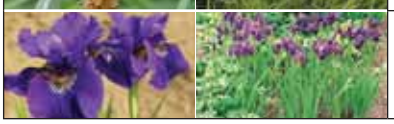
Photo	Plant name	Light	Native	Evergreen	Pollinators	Rain Garden Function
	**Creeping mahonia** *Mahonia repens*	☀	✓	✓	🐦 🦋	👁
	**Shiny-leaf spirea** *Spiraea betulifolia*	☀	✓		🦋	👁
	**Prostrate white abelia** *Abelia x grandiflora 'Prostrata'*	☀			🦋	👁
	**Tickseed** *Coreopsis lanceolata 'Sterntaler' or* *Coreopsis verticillata 'Zagreb'*	☀			🦋	👁
	**Happy returns daylily** *Hemerocallis 'Happy Returns'*	☀			🐦 🦋	👁
	**Variegated iris** *Iris foetidissima 'Variegata' or* *Iris pallida 'Aurea-Variegata'*	☀		✓		👁
	**Daffodil** *Narcissus 'Dutch Master' or* *'King Alfred'*	☀			🐝	👁
	**Elfin creeping thyme** *Thymus serpyllum 'Elfin'*	☀		✓	🦋	👁 🥾
	**Coral carpet stonecrop** *Sedum album 'Coral Carpet'*	☀			🦋	👁 🥾
	**Dwarf redtwig dogwood** *Cornus sericea 'Kelseyi'*	☀	✓		🐦 🦋	👁 💧
	**Beaked sedge** *Carex stipata*	☀	✓		🐦 🐝 🦋	💧
	**Goldstrike rush** *Juncus effusus 'Gold Strike'*	☀	✓	✓	🐦	💧

KEY

- Light: Sun, Part shade
- Native: Native plant
- Evergreen: Evergreen
- Pollinators: Hummingbird, Songbird, Bee, Butterfly
- Rain Garden Function: Aesthetics, Stepable plant, Wet tolerant

Blended Palette

The blended plant palette was installed in roadside rain gardens on streets with low walls, fences, and shrubs. Characteristics of plants in the blended palette include medium dark green foliage, needle-leaf evergreens, and showy red and magenta flowers.

Photo	Plant name	Light	Native	Evergreen	Pollinators	Rain Garden Function
	**Emerald spreader Japanese yew** *Taxus cuspidata 'Emerald Spreader'*	☀		✓		👁
	**Western sword fern** *Polystichum munitum*	☀	✓	✓		👁
	**Blue oat grass** *Helictotrichon sempervirens*	☀		✓		👁
	**Blue Pacific shore juniper** *Juniperus conferta 'Blue Pacific'*	☀		✓	🐦	👁
	**Coneflower** *Echinacea purpurea*	☀			🐦 🦋	👁
	**Geum** *Geum flora-plena 'Blazing Sunset'*	☀			🦋	👁
	**Creeping speedwell** *Veronica repens or Veronica liwanensis or Veronica 'Georgia Blue'*	☀		✓	🐝 🦋	👁 🥾
	**Oregon stonecrop** *Sedum oreganum*	☀	✓	✓	🐝 🦋	👁 🥾
	**Sunshine blue caryopteris** *Caryopteris 'Sunshine Blue'*	☀			🦋	👁
	**Giant snowdrop** *Galanthus elwesii*	☀			🐝 🦋	👁 🥾
	**Baltic rush** *Juncus balticus*	☀	✓	✓	🐝 🦋	💧
	**Beaked sedge** *Carex stipata*	☀	✓		🐦 🐝 🦋	💧
	**Ruffled velvet Siberian iris** *Iris sibirica 'Ruffled Velvet'*	☀			🐝 🦋	👁 💧

KEY

- **Light:** Sun, Part shade
- **Native:** Native plant
- **Evergreen:** Evergreen
- **Pollinators:** Hummingbird, Songbird, Bee, Butterfly
- **Rain Garden Function:** Aesthetics, Stepable plant, Wet tolerant

Curb Bulb and Intersection Palette

The curb bulb and intersection plant palette was installed in streets with 'no parking' zones. All plants are low (under 24" height) to provide visibility at intersections. Characteristics of plants in the curb bulb and intersection palette include bright foliage, medium-sized leaves, and long blooming with distinctively blue colored flowers.

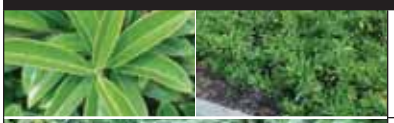
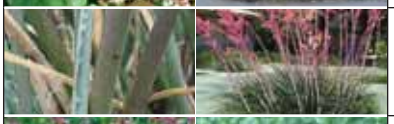
Photo	Plant name	Light	Native	Evergreen	Pollinators	Rain Garden Function
	**Ice dance sedge** *Carex morrowii 'Ice Dance'*	☀		✓		Aesthetics
	**Blondy wintercreeper** *Euonyumus fortunei 'Interbolwi' or euonymus 'Emerald n' Gold'*	☀		✓	Songbird	Aesthetics
	**Frosty Potentilla** *Potentilla fruticosa 'Sunset'*	☀	✓		Butterfly	Aesthetics
	**Blue oat grass** *Helictotrichon sempervirens*	☀		✓		Aesthetics
	**Rozanne geranium** *Geranium 'Gerwat' rozanne*	☀			Bee, Butterfly	Aesthetics
	**Daffodil** *Narcissus 'Dutch Master' or 'King Alfred'*	☀			Bee	Aesthetics
	**Creeping mahonia** *Mahonia repens*	☀	✓	✓	Songbird, Butterfly	Aesthetics
	**Dwarf redtwig dogwood** *Cornus sericea 'Kelseyi'*	☀	✓		Songbird, Butterfly	Wet tolerant
	**Wintercreeper euonymous** *Euonymus fortunei 'Kewensis'*	☀		✓	Songbird	Stepable plant
	**Creeping speedwell** *Veronica repens or Veronica liwanensis or Veronica 'Georgia Blue'*	☀		✓	Hummingbird, Butterfly	Stepable plant
	**Corkscrew soft rush** *Juncus effusus 'Lemon Swirl'*	☀	✓	✓	Songbird	Wet tolerant
	**California gray rush** *Juncus patens 'Elk Blue'*	☀		✓		Wet tolerant

KEY

- **Light:** Sun, Part shade
- **Native:** Native plant
- **Evergreen:** Evergreen
- **Pollinators:** Hummingbird, Songbird, Bee, Butterfly
- **Rain Garden Function:** Aesthetics, Stepable plant, Wet tolerant

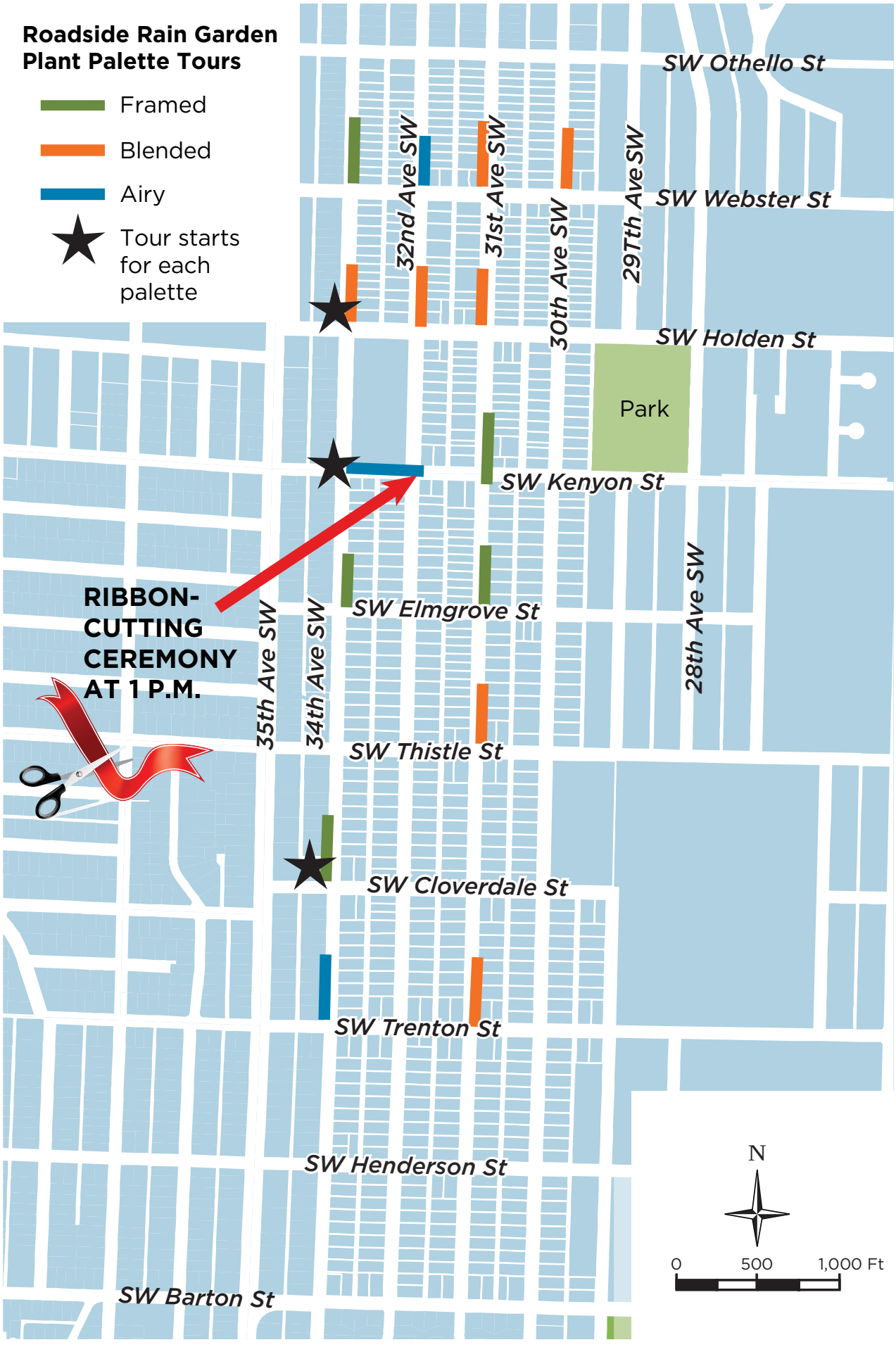
Framed Palette

The framed plant palette was installed in roadside rain gardens on streets with few walls, fences, or trees. Characteristics of plants in the framed palette include dark green foliage, broadleaf evergreens, and subdued rose to blue colored flowers.

Photo	Plant name	Light	Native	Evergreen	Pollinators	Rain Garden Function
	**Mount Vernon cherry laurel** *Prunus laurocerasus 'Mount Vernon'*	☀		✓	Songbird	Aesthetics
	**Western sword fern** *Polystichum munitum*	☀	✓	✓		Aesthetics
	**Salal** *Gaultheria shallon*	☀	✓	✓		Aesthetics
	**Red yucca** *Hesperaloe parviflora*	☀		✓	Hummingbird	Aesthetics
	**Wall germander** *Teucrium chamaedrys*	☀		✓	Bee, Butterfly	Aesthetics
	**Wintercreeper euonymous** *Euonymus fortunei 'Kewensis'*	☀		✓	Songbird	Aesthetics, Stepable plant
	**Kinnikinnick** *Arctostaphylos uva-ursi*	☀	✓	✓	Songbird	Aesthetics
	**Common camas** *Camassia quamash*	☀	✓		Songbird	Aesthetics, Wet tolerant
	**Baltic rush** *Juncus balticus*	☀	✓	✓	Bee, Butterfly	Wet tolerant
	**Beaked sedge** *Carex stipata*	☀	✓		Songbird, Bee, Butterfly	Wet tolerant
	**Ruffled velvet Siberian iris** *Iris sibirica 'Ruffled Velvet'*	☀			Hummingbird, Bee, Butterfly	Aesthetics, Wet tolerant

KEY

- **Light:** Sun, Part shade
- **Native:** Native plant
- **Evergreen:** Evergreen
- **Pollinators:** Hummingbird, Songbird, Bee, Butterfly
- **Rain Garden Function:** Aesthetics, Stepable plant, Wet tolerant



* Curb bulb/intersection palette is on all streets except 31st between Holden and Kenyon.

King County
Department of Natural Resources and Parks
Wastewater Treatment Division
201 S. Jackson St., KSC-NR-0505
Seattle, WA 98104-3855

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Barton Combined Sewer Overflow Control (CSO) Project

Pre-Construction Survey

Please take our survey. When completed, refold the survey so the Business Reply Mail panel is showing, tape it closed, and mail it back to us. Thank you!

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Barton Combined Sewer Overflow Control (CSO) Project

Pre-Construction Survey

January 2014

The King County Wastewater Treatment Division (WTD) would like to hear from you prior to the start of construction [illegible]trol Project. Thank you to all the community members who contributed time and provided input during the project design process. This project will install roadside rain gardens in the planter strips on 15 streets in the Sunrise Heights and Westwood neighborhoods of West Seattle. Roadside rain gardens will protect our environment by keeping stormwater out of the sewer system and r[illegible]

King County wants to minimize disruptions caused by construction as much as possible. The information from this survey will help construction crews work with neighbors and commuters who will be directly impacted by this project. [illegible] activities on January 23 and 25. Look for a meeting invitation in your mailbox.

Prefer to submit your answers electronically? Visit **www.kingcounty.gov** *and search for "Barton CSO" - the survey will be at the top of the page.*

1. **Please provide your name and contact information** *(we need this information so we can contact you if the contractor has follow up questions about the information you provide here):*

____
Name

____
Address

____
Phone Email

2. **Please indicate any special needs you have that would be helpful for the contractor to know** *(check all that apply):*

☐ Disability parking
☐ Frequent daytime deliveries
☐ Child or elder care
☐ Work at night/daytime sleep
☐ Other *(please explain)* ______________________

continues

3. **We plan to keep you informed during construction. You can expect fliers left at your door and email notifications of construction activities if you are on our email listserv. What other methods work well for you for construction updates:** *(check all that apply)*

☐ Social media – Facebook, Twitter, etc. *(please specify):*
____

☐ Presentation at community group *(please specify):*
____

☐ [illegible]
☐ Posted community notices – bulletin boards, library, retail outlets *(please specify):*
____

☐ *Other (please specify):*
____

Please provide your contact information above if applicable

4. **What additional comments would you like to share with the project team about upcoming construction?**

____
____
____
____
____

Thank you for your time and input!

Please contact Kristine Cramer via phone: **206-477-5415** or e-mail: **kristine.cramer@kingcounty.gov** to share any additional comments.
For more information about the Barton CSO Control Project, visit **www.kingcounty.gov** and search for "**Barton CSO**."

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

201 S. Jackson St., KSC-NR-0505
Seattle, WA 98104-3855

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WE WANT TO HEAR FROM YOU!

Barton CSO Control Project

COMMUNITY SURVEY

Please return by September 25, 2015

Alternative Formats Available
206-477-5371 TTY Relay: 711

When returning survey, please fold and seal with tape at the top open edge in the center of the Business Reply Mail panel.

Printed on recycled paper. Please recycle.
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BUSINESS REPLY MAIL
STANDARD MAIL PERMIT NO. 168

POSTAGE WILL BE PAID BY ADDRESSEE

ATTN: KRISTINE CRAMER
WASTEWATER TREATMENT DIVISION
KING COUNTY DEPARTMENT OF NATURAL RESOURCES AND PARKS
KSC-NR-0505
201 S JACKSON ST
SEATTLE WA 98104-9887

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

Tape Here

Tape Here

King County

Barton Combined Sewer Overflow (CSO) Control Project

POST-CONSTRUCTION SURVEY ***Please respond by September 25, 2015***

PROJECT OVERVIEW

King County Wastewater Treatment Division protects public health and the environment by conveying and treating the region's wastewater. King County has completed construction of roadside rain gardens in the Sunrise Heights and Westwood neighborhoods.

Located in the planter strip between the curb and sidewalk, these roadside rain gardens will divert stormwater runoff away from the combined sewer system. When it rains, stormwater will filter through rain garden soil to a drain pipe, which will take the water to a deep well to soak in underground. Keeping stormwater out of the sewer system will reduce combined sewer overflows (CSOs) of raw sewage and untreated stormwater into Puget Sound near the Fauntleroy ferry dock.

Your thoughts are important to us.

Please take a moment to fill out this survey.

Roadside rain garden at 31st Ave: SW Kenyon to SW Holden

Before

After

1. Which of the following is located near the Barton CSO project area?

- ❑ Your residence
- ❑ Your business
- ❑ Both your residence and your business
- ❑ Recreational opportunities of interest to you
- ❑ Other (please specify)_____
- ❑ None of the above

2. On a scale of 1 to 7 (where 1 = very low interest and 7 = very high interest), how high was your interest in the project?

❑ 1 very low interest ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7 very high interest

3. Did you understand the purpose of the project?

❑ No ❑ Yes

This survey is also available online at ***www. kingcounty.gov***. Search **Barton cso gsi**.

4. Do you recall seeing or hearing information about this project?

❑ No (skip to Question 6) ❑ Yes

5. Where do you remember seeing or hearing information about the project? (check all that apply)

❑ Direct mail
❑ Email
❑ Phone call
❑ Social media (please specify) _____
❑ Project representative visit
❑ Flier hung on your door
❑ Community meetings
❑ Fairs/community events
❑ Community/religious leaders
❑ Project web site
❑ Sign at project site
❑ Neighborhood blog
❑ Community newspapers
❑ Other (please specify) _____

6. On a scale of 1 to 7 (1 = very difficult; 7 = very easy), how difficult or easy was it to get information about the project?

❑ 1 very difficult ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7 very easy ❑ I did not try to get information about the project (skip to Question 7)

Please comment on your difficulty or ease of getting information about the project. _____

_____

7. On a scale of 1 to 7 (1 = not at all easy; 7 = very easy), how easy was it to understand the information that King County provided about the project?

❑ 1 not at all easy ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7 very easy ❑ Not applicable (skip to Question 8)

Please comment on how easy you thought it was to understand information about the project. _____

_____

8. How much do you agree or disagree with the following statements? Please use a scale of 1 to 7 (1 = strongly disagree; 7 = strongly agree). You can also choose "not applicable".

I was adequately informed of when construction work would take place

❑ 1 strongly disagree ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7 strongly agree ❑ not applicable

I was adequately informed of potential impacts of construction

❑ 1 strongly disagree ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7 strongly agree ❑ not applicable

I received construction updates often enough to be informed about the project's progress

❑ 1 strongly disagree ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7 strongly agree ❑ not applicable

9. Did you contact King County with a question or concern about the project?

❑ No (Skip to Question 11) ❑ Yes

10. Did the information you received from the King County staff person answer your question or concern?

❑ No ❑ Yes ❑ I don't remember (skip to Question 11)

Please comment on the information you received from the King County staff person. _____

_____

_____

11. What is the best way(s) to keep you informed about projects like this? (check all that apply)

❑ Direct mail
❑ Email
❑ Phone call
❑ Social media (such as Twitter or Facebook)
❑ Project representative visit
❑ Flier hung on your door
❑ Community meetings
❑ Community/religious leaders
❑ Project web site
❑ Sign at project site
❑ Neighborhood blog
❑ Community newspapers
❑ Other (please specify) _____

12. Did you know who to contact if you had a question or concern about the project?

❑ No ❑ Yes

13. Would you like to be contacted by King County staff to discuss the project with you?

❑ No (skip to Question 15) ❑ Yes

14. Please provide your contact information below.

Name: _____ Phone number: _____

Email address: _____

Address: _____

15. Do you have any other concerns or comments for the project team? _____

_____

_____

Please fold and seal with tape at the top open edge in the center of the Business Reply Mail panel.

THANK YOU!

Your feedback is important to us, and will help King County improve its service to impacted communities during construction projects.

Roadside rain garden maintenance: what can you expect?

King County is responsible for regular maintenance of roadside rain gardens year round. You can expect to see crews onsite at least monthly performing regular maintenance. Expect more frequent visits before and after large storms, and during the summer growing season.

Here is what crews will be doing:

- Monitoring plant health
- Removing weeds
- Monitoring drainage
- Removing debris and trash
- Clearing curb inlets and gutters
- Caring for the pipes and deep wells
- Gathering ongoing information on the performance of roadside rain gardens

Since the construction hotline will no longer be in use, please call the number listed on the facility marker if you see:

- Ponding water that lasts longer than 24 hours after it has stopped raining
- Vandalism
- Spills or contamination
- Other major concerns

King County installed curb markers on every block with information on how to contact the County with questions or concerns about the rain gardens.

If you see a small amount of garbage in a roadside rain garden, please pick it up!

While crews will be on the lookout for problems when they perform regular maintenance, they are not onsite daily like neighbors. Keeping hotline calls to major issues ensures a prompt response when needed.

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Appendix H: Quality Assurance Plan Example

- Example Quality Assurance Plan for Construction from WTD's Barton project

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Barton CSO Project

Construction Quality Assurance Management Plan

Prepared by: MWH Constructors
December 2013

Table of Contents

1.1 Project Description and Background.

In 2008, King County Wastewater Treatment Division (KCWTD) reported that the Barton Combined Sewer basin had an average of four overflows per year that discharge a total of four million gallons into Puget Sound from an overflow at the Barton pump station located near the West Seattle Fauntleroy Ferry Terminal. A "CSO event" occurs when a mixture of raw sewage and stormwater discharges into local water bodies.

In order to reduce overflows to no more than one CSO event per year (averaged over a 20-year rolling period) to comply with Department of Ecology requirements (Ecology), King County (County) will construct Green Stormwater Infrastructure (GSI) facilities on 15 streets with approximately 93 swales and up to 18 underground injection control wells in selected planter strips in the City right-of-way in the Sunrise Heights and Westwood neighborhoods in West Seattle. This Project will intercept, treat and reduce a portion of the stormwater runoff flowing from the public streets into the combined sewer system.

The intercepted stormwater in each planter strip will filter through 18-inches of bioretention soil (prescribed mix as defined in City of Seattle Standard Specifications) and then enter an underdrain that conveys the flow to an Underground Injection Control (UIC) well for deep infiltration into a soil layer (identified as "Vashon Advance Outwash") with infiltrative capacity to absorb the stormwater. All stormwater that is discharged into the UIC well for infiltration will have been treated through the bioretention soil section in accordance with Ecology's water quality requirements.

With stormwater diverted to the bioretention swales and UIC wells, the amount of stormwater currently discharging into the combined sewer pipes is reduced; thus decreasing the volume and peak flows at the Barton pump station and reducing the number of CSO overflow events for the Barton basin. The Project Area for implementing GSI for Barton's CSO Project is an area within Barton's 416 Subbasin, in the Sunrise Heights and Westwood neighborhood. The Project Area northern limit is SW Othello Street and southern limit is SW Barton Street. The western limit of the Project Area is an alley just west of 34th Avenue SW and the eastern limit is approximately 30th Avenue SW.

MWH Constructors' professional services contract with King County provides construction management and inspection services for the Barton CSO Project. King County personnel will also provide construction management and inspection and will maintain the decision-making authority with respect to oversight of the construction contract.

The Barton CSO Project was designed by SvR Design. The County has structured this construction management scope of work to include scheduling, cost control, estimating, administration and inspection services during construction.

1.2 Construction Schedule

An outline of the anticipated construction schedule is provided below. The actual construction schedule will depend on the selected construction contractor's planning and methods.

- Construction Contract Notice To Proceed: November 2013
- Pre-construction submittals and selected submittal reviews– November through December 2013
- UIC well drilling – January 2014 through May 2014
  - Green Stormwater Infrastructure (GSI) Phase 1 – March to October 2014
  - Green Stormwater Infrastructure (GSI) Phase 2 – March to October 2015

Substantial Completion:

- GSI Phase 1 by October 31, 2014
- GSI Phase 2 by October 31, 2015

Final Acceptance – October 2015

A detailed baseline construction schedule will be provided by the contractor which includes a summary of planned construction activities, their sequence, interrelationships, durations, and milestone dates. The contractor will provide monthly updates to the baseline schedule as well as three-week look-ahead schedules weekly for the duration of the project.

1.3 Construction Management Organization

The Construction Management team for this project will be led by King County staff with support provided by MWH Constructors (MWHC) and its subconsultants. The Construction Management organizational structure for this project is outlined below.

1.3.1 Description of Construction Management Team

The Construction Management Team for the Barton CSO Project is comprised of King County, MWHC, and other subconsultant staff. MWHC's services are considered third-party construction management services because MWHC had no involvement in the design of the project. The MWHC CM staff works with King County toward achieving the project's objectives and goals including safe and high quality construction work, on-time completion, and cost controls.

1.3.1.1 Relationship with the Owner – King County

King County has retained MWHC to provide services in support of the County's CM program. The sole decision making authority rests with the County for changes to the construction contract. King County must approve all contract modifications. No contract modification can be issued by any person other than an authorized representative of King County.

MWHC will focus on communication with King County to keep the County apprised of the status and progress of the work at all times. Issues affecting the quality or safety of the work will be immediately brought up with the King County Project Representative.

1.3.1.2 Relationship with Design Engineers – SVR Design

The Design Engineer (DE) is retained by King County to design the Green Stormwater Infrastructure CSO Control System. The DE is responsible for the adequacy of the plans and is solely responsible for their technical provisions and intent. Neither the CM nor the Contractors can encroach upon this responsibility.

Decisions required for effecting compliance with the contract documents, and for the interpretation of the intent of plans and specifications, are to be made by DE and King County. The DE will decide on all questions that may arise as to the quality and acceptability of materials, equipment, and specified performance requirements.

Recognizing the full importance of the DE's project responsibilities, DE staff is an important part of the Quality Assurance management team. It is anticipated that the DE will have a part time presence at the site to facilitate the coordination and timely resolution of construction/ design issues.

1.3.1.3 Relationship with the Contractor

All construction contracts are between King County and the Contractor. MWHC will assist with contract administration and acts on behalf of King County to verify Contractor compliance with the contract documents. MWHC's field staff will communicate with the Contract to review the requirements of the contract documents. However, Contract modifications are negotiated only through the Contractor’s representative authorized to commit the company to contractual obligations. Communication with a foreman or other workman is restricted to discussions not pertinent to making changes or directing the work. No changes can be effected without prior approval of the contracting parties: King County and the Contractor.

The means and method of construction and scheduling of all resources are the responsibility of the Contractor, who must meet contract specifications for the construction and project completion dates. Direction to the Contractor will only come from the County's project Representative.

Communications from the Contractor shall be directed to the County Project Representative. MWHC will assist with handling and processing official communications.

1.3.1.4 Relationship with Subcontractors and Suppliers

Except as specifically defined in the Contract, neither the County nor MWHC has any contractual obligations with vendors and subcontractors. The Contractor has sole responsibility for resolving contractual disputes with the subcontractors and vendors. All correspondence from vendors and subcontractors to the CM Team must be routed through the Contractor with contractor's explanation of the transmitted correspondence.

1.3.2 Construction Management Procedures

King County: The King County Project Representative is responsible for the contract administration of the construction project. King County holds the ultimate decision authority on any and all issues related to the project. King County receives guidance and direction for overall project design decisions from the Design Engineer and contract administration and inspection guidance from MWHC.

MWHC and King County Field Staff: The MWHC and King County Field Staff (Inspectors and Resident Engineer) will work collaboratively to address all issues arising at the construction site(s). The Inspectors and Resident Engineer may not direct or authorize work or requirements that are outside of the construction contract documents. The Lead Inspector or Resident Engineer should forward issues affecting the contract price and/or time or other issues materially affecting the project, to the King County Project Representative for decision.

Design Engineer: The Design Engineer shall address issues affecting the integrity of the design. Contractor requests for submittal review, clarification and requests for substitution/deviation shall be forwarded through the KC Project Representative to the Design Engineer. The Design Engineer responses shall be reviewed and recorded by the CM Team before being transmitted to the Contractor.

Contractor: The contractor is responsible for the prosecution of the work, in accordance with the contract, by the means he chooses. MWHC and County inspectors shall observe, inspect and document the Contractor's work. The inspectors may not direct the Contractor as to means and methods of construction unless those means and methods present an imminent danger to life or property or will, without question, result in non-compliant work. All Contractor communications shall be addressed to the County.

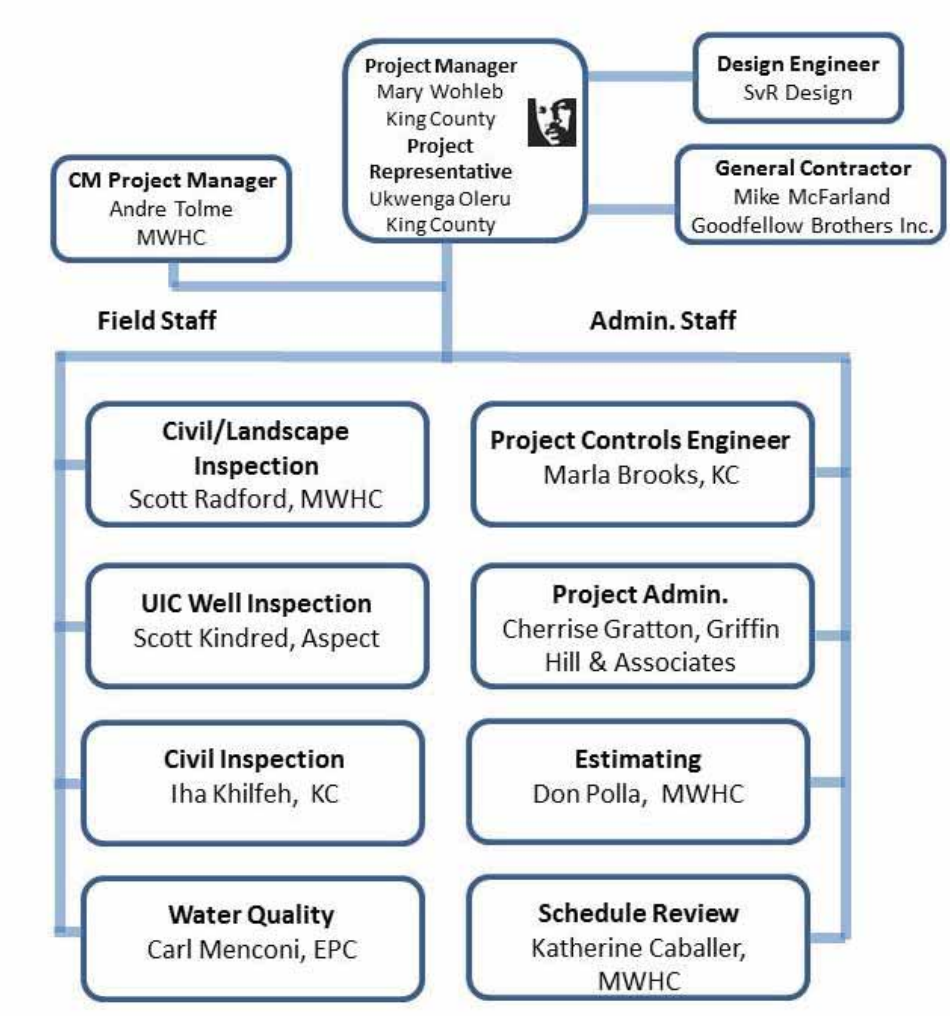
1.3.3 Lines of Communication

The County Project Representative will be the focal point of communication during the construction phase. All communication to and from the Contractor must pass through the County Project Representative. The project has established a Project Specific SharePoint (SP) website to manage document submittals and document storage. Access and use of the SharePoint site is described in subsequent sections of this management plan.

1.4 Staffing plan

MWHC and King County will participate in shared administrative and field staff roles for the project described in the following section. The County Project Representative has the primary decision-making role with sole authority regarding construction contractual matters. MWHC will provide one full-time civil inspector, and a part time geotechnical inspector, and a part time water quality inspector for the Project. The County will provide an additional civil inspector during times of peak activity where work taking place in multiple locations requires full-time observation. KC will provide a project controls engineer, MWHC will provide one administration support staff, and part time permit tracking staff person and a part time cost estimator and project schedule reviewer. MWHC staff work efforts will be coordinated by the MWHC project manager.

1.4.1 CM Staff Organization Chart



1.4.2 MWHC Roles and Responsibilities

1.4.2.1 MWHC Construction Contract Administration Staff

Andre Tolme, MWHC
Project Manager
17% during Project duration
Responsibilities: Provide project management support to MWHC construction management staff; in particular provide organization, management and coordination of the consultant services under this contract including coordination of subconsultants. Coordination of consultant services staff with King County staff. Keep the County advised on all aspects of work under this contract, including Quality Management oversight of consultant services including periodic QC audits of Consultant's procedures.
Cherrise Gratton, Griffin Hill Associates
Project Controls/Administration
25% during Project duration
Responsibilities: Provide day to day document control assistance to KC Project Controls Engineer. Assist in the preparation and development of Contractor's administrative requirements including As-Built documentation, submittal follow up, change order processing, RFI responses, schedule submittals, technical submittals and re-submittals.
Don Polla, MWHC
Cost Estimating
5% during Construction
Responsibilities: Provide independent cost estimates for engineering alternatives. Provide written documentation of cost reviews and recommendations. Provide written cost estimates and recommendations for RCOs and RCPs, with backup analyses.
Dan McDonald, MWH
Permitting Coordination and Labor Compliance Oversight
5% during Construction
Responsibilities: Permit Coordinator will develop a master permit tracking log for all permits acquired by King County for the project and associated permit conditions. The permit coordinator will update tracking log as necessary and report permit tracking information to the project team. Labor compliance includes Davis Bacon wage rate monitoring and labor surveys.
Katherine Caballer, MWHC
Schedule Review
15% during Construction
Responsibilities: Review of contractor's baseline construction schedule and monthly construction schedule updates. Monitoring of schedule progress vs. actual progress, compliance with schedule constraints and compliance with specified scheduling procedures and submittals.

1.4.2.2 MWHC Field Staff

Scott Radford, MWHC
Civil Inspector Lead Landscape Inspector
100% during Construction, Part time during off season and preconstruction period
Responsibilities: Provide day to day onsite civil and landscape compliance inspection and documentation and reporting of all site work activities including tree transplanting, excavation of site soils, installation of drainage structures, grading, installation of bio soils, irrigation system and plant material, testing, and project punch list/closeout.

Scott Kindred, Aspect Consulting
UIC Well and Geotechnical Inspector
100% during UIC Construction
Responsibilities: Provide day to day onsite UIC Well inspection and documentation and reporting of work activities relative to UIC well location staking, well drilling, development and testing. Provide inspection of excavation and grading within bioretention swales for compliance with geotechnical requirements. Coordinates with Engineer of Record on geotechnical issues requiring technical resolution.
Carl Menconi, Environmental Project Consulting
Water Quality Compliance Inspector
10% during Construction
Responsibilities: Provide periodic inspection of Erosion and Sediment Control protections and wastewater discharge procedures for compliance with stormwater and industrial waste permit requirements. Monitors contractor's compliance with water quality and permit reporting.

1.4.3 KC Roles and Responsibilities

1.4.3.1 KC Construction Contract Administration Staff

Ukwenga Oleru, King County
Project Representative
Part time during the entire project
Responsibilities: The Project Representative (PR) has overall authority for managing the construction contract. All communications from the contractor are addressed to the PR. Coordinates the activities of the CM Team to see that the County's construction management responsibilities are maintained.

Marla Brooks, King County
Project Controls Engineer
Part time during the entire project

Responsibilities: Processing and tracking correspondence pertaining to the construction contract. Overall responsibility for maintaining project records in accordance with County procedures.

1.4.3.2 KC Field Staff

Iha Khilfeh, King County
Civil Inspector
Full Time during Peak Construction, part time during non-peak construction activity
Responsibilities: Provide day to day onsite civil compliance inspection and documentation and reporting of work activities relative to utility service installations and relocations; and provide coordination and inspection of street and sidewalk restoration. Provide support to civil site inspection during peak GSI construction work activity.

1.5 Communication protocol

Project communications from the contractor shall be through the contractor's representative to the County Project Representative. All project documents from the contractor will be addressed to the County Project Representative and will be routed to the project controls engineer for proper routing to the project team. Submittals and submittal reviews will follow the procedures outlined in Specification Section 01300. Requests for information (RFI's) will be submitted and responded to according to Specification Section 00700 Part 4.5.

Weekly construction progress meetings will be conducted by the Project Representative and will be attended by the contractor, and appropriate field and administration staff. All outstanding Submittals, RFI's, RCO's, RCP's and non-compliance issues will be reviewed and discussed as necessary.

A project contact list including names, roles, company associations, contact phone #, and email addresses is provided in Appendix A.

1.6 Documentation Standards

Documentation standards, including description of the technical records handling methodology that includes where plans and specification, as-builts, drawings, field orders and change orders will be kept, per Division 0 of the construction contract documents.

1.6.1 Project Specific Report Forms

Project specific forms to be used by the Contractor for the project are included in Specification Section 01999. These forms include the following:

- Monthly Contractor Injury Summary report
- SDOT Pre-Construction Material Transmittal Form
- Submittal Transmittal Form

- Substitution Request Form
- City of Seattle RAMS Form
- Environmental Mitigation Form
- Waste Management Form
- Guarantee Documentation Form
- Standard Form Format

The CM team will use standard forms to document the construction activities and to identify and track quality assurance issues. These standard forms include: Daily Inspection Report, Change Order Log, Submittal Log, RFI Log, Meeting Agenda, Meeting Minutes, Testing Reports, Non-conformance Notices and Preliminary Deficiency Lists. All project documentation will be maintained on the project SharePoint site.

1.7 Change Order Process

The County and MWHC will manage and maintain a change order management system that is consistent with County practices. Requests for Change Order (RCO), Requests for Change Proposal (RCP), and Notices of Differing Site Conditions will be logged and tracked, in compliance with the applicable contract terms and conditions and with the County's Construction Management Processes. The Contractual Change Order process is described in the Division 0, Section 00700 Article 5 of the contract documents.

Each item will be logged as it is generated by the Project Representative, or the Contractor. An independent analysis and cost estimate will be performed by MWHC's Estimator for each RCO / RCP including review of the Cost Proposal submitted by the contractor. The CM team will perform schedule impact analysis for major changes and will negotiate Change Proposals with the contractor, document change order negotiations, and provide backup documentation for County files per the CM procedures.

Selected change proposals will be forwarded to the design consultant for response if significant design elements are changed by the proposal. The design consultant’s response to proposed changes will be tracked and maintained in the Project files.

1.8 Construction Testing Quality Control Plan

Guidance for testing and inspection of materials and installed work will be performed in general conformance to the King County Wastewater Treatment Division Construction Management Manual, Section 13.6. The Contract Documents outline the required inspection and testing in Division 1 and Division 2 of the technical Specifications. Specification Section 01410 – Construction Testing, outlines the overall requirements for construction testing required for the

project. A list of the relative technical specifications and associated anticipated inspections is listed below.

- **Section 02200 – Earthwork:** All fill materials proposed to be used for the project must be tested in accordance with specification 02200 – Earthwork.

Type of Test	Standard Procedure	Performed by
Moisture Content	ASTM D3017, ASTM D2216	Independent Testing Lab
Gradation	ASTM C136, ASTM D476	
Density In-place	ASTM D1556	
Moisture-density relationships	ASTM D1557	

  Testing Frequency: As defined in specification 02200 paragraph 1.07.

- **Section 02310- Soils Materials and Preparation**: Bioretention soil and topsoil and individual components. Tests and reports must be current (within 90 days prior to installation)

Type of Test	Standard Procedure	Performed by
Grain Size analysis (of mineral aggregate portion of mix)	Per COS 7-21.3(1)A	Independent Testing Lab
Quality analysis	Per COS 7-21.3(1)A	Independent Testing Lab
Organic content	Per COS 7-21.3(1)A	Independent Testing Lab
PH	Per COS 7-21.3(1)A	Independent Testing Lab
Bioretention soil compaction	ASTM D1557	Independent Testing Lab

  Testing Frequency: Tests and reports must be current (within 90 days prior to installation)

- **Section 02520 – Underground Injection Control Wells:** The well driller is required to provide drilling logs for each well as described in detail in the contract documents. Flow testing is required upon completion of wells as described in section 02520 paragraph 3.07 and the contractor is required to submit an inflow testing plan.

  Testing Frequency: Tests shall be performed for each UIC well.

- **Section 02530 – Sanitary Sewage:** Side sewers shall be cleaned and tested in conformance w/COS Section 7-17.3(4). Video recording of side sewers is required and shall be in conformance with COS 7-17.3(4)I.

  Testing Frequency: Tests shall be performed for each Side Sewer.

- **Section 02610 – Water Distribution:** Contractor shall be responsible for excavation, bedding and back fill per section 02200. New pipe and connections will be performed by SPU. Testing and disinfection shall be coordinated with SPU.

  Testing Frequency: Tests shall be performed for each water connection.

- **Section 02720 – Storm Drainage System:** Side sewer systems will be tested in accordance with COS Section 7-17.3(4).

  Testing Frequency: Tests shall be performed for each side sewer system.

- **Section 02771 – Concrete Curbs, Sidewalks and Curb Ramps:** Concrete shall meet COS Section 5-05, Curbs and Ramps shall be straight and true and tested with a ten-foot straight edge and shall not deviate more than 1/8" and shall not vary alignment more than ¼".

  Testing Frequency: Tests shall be performed for each occurrence of curb, sidewalk, and ramp.

- **Section 02795 – Pervious Concrete Pavement:** Test Panel-Perform installation of a 150 sf to 200 sf test panel to determine acceptance of job mix formula. Perform required test in accordance with section 02795 paragraph 3.02.

Type of Test	Standard Procedure	Performed by
Fresh Density	ASTM C138, ASTM C29, ASTM C172	Independent Lab
Uniform Finish	Less than 5% sealed	Civil Inspector
Field Infiltration Rate	As described in paragraph 3.02	Civil Inspector

- All subsequent porous concrete locations: - Perform required test in accordance with section 02795 paragraph 3.02.

Type of Test	Standard Procedure	Performed by
Concrete batch certification	ASTM C1688	Independent Lab
Fresh Density	ASTM C138, ASTM C29, ASTM C172	Independent Lab
Uniform Finish	Less than 5% sealed	Civil Inspector
Field Infiltration Rate	As described in paragraph 3.02	Civil Inspector

  Testing Frequency: Batch Concrete tests will be performed for 1x per day or for each 100 cy. Placed concrete tests shall be done on each poured section. A minimum of 3 Infiltration tests shall be performed no sooner than 7 days after placing

- **Section 02810 – Irrigation Systems:** Pressure testing of all irrigation mainline and lateral lines will be performed. Coverage testing of areas to receive irrigation.

Type of Test	Standard Procedure	Performed by
Pressure Tests	As described in paragraph 3.04	by Contractor observed by Landscape Inspector
Coverage Test	As described in paragraph 3.04	by Contractor observed by Landscape Inspector

1.9 Monitoring Records Management Plan

Project records will be stored on the project SharePoint website which has been created by MWHC. The Barton CSO SharePoint site is a website that serves as project document control and tracking systems. There are three sections to each site, the Home Page section, the Construction Submittals section, and the Project Records section.

The main Home page section contains documents available to all users, including SharePoint instructions, drawings, technical specifications and permits. The Construction Submittals section contains libraries of contractor related documents, including both dynamic correspondence such as RFIs, submittals, field orders, RCOs, RCPs, and design clarifications as well as static documents such as, quality control reports and safety reports. The review process for both submittals and RFIs are interactively tracked by the Project Controls Engineer through the site's workflow processes found in this section. The final section of the site contains all of King County's Project Records from preconstruction, through construction, and post-construction. The contractor does not have access to this section. The libraries in this section have been organized according to County document control filing structure.

Secure access to the SharePoint will be provided through a username and password login system. The username and passwords are assigned by the MWH SharePoint site administrator. As stated above, the contractor only has access to the submittals section of the SharePoint site. Access by other project staff will be determined by the Project Representative and the MWHC Project Manager.

Day to day administration of the SharePoint site will be performed by the Project Controls Engineer with support from the project administration staff. The URL for the location of the documents is provided below:
https://amcollab.mwhtools.com/sites/bartoncso/sitepages/home.aspx

At the completion of the project, the site data will be stored on the County server and backed up and archived in the County files. The County also maintains paper copy files for all project documentation, which will be archived in accordance with County procedures.

MWHC, subconsultants, and the design consultants will maintain archived project records in accordance with the County's terms of the Washington Department of Ecology consent decree. This period is expected to be approximately 25 years.

Contact List -King County Barton CSO Project

King County

Name	Position/ Specialty	Company	Contact Phone #	E-Mail Address
Jim Benedict	Construction Supervisor	KC	206-684-5942	Jim.Benedict@kingcounty.gov
Mary Wohleb	Project Manager	KC	206-477-5524	Mary.Wohleb@kingcounty.gov
Ukwenga Oleru	Project Representative	KC	206-263-6602	ukwenga.oleru@kingcounty.gov
Marla Brooks	Project Controls Engineer	KC	206-263-5402	Marla.Brooks@kingcounty.gov
Iha Khilfeh	Civil Inspection	KC	206-684-5942	Iha.Khilfeh@kingcounty.gov

Engineer/Design Contract

Name	Position/ Specialty	Company	Work Phone #	E-Mail Address
Steve Burke	Civil Design Engineer	SvR	206-223-0326	steveb@svrdesign.com
Kathy Gwilym	Landscape Architect	SvR	206-223-0326	kathyg@svrdesign.com

MWHC and Subconsultants

Name	Position/ Specialty	Company	Work Phone #	E-Mail Address
Andre Tolme	Project Manager	MWH	925-360-0646	Andre.Tolme@mwhglobal.com
Scott Radford	Resident Engineer/GSI and Landscape Inspector	MWH	425-896-6922	scott.w.radford@mwhglobal.com
Charrise Gratton	Project Administrator	Griffin, Hill & Associates	206-817-4824	ghagratton@qwestoffice.net
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Carl Menconi	Water Quality Compliance Inspector	EPC	206-387-8892	Enviprocon@q.com

General Contractor

Name	Position/ Specialty	Company	Work Phone #	E-Mail Address
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Appendix I: Excerpt from GSI Section in SPU CMD Quality Assurance (QA) Inspectors Handbook

- Contact SPU Construction Management for copy of SPU CMD Quality Assurance Inspectors Handbook.

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