

Duwamish Valley Green Infrastructure Job Training Program

2018 Combined Sewer Overflow Long-term
Control Plan Update

December 2015

Prepared by Urban Systems Design for:



King County

Protecting Our Waters

Doing our part on rainy days

For comments or questions, contact:

John Phillips

King County Department of Natural Resources and Parks

Wastewater Treatment Division

201 S. Jackson St.

KSC-NR-0503

Seattle, WA 98104-3855

(206) 477-5489

john.phillips@kingcounty.gov

Alternative Formats Available

206-477-5371 (voice) or 711 (TTY)

Contents

1.0	Introduction and Purpose	1
2.0	Background	2
3.0	DROF Green Infrastructure Job Training Pilot Program.....	4
4.0	Regional O&M Interviews	6
5.0	Agency/Organization Stakeholder Interviews and Financing Model Approaches	7
6.0	Conclusions	9
7.0	Recommendations and Next Steps.....	12
Appendix A: DROF Green Infrastructure Job Training Program, Concerns from Stakeholders and Community Partners		13
Appendix B: Summary of Regional O&M Interviews to Explore Green Infrastructure Maintenance Strategies.....		21
Appendix C: Agency/Organization Stakeholder Interviews to Explore Approaches for Establishing a Duwamish Valley Green Infrastructure Job Training Program.....		39

Tables

Table 2-1.	Voluntary “Green Street” Roadside Rain Garden Sites	2
Table 6-1.	Financing Model Approaches	10

This page left intentionally blank.

1.0 Introduction and Purpose

The purpose of this technical memorandum is to support overall green infrastructure¹ implementation in the Duwamish Valley. This technical memorandum describes the activities and plans to create the existing Duwamish Valley Green Infrastructure Job Training Program, and the establishment of a permanent green infrastructure job training program for Duwamish Valley residents. This program would provide mentorship and career pathways to young adults living in the Duwamish Valley area, while providing care of green infrastructure and open spaces that lack existing maintenance plans.

Improving the health of community members is one element of Seattle's and King County's race and social justice initiatives for the Duwamish Valley, and one of the main determinants of health is access to employment.² As multiple agencies and stakeholders proceed with implementing infrastructure improvements, sediment cleanups, and habitat restoration activities across the Duwamish Valley and the wider region, there will be equity and social justice considerations for developing employment opportunities in disadvantaged communities impacted by these projects. Green infrastructure can provide employment opportunities that are readily accessible to young adults.

In recent years, the amount of constructed green infrastructure in the Duwamish Valley is rapidly increasing due to the recognition by businesses, government agencies, and the public of the valuable ecosystem services that water retention/filtration provides, as well as to provide habitat enhancement on public and private lands. Proper maintenance is critical for increasing public acceptance and support for green infrastructure projects. However, ongoing maintenance of green infrastructure facilities presents challenges for municipalities and their community partners. The Duwamish Valley has seen an increase in the number of green infrastructure facilities built through municipal capital water quality and source control efforts, the Seattle and King County RainWise Program, and non-profit and community-led grant funding. The Duwamish Valley green infrastructure projects showcase the possibilities for increasing green infrastructure solutions to improve water quality in impacted neighborhoods, as well as the need for a variety of approaches to meet the specific maintenance requirements of the facilities. There is an opportunity to develop a strategy to sustainably fund a green infrastructure job training program because of the attention and investments already underway for the Duwamish Valley in the foreseeable future.

¹ For the purposes of this technical memorandum, the U.S. Environmental Protection Agency (EPA) broad definition of green infrastructure is used. EPA defines green infrastructure as: "...the use of vegetation, soils, and natural processes to manage water and create healthier urban environments. At the scale of a city or county, green infrastructure refers to the patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the scale of a neighborhood or site, green infrastructure refers to stormwater management systems that mimic nature by soaking up and storing water." EPA Green Infrastructure website: http://water.epa.gov/infrastructure/greeninfrastructure/gi_what.cfm

² The City of Seattle's Race and Social Justice Initiative and King County's Equity and Social Justice Strategic Plan address equity and social justice, with a focus on health, opportunity, and employment.

2.0 Background

Urban Systems Design (USD) has worked with Duwamish Valley neighbors, agencies, and organizational partners since 2005 to design and install four voluntary “green street” roadside rain garden projects using the Seattle Department of Transportation and King County Road Services Division Special Use Permitting requirements for altering/retrofitting the road right-of-way. Table 2-1 describes the areas that the voluntary green infrastructure facilities are located.

Table 2-1. Voluntary “Green Street” Roadside Rain Garden Sites

Neighborhood or Area	Location
South Park (Unincorporated King County)	12th Avenue South at the intersection of South Southern Street and South Rose Street
Georgetown	South Orcas Street at 7th Avenue South
Georgetown Industrial Area (Industrial Strength Natural Drainage Project)	8th Avenue South
East Ballard	11th Avenue Northwest at the intersection of Northwest 57th Street

The green infrastructure projects were endorsed by the community and were built using both grant funding and voluntary labor. The adjacent homeowners signed maintenance agreements with the City of Seattle and King County Roads Services Division to provide ongoing stewardship.

Additionally, many property owners (commercial and residential) have participated in the RainWise program to install rain gardens and cisterns on their properties to reduce stormwater runoff to the combined sewer system. In order to receive the rebate, property owners agreed to maintain the green infrastructure facilities for a minimum of five years.

Over the past few years USD and the adjacent property owners have identified the following challenges related to adequately maintaining these green infrastructure sites:

- Physical abilities,
- Limited availability of time,
- Excessive costs for materials like mulch and tools,
- Lack of expertise related to plant identification, and
- Property owners generally feeling overwhelmed as the rain gardens mature.

Through various volunteer days of service over the past few years, including the semi-annual *Duwamish Alive* events, the property owners have received varying levels of support by volunteers to remove weeds, spread mulch, and plant new plants. However, the property owners still feel generally uncertain about how to care for and adequately maintain the green infrastructure sites, but they are still committed to being involved. These maintenance challenges are not unique to property owners; many agencies find it difficult to meet the operations and maintenance (O&M) needs of green infrastructure facilities. The maintenance challenges are generally due to available time, funding, and expertise.

Due to the challenges associated with the ongoing stewardship of green infrastructure sites, USD completed the following tasks for the King County Wastewater Treatment Division (KCWTD) to explore approaches to maintain green infrastructure sites:

1. **DROF Green Infrastructure Job Training Pilot Program:** USD implemented the pilot program from March to May 2015 using funds from the City of Seattle Department of Neighborhoods Duwamish Opportunity Fund (DROF). The program developed a unique curriculum and a 12-week training program for South Park and Georgetown young adults to care for neighborhood spaces that lack organized maintenance. This pilot program is summarized in Section 3.0 and is described in further detail in Appendix A.
2. **Regional O&M Interviews:** USD conducted regional O&M interviews to determine what approaches other municipalities across the Puget Sound region implement for green infrastructure O&M. The regional O&M interviews are summarized in Section 4.0 and are described in further detail in Appendix B.
3. **Agency/Organization Stakeholder Interviews and Financing Model Approaches:** USD conducted agency/organization stakeholder interviews of local government agency and non-governmental organization (NGO) partners that may be interested in the establishment of the Duwamish Valley Green Infrastructure Job Training Program and partners that could also provide care and stewardship of green infrastructure and open spaces. The interviews also identified potential financing model approaches for funding a green infrastructure job training program. The agency/organization stakeholder interviews and financing model approaches are summarized in Section 5.0 and are described in further detail in Appendix C.

3.0 DROF Green Infrastructure Job Training Pilot Program

In order to address multiple needs identified by USD and its partners, USD explored the option of developing a young adult green infrastructure maintenance crew, which would provide the following community benefits:

- Career development for young adults
- Paying jobs
- Maintenance for green infrastructure sites in the community that lack existing maintenance plans

The City of Seattle Department of Neighborhoods DROF funded the pilot program “Green Infrastructure Job Training Program” from March to May 2015 to develop a unique curriculum and a 12-week training program for South Park and Georgetown young adults. KCWTD matched funding to identify stakeholder needs and conduct programmatic planning. The program participants earned a small stipend while becoming immersed in a course curriculum that provided training for individuals who sought green infrastructure-related construction, landscaping, or O&M experience. USD identified professionals in the fields of landscape design and horticulture and arborists, engineers, and planners to meet with participants over the 12-week training program to share their work experiences and career pathways. Students met professional staff from governments, NGOs, and businesses, providing opportunities to learn about invasive weeds, rain garden planting plans, engineering, design, urban forestry, ecological restoration, and equitable community outreach. Students used these skills to develop maintenance plans for various green infrastructure sites in the South Park and Georgetown neighborhoods. The program also organized a weekly O&M crew that maintained existing voluntary green infrastructure sites near the Duwamish River in the South Park and Georgetown neighborhoods every Saturday for 11 weeks. Students also learned what types of training and educational programs are needed for specific employment opportunities, and what local technical trade and labor union opportunities are available.

Through the process of developing curriculum and monthly evaluations, the program evolved to become the Duwamish Infrastructure Restoration Training Corps (DIRT Corps), serving young adults (17 to 30 years old)³. Embedded in the program is a unique problem-solving curriculum that provides more than a standard landscape maintenance service and is designed to collaborate with multiple partners to deliver high value care for green infrastructure sites. The program distinguishes itself from Duwamish River Cleanup Coalition/Technical Advisory Group’s Youth Program, which is focused on providing teenagers with recreational activities embedded with an environmental social justice curriculum and community service.

Lessons learned from implementing the pilot program included the following:

³ During the program, USD learned that while younger high school students were enthusiastic about the work and learning, they were not ready to learn about career opportunities, and so the minimum age for the program was set at 17 years old.

- DIRT Corps teachers, partners, and participants developed a successful model that brings together the needs identified by the community to care for green spaces, with an accessible, experiential “on ramp” to employment opportunities in multiple expanding green infrastructure careers.
- There is high demand for this type of work in the South Park and Georgetown neighborhoods, where the green infrastructure, open spaces, recreational areas, and tree canopy lag behind other Seattle neighborhoods.
- There is strong interest by the participants to continue to expand the program.
- Community partners think that this is a worthwhile project and want to see the group continue.
- The curriculum could be developed further to become a community college course that would provide more technical skills to meet the needs of agency, design, construction, and O&M careers related to green infrastructure.
- The program is funded through multiple small grants; however, a sustainable funding model is needed to ensure that the program continues.

Appendix A includes a detailed summary of the young adult green infrastructure job training pilot program.

4.0 Regional O&M Interviews

USD conducted research via an interview process to determine what approaches other municipalities across the Puget Sound region are implementing to provide green infrastructure O&M, and what kind of training programs exist for current employees, and what will be needed in the future. The team conducted six interviews with municipal program management staff from around the region to determine what strategies they are using to care for green infrastructure facilities and their lessons learned. The focus was to interview managers at jurisdictions where long-term maintenance is a concern, and that have developed Capital Improvement Programs (CIPs) that include green infrastructure facilities for water quality/flow/combined sewer overflow (CSO) control, and voluntary programs on private property or public lands. The strategies include intergovernmental partnerships, contracting through Requests for Proposals (RFPs), organized voluntary stewardship, and other strategies.

Individuals at the following municipalities were interviewed:

- Portland, Oregon
- Bellingham, Washington
- Port Townsend, Washington
- Seattle, Washington
- Kitsap County, Washington
- Pierce County, Washington

These municipalities were identified and chosen because of the high visibility of their programs and public engagement. Each municipality has successfully worked with property owners to build green infrastructure projects in the public right-of-way to control combined sewer or stormwater flows, and addressed the ongoing maintenance needs in creative ways.

Lessons learned from the regional O&M interviews included the following:

- Municipal employers described what they need to keep their green infrastructure facilities in good working order.
- Each municipality had to develop a long-term plan to care for their green infrastructure facilities in order to meet regulatory compliance (function) as well as public acceptance of the projects (aesthetics).
- Each municipality had to address O&M requirements on its own without any overarching regional guidance, based on its budget, time and expertise; in some cases, this has been challenging to accomplish.
- A regionally-accepted green infrastructure O&M curriculum or training program for both existing municipal staff and future employees will help everyone in the region.

Appendix B provides summaries of the regional O&M interviews, including what each municipality has implemented to provide green infrastructure O&M.

5.0 Agency/Organization Stakeholder Interviews and Financing Model Approaches

USD conducted five key informant interviews with local Seattle government agency and NGO partners who were identified to have interest in the establishment of the Duwamish Valley Green Infrastructure Job Training Program. The job training program would provide care and stewardship of voluntary green infrastructure facilities and open spaces while also including mentorship, career, and educational pathways to jobs within the green/gray infrastructure, landscaping, construction, planning, and design industries.

Individuals from the following local government agencies were interviewed:

- The Port of Seattle
- The Boeing Company
- King County Wastewater Treatment Division
- City of Seattle
- Seattle Parks Foundation

These municipalities were identified and chosen because of their highly visible role in the Duwamish Valley. Four of these agencies/organizations also comprise the Lower Duwamish Waterway Group (LDWG), which is the organization of responsible parties working with EPA on the Lower Duwamish Superfund cleanup process. The Seattle Parks Foundation has also launched the Duwamish Green Spaces Initiative campaign to increase public access to parks and open spaces that could also include partnerships with local governments to implement green infrastructure.

Despite only interviewing five representatives of local governments, the interviews helped USD understand interviewees' beliefs and perceptions about the potential establishment of a permanent green infrastructure job training program. Lessons learned from the agency/organization stakeholder interviews included the following:

- All respondents agreed that residents of the Duwamish Valley are underemployed relative to the rest of the City of Seattle and King County, and interviewees were generally enthusiastic and eager to assist in remedying this situation.
- There are several green infrastructure facilities being built in the Duwamish Valley and the number of facilities will continue to increase. Voluntary, community-led projects are increasing due to recent funding (DROF, Green Grants, and now King County Waterworks grants), so the assumption is there will be more demand for both stewardship of sites and a need to coordinate care and maintenance.
- There is no consensus about who will conduct maintenance/stewardship of these green infrastructure sites.
- There is currently a lack of skilled maintenance/stewardship workers who understand the context of maintenance issues in the Duwamish Valley.

- Developing and teaching a curriculum on maintenance/stewardship topics is important and can be done at the community college level or with an independent company.
- An ideal model is to cultivate Duwamish Valley residents to be leaders in their communities, as “ambassadors,” to develop and host maintenance plans for green infrastructure sites in need of care.
- Generally, interviewees encourage the approach of a pooled funding mechanism but are not confident how it can happen. As a result, they have suggested financing model approaches that are summarized in Table 6-1 below.

Appendix C provides summaries of the agency/organization stakeholder interviews, including their interests and potential roles to establishing permanent funding to care for existing or future green infrastructure facilities.

6.0 Conclusions

The City of Seattle and King County Race and Social Justice Initiative and the Equity and Social Justice Strategic Plan, respectively, will be seeking opportunities to develop meaningful and community-driven approaches, with a focus on health and employment while providing care of green infrastructure and open spaces. One of the main determinants of health is access to employment.⁴

KCWTD has a strong commitment to job recruitment and training towards replacing current staff as part of succession planning. As KCWTD proceeds with implementing their CSO control plan, there will need to be equity and social justice considerations for developing employment opportunities in disadvantaged communities impacted by KCWTD projects. This effort can be extended to include a more inclusive approach to green infrastructure O&M through employment development, recruitment, apprenticeship, and training.

Nationally, regionally, and locally, green infrastructure is critical to decreasing the incidents of flooding, polluted runoff, erosion, or other manifestations of climate change on the built environment. Successful planting and ongoing plant care and maintenance efforts are critical to increasing neighborhood resilience to the effects of climate change and absorbing stormwater runoff.⁵ Accordingly, these outcomes work together to support multiple social, economic, and environmental outcomes of importance in the community.

Based on the needs identified, USD recommends the following financing model approaches summarized in Table 6-1 to fund the Duwamish Valley Green Infrastructure Job Training Program. These financing model approaches were identified by interviewees in Section 5.0.

⁴ Health Impact Assessment: Proposed Cleanup for the Lower Duwamish Superfund Cleanup Site (2013)

⁵ Green Infrastructure for Climate Resiliency (2014)

Table 6-1. Financing Model Approaches

Approach	Organization or Group	Proposal
Approach Unified Body		
	Lower Duwamish Waterway Group ⁶	Recommend a green infrastructure job training program be instituted as part of LDWG Superfund Cleanup and possibly align with some of the recommendations that came out of the University of Washington Health Impact Assessment: Proposed Cleanup Plan for the Lower Duwamish Waterway Superfund Site (September 2013). LDWG could set aside job training and O&M funding from site cleanup and restoration efforts through a proposed “1% for Jobs” program that would set aside resources from Superfund cleanup investments to help pay for the ongoing costs of programs such as DIRT Corps and other needed industry training. A community-based, non-profit funding model would be best for this approach.
Approach Agencies Independently		
	Boeing	Develop a proposal, specifically around stormwater in the community, and approach Boeing Community grants, and request funding to design, build, and then maintain a project.
	Port of Seattle, POS	Develop a pilot O&M program around a piece of acreage (e.g., the restoration site at T-117), then conduct the work through monitoring and maintenance plans. Contract with the Port of Seattle long-term for additional work on more acreage after proving success.
	City of Seattle	Work with Steve Lee (through the City of Seattle’s Interdepartmental Team working on Duwamish Cleanup Resolution; January 28, 2015). There is potential to expand the City of Seattle Department of Neighborhoods DROF (or similar program) to include job training in more detail, as well as the potential to expand the DIRT Corps to include pathways to Superfund job training in its curriculum.

⁶ Approach the LDWG as a unified body since Boeing, City of Seattle, King County, and Port of Seattle are among the responsible parties invested in the Lower Duwamish Superfund Cleanup program.

Approach	Organization or Group	Proposal
	KCWTD	Funding for this type of program could include: <ul style="list-style-type: none"> • RFP process to provide green infrastructure O&M landscape services. • Waterworks grant cycle (February 2016). • Developing community ambassadors who receive training around specific stormwater issues and would “adopt” green infrastructure facilities to focus on the aesthetics; this is like a volunteer-based stewardship model (Greenstreet Stewards) founded in Portland, but could be modified as a paid program to work alongside contracted KCWTD utility staff or contractors as a job training program.
	Seattle Parks Foundation (or another Duwamish-based NGO)	Provide administration to the DIRT Corps program to provide fund raising, administration and program development, and focus the work on parks, open spaces and other green infrastructure facilities.

The organizations listed in Table 6-1 above could be approached using a non-profit, for profit, or public/private partnership; examples include:

- **Non-profit model** – Seattle Parks Foundation could act as a fiscal sponsor of a pool of funding that could come from multiple sources including those listed above. Seattle Parks Foundation expressed the opinion that they could attract individual donors and private foundations as well.
- **Private company model** – A company such as USD could run DIRT Corps as a business, making it eligible for bidding, contracting, and teaming agreements with larger construction and landscaping firms for projects; DIRT Corps would identify and seek certification as MWBE/DBE firm for Federal, State and local government contracts.
- **Public/private partnership model** – Prince George’s County in Maryland contracted out 4,000 acres of green infrastructure to a private firm, Corvias Solutions, to design, build and maintain \$100 million in green infrastructure to meet the County’s requirements for preventing discharges to Chesapeake Bay. Anacostia Watershed Society, a non-profit organization also located in Maryland focusing on Chesapeake Watershed restoration, is administering a green roof rebate program and a stormwater credit trading program in Washington D.C. that includes long-term maintenance.

7.0 Recommendations and Next Steps

There is an opportunity to develop a strategy to sustainably fund a green infrastructure job training program because of the attention and investments already underway for the Duwamish Valley in the foreseeable future; thus, this is an ideal time to leverage support. Due to the number of stakeholders and each organization's separate mechanisms for supporting community projects, many of the individuals from the stakeholder interviews were not able to identify one unified solution that represents their organization's recommended financing model approach to fund the Duwamish Valley Green Infrastructure Job Training Program. However, USD supports the financing model approaches listed in Table 6-1, which showcase the following three concepts to establish a Duwamish Valley green infrastructure job training program:

- Facilitating additional follow-up interviews, round tables, and workshops with agency/organization management to further evaluate funding approaches, including individual or collaborative agency contributions.
- Developing a matrix of the needed skills for future workers in the expanding field of green infrastructure in the state of Washington. The Duwamish Valley, with access to South Seattle College's two campuses, multiple government-led water quality projects in progress, networks of NGO and community-based organization (CBO) partners, and a large population of young job seekers, provides a geographic nexus to offer a green infrastructure job training program. USD recommends working with South Seattle College to develop an accredited curriculum for a regional green infrastructure O&M certification program that links to both union construction jobs as well as private employers.
- Developing and implementing a detailed participant evaluation system for the DIRT Corps program to track how people engage with the program and the employment or educational paths they take after completing the program. The program is moving out of its pilot phase and finishing its second season of work. The program will continue through two more quarters to further refine and develop the field-based program and is seeking additional funding to continue the program through 2017. The DIRT Corps program is setting itself apart from other volunteer stewardship programs to become a legitimate job training program with a commitment to providing paid on-the-job training and educational and career mentoring for its participants. There are lessons learned to evaluate, both from the participants and partners, as well as the wider community.

Appendix A: DROF Green Infrastructure Job Training Program, Concerns from Stakeholders and Community Partners

This page left intentionally blank.

A.1 Introduction

As a result of the needs for both a young adult job training program and an organized system to provide routine maintenance of voluntary and municipal/agency green infrastructure projects in the Duwamish, Urban Systems Design (USD) has applied annually for funding from multiple organizations to support green job opportunities for both youth and adults in the Duwamish Valley. In early 2015, USD launched the Duwamish Infrastructure Restoration Training (DIRT) Corps program, using \$39,000 from the City of Seattle's Department of Neighborhoods Duwamish River Opportunity Fund (DROF) and in-kind staff support from the Duwamish River Cleanup Coalition/Technical Advisory Group (DRCC/TAG). The grant funding helped develop a core curriculum and a 12-week green infrastructure job training pilot program for South Park and Georgetown young adults that included after school classes on Thursday evenings, and organized a weekly operations and maintenance (O&M) crew every Saturday from mid-March through the end of May 2015. The program provided young adult job training, mentorship, and activities through care and maintenance of over ten green infrastructure sites located in the South Park, Georgetown, and northern Tukwila areas that currently lack existing maintenance plans. The crew earned a stipend provided by the grant funding to develop maintenance plans and basic monitoring of the sites, so that subsequent groups can continue the care, assess survival rates of vegetation, and identify areas where more work is needed.

USD and its partners have raised an additional \$118,000 to continue the DIRT Corps program from fall of 2015 to spring of 2016. However, a more permanent and sustainable source of funding is needed to continue this work, particularly to connect young adult job training pilot program participants with opportunities.

A.2 Teaching/Work Days – Sites and Guests

USD confirmed sites that were installed in the South Park and Georgetown neighborhoods with grant funding or other voluntary programs (e.g., grant-funded projects and RainWise) that served as teaching sites. The Saturday 10pm to 2pm hands-on teaching/work days focused on care and stewardship of green infrastructure sites that did not currently have maintenance plans, creating a maintenance schedule, and developing leadership skills within the crew to be site leaders for future community work party events.

The indoor classroom was located at the South Park Neighborhood Center from 4:30pm to 6:30pm every Thursday.

The confirmed sites/hosts included the following:

- 3/21/15: Bob LeCoque, Vice President of Markey Machinery, and proponent of the Industrial Strength Natural Drainage site in Georgetown
- 3/28/15: Neighbors at South Orcas Greenstreet in Georgetown
- 4/4/15: Crew leads at Nature Consortium in the Duwamish Greenbelt
- 4/11/15: Vicky Raya from ECOSS connecting us with RainWise homeowners' rain gardens
- 4/18/15: Duwamish Alive @ Recology/Gateway Park North for tree planting
- 4/26/15: Rivercity Skatepark, the 8th Avenue Trail ("Scary" Trail)

- 5/2/15: South Park Greenstreet roadside rain gardens
- 5/7/15: On-site tour of the Barton Roadside Rain garden project from John Phillips, King County's Green Infrastructure Manager; tour included job mentoring for careers in wastewater management
- 5/9/15: Kyong Soh from Solid Ground's Marra Farm
- 5/14/15: Tour "behind the gate" at Boeing's Plant 2 restoration site
- 5/16/15: Marie Swanson (City Light), Liana Beal and Jeremy Grisham (VCC) at Hamm Creek
- 5/21/15: Tour South Seattle College's Horticulture program, meet faculty and students
- 5/30/15: Nisqually Estuary (tour led by Nisqually Tribe) to see what the Duwamish estuary once looked like, and also the power of collaboration for change to improve watersheds for equity and health.

Class guests included the following:

- Sasha Shaw, King County Invasive Weeds program
- Dhira Brown, EarthCorps
- John Phillips, King County Green Infrastructure Program
- Janna Dilley, Seattle's ReLeaf program
- Nature Consortium staff
- ECOSS staff
- Trinh Truong
- King County Roads staff
- Applied Ecology staff
- Kyong Soh, Solid Ground
- John Kern, NOAA
- Brian Anderson, The Boeing Company; Shawn Blocker, EPA
- Sandra Husband, State Laborers Union Apprentice Program
- Veterans Conservation Corps

A.3 Youth Recruitment

Carmen Martinez, a South Park resident, was hired to recruit 10 youth from the South Park and Georgetown neighborhoods to participate in the Duwamish Valley Green Infrastructure Job Training Pilot Program. She has previously worked for Seattle Parks and Recreation and DRCC, and has a very good relationship with neighborhood youth and their parents. She invited two to three youth who she has already been working with through the DRCC to continue to participate in the job training pilot program, and will recruit 7 to 8 additional youth from the community who have not had a chance to participate in this type of program before. Other criteria for youth recruitment included that the youth must be in high school and have one parent or guardian in the South Park or Georgetown neighborhoods.

Young adults received approximately \$720 for the 12-week program if they participated in all the hours of the events.

Young adults included one Antioch University BA program student and one Masters student participating for credit (independent study) or for the stipend; the participant was able to make the choice.

Young adults also included one Veteran participant. For future sessions, USD will directly recruit at Veteran job fairs, outreach events, and through WorkSource to receive more respondents from veterans.

A.4 April Activities – Graphic Designs

In addition to the work conducted each week, a group of young adults worked on developing a logo, slogan, and designs for program placards that would be used at the green infrastructure sites. The youth designers worked with a skilled graphic designer to develop the artwork for printing, and modified it to be used for t-shirts, stickers, brochures, web page, etc. These materials were completed in May 2015. USD bought all participants t-shirts, and put placards up at the rain garden sites being monitored.

A.5 May/June 2015 Activities

- On May 21st, participants in the program were invited to present at the monthly Green Infrastructure Partnership meeting at Antioch University. Andrew Schiffer and Luke Templer, who are both Antioch University students, assisted with developing the presentation and represented the young adult participants' perspectives.
- In summer 2015, the job training pilot program participants were invited to participate in events such as Duwamish Revealed, Fiestas Patrias, and other community events to showcase the program and successes.
- The crew was also enlisted to help distribute tree watering bags and teach homeowners how to fill the bags each week to ensure the trees survived the summer.
- The job training pilot program participants will be ready, as opportunities arise, to present with other youth empowerment, neighborhood, and restoration groups.
- Many of the young adults will be looking for work, including joining existing RainWise contractor crews, alerting neighbors that they are available for lawn mowing and rain garden care, and other landscaping tasks.

A.6 Lessons Learned for Fall 2015 Session

This section describes lessons learned based on input from the program participants.

Program set-up:

- Invite partners, guests, and site hosts who can help augment or build on the skills of our teachers; advise them to present to young adult audience – interactive and no jargon.
- Set up the participants' tool kit (with logo branding), i.e. rubber and leather gloves, hori hori, backpack, group business cards, rain gear, etc.

- Provide healthy food (e.g., local foods meal/snack) with minimal packaging where possible, and ensure proper disposal of waste (theme: reusing wastes as resources) by educating participants, i.e. compost/recycle/garbage.
- Emphasize sanitation and cleanliness due to health reasons and also for the sake of the impression left on others, such as the public or employers.
- Establish a team-vision and mission early in the program, along with shared values.
- Develop group ground rules or a charter that outlines expectations and consistent consequences for specific behavior.
- Teach and practice proper techniques and methods (planting, weeding, mulching etc.), and reinforce the skills over the whole program; revisit technical training throughout the course.
- Based on the languages spoken by the participants, have interpreters/translation available for classes and work in the field.
- Value contrast (before-after photos), and expose participants to our ability to make change in our environment.

Build group dynamics:

- Emphasize participants identifying their own useful niche based on their unique individual talents in relation to others in the program, while also encouraging them to help bring out the best in their colleagues in the same way, so our group grows together and gradually forms a cohesive team in which leaders are brought up.
- Emphasize the value of diversity, friendliness, relationships, and networking (toward resilience).
- Emphasize the power of cooperation in community to build its voice for equity/social justice.
- Emphasize how with green infrastructure we are rebuilding nature that has been lost to development, and that we are part of larger systems which, to function as a whole, rely on networks of decentralized small pieces (rain gardens) that are managed by the local community.
- Emphasize how we are establishing things that will outlive us all and that are globally important (think global act local).
- Emphasize that humanity is fully capable of having a positive and regenerative impact on the earth through development.
- Treat participants as adults, responsible and highly capable.
- Provide more opportunities for the participants to create art, such as handmade signage and culturally appropriate educational materials for the local community.
- Always provide time (2-5 mins) for open & close-outs as a buffer for reflection.

Classroom and field learning:

- Encourage asking “Why?” more, and explain why we are doing what we are doing, especially when we are in the field.
- Focus on planting in the fall/winter session, and set up participant-plant care relationships (prefer voluntary) by naming our plants and tending to them until they are established and able to resist weed competition and drought come summer.

- The experiential learning activities were fun and most effective in our education, and so work to ensure that our in-classroom lecture was more captivating.
- Try to plan better for work sessions, take smaller bites at jobs so we are not rushed and not thorough, and attempt to stay on task and schedule.
- Regularly seek more input and feedback from the participants, clients, and other locals, in order to better critique our work.
- Emphasize the value of hard work that is done efficiently and consciously.
- Help the participants and clients to get in touch with nature and become better connected to their local communities.
- Emphasize the fact that we are part of this place's story, and that we must know the past to ensure the future.
- Emphasize the value of using what is available around us (repurposing wastes and minimizing expenses).

This page left intentionally blank.

Appendix B: Summary of Regional O&M Interviews to Explore Green Infrastructure Maintenance Strategies

This page left intentionally blank.

B.1 Introduction

This appendix provides technical support and guidance to King County Wastewater Treatment Division (KCWTD) as they develop their approach to operations and maintenance (O&M) of their capital green infrastructure projects in Seattle, as well as potential roles for KCWTD to support the development of green infrastructure O&M career pathways for Duwamish Valley residents.

In recent years, the amount of green infrastructure being built across the Puget Sound region is rapidly increasing due to the recognition by utility managers and the public of the valuable ecosystem services that water retention/filtration provides, as well as habitat enhancement and beautification of public and private lands. Achieving a high level of care is critical for increasing public acceptance and support for green infrastructure projects. Ongoing care and maintenance of green infrastructure projects presents challenges for municipalities and their community partners. South Seattle specifically has seen an increase in the number of green infrastructure projects built through municipal capital water quality efforts, voluntary rebate programs (e.g., RainWise), non-profit and community-led efforts through grant funding, or other voluntarily initiated methods. The South Seattle projects collectively showcase the possibilities for increasing natural drainage solutions to improve water quality in impacted neighborhoods, as well as a potential incubator for small businesses, community leadership, and an on-ramp to careers in design, construction, landscaping, and maintenance.

Concerns with maintenance include the overall long-term care of voluntary installation sites that do not already have maintenance agreements or contracts through government agencies. Some sites are on public property, right-of-way, or on private property (such as RainWise installations where a homeowner is no longer able to perform maintenance and needs assistance).

Another concern is with the aesthetic maintenance of municipal sites that have existing O&M plans, agreements, and contracts to keep up the function, but need an extra level of maintenance to keep adjacent property owners happy. In South Park and Georgetown there are bigger concerns regarding sites, areas, and corridors that fall into the gap between the responsibilities of the jurisdictions and end up in disrepair with no clear pathway for a cohesive O&M plan (8th Avenue South/Gateway Park North in Georgetown is an example, with overlapping Seattle Department of Transportation [SDOT], Burlington Northern Santa Fe [BNSF], Seattle Public Utilities [SPU], Parks, private landowners, and the Port of Seattle.)

As more neighborhood-scale green infrastructure projects gain wider acceptance, a variety of approaches and tactics will be necessary to meet the specific maintenance requirements of sites. There is also an opportunity for agencies responsible for source control efforts and Superfund cleanup actions to recognize that these projects create skilled jobs that are needed by the underemployed populations living around the Duwamish Valley. With the attention and investments being planned for the Duwamish Valley across multiple agencies for the foreseeable future, this is an opportune time to develop a strategy to sustainably fund a green infrastructure job training program.

B.2 Approach

Urban Systems Design (USD) conducted research via an interview process to determine what other municipalities across the Puget Sound region are doing about green infrastructure O&M, and what kind of training programs exist now and are needed. These interviews will support recommendations for the City of Seattle and KCWTD.

In order to determine the big picture of existing best practices for green infrastructure O&M, the consultant team for this work order conducted six interviews with municipal program management staff from around the region to explore what strategies are being used to care for facilities and their lessons learned. The focus was to interview managers at jurisdictions that have developed both Capital Improvement Program (CIP) green infrastructure projects for water quality/flow/CSO control, as well as voluntary programs on private property or public lands, since both of these scenarios exist in Seattle, and long-term maintenance is a concern.

The team also included opportunities for local educational and technical training pathways for green infrastructure O&M, through a meeting with South Seattle College's leadership from both their Horticulture program and their B.A. Sustainable Building Science Technology program at the Georgetown Campus. There are also opportunities to design and develop a Green Infrastructure Labor Apprenticeship program at South Seattle College – Georgetown campus, and the report contains additional information from local Labor Union Apprenticeship programs.

This appendix outlines six strategies from the cities of Portland, Oregon; Bellingham, Washington; Port Townsend, Washington; Seattle, Washington; as well as Kitsap and Pierce Counties in Washington. These municipalities were identified and chosen because of the high visibility of their programs and public engagement. Each municipality has successfully worked with adjacent homeowners to build projects in the public right-of-way to control combined sewer or stormwater flows, and addressed the ongoing maintenance needs in creative ways.

These strategies include intergovernmental partnerships, contracting through Requests for Proposals (RFP), organized voluntary stewardship, and other strategies.

- Capital green infrastructure installations' function and aesthetics is maintained and overseen by the agency:
 - Public Works staff
 - Hired landscape maintenance contractors through RFP process
- Capital green infrastructure installations' function is maintained and overseen by the agency, and aesthetics is maintained by others
 - Maintained by adjacent property owners
 - Maintained by organized CBO/NGO organization
- Voluntary green infrastructure installations are maintained by volunteer stewards
 - Maintained by adjacent property owners
 - Maintained by organized CBO/NGO organization

B.3 Methods

The project team contacted leadership and/or staff at six regional municipalities in February 2015, and phone interviews were conducted between February and May 2015. Additional web research was conducted to locate specific documents pertinent to each project.

B.4 Portland, Oregon

Portland, Oregon

Emily Hauth, Bureau of Environmental Services

503-823-7378

Emily.hauth@portlandoregon.gov

Project Description

The City of Portland is a regional leader for green infrastructure design, construction, and maintenance. Since 2003, the City of Portland and its partners have constructed over 1,500 green street facilities to improve pipe capacity and control combined sewer overflows (CSOs) into the Willamette River. Their program anticipates building another 150 facilities in 2016 as part of their CIP efforts, and plans to reach more than 2,000 facilities in the next 5 years. The City of Portland Bureau of Environmental Services (BES) uses green streets, ecoroofs, trees, and other green infrastructure to increase sewer system efficiency, and protect water quality, public health, and the environment. The original focus of their program was controlling CSOs, but now the program is exploring green infrastructure solutions for localized issues like basement flooding, sewer backups, and stream water quality enhancement.



O&M Strategies

The Portland BES revegetation program staff visit each site about four times a year to visually inspect the 1,500 green street sites to determine what type of maintenance is needed and ensure work is being done to utility requirements. They use a combination of city staff, landscape companies contracted through an RFP process, and trained community volunteers called “Green Street Stewards.” The city staff oversees professional contracted landscape companies that are selected by BES through a rigorous RFP process to work with utility staff to trim vegetation, remove and dispose of sediment, add compost or mulch, and planting or replanting vegetation. Their Green Street Maintenance Guide outlines the work. The Green Street Stewards program actively works to sign up residents, businesses, and community groups to “adopt” individual



green streets or blocks of green street facilities, like an “Adopt-a-Street” program. The City of Portland BES offers one-on-one training to teach the basics, and they also collaborate with community groups to organize bigger clean-up events. The volunteer Green Street Stewards sign up to complete four activities: clean up trash, pull weeds, push sediment aside if it is blocking inlets/outlets, and water occasionally in summer if needed. Homeowners adjacent to the facilities are invited to become Green Street Stewards of their block, and CBO or NGO groups from other areas of Portland may sign up to care for a particular area. BES utility staff handles all the infrastructure maintenance of the facilities not related to vegetation or sediment.

Lessons Learned

Portland BES staff suggested building partnerships with adjacent residents and businesses, as well as local/citywide NGO or CBO partners early in the process, so there is a supportive group and interest early in the design and construction process for each area where the city plans to work.

They also suggest being strategic about planning operations and maintenance needs, including what BES staff/contractors must do, what community organizations can do, and what adjacent residents want to see as far as aesthetics.

The big goal is to maintain function and keep the sites “looking good”. Towards this goal, they suggest creating simple tracking systems for Green Street Stewards to count and measure volunteer time, hours needed to complete tasks, materials needed, and more. For now their program is all-volunteer, as they prefer not to enter into financial compensation agreements, but they are open to new ideas. Through their program to contract with private landscape companies, they seek out MWBE and DBE firms for inclusion in the RFP process. There are some emerging youth employment/empowerment organizations in Portland, including the Groundwork Portland Green Team. There may be interest from the BES Green Street Steward program to develop youth job training partnerships with BES green infrastructure contracts.



B.5 Bellingham, Washington

City of Bellingham, Washington

Eli Mackiewicz, Engineering Technician, CESCL

emackiewicz@cob.org

360-778-7742

Project Description

The Downtown Improvement Garden (DIG) project is a capital stormwater project completed in fall 2014. The project improves water quality by installing 36 bioretention facilities to help treat oils, greases and metals, and infiltrate stormwater from over 80 urban acres that currently flow untreated into Whatcom Creek in downtown Bellingham, WA. The DIG project also created attractive urban green spaces downtown, improved pedestrian and bicycle safety, and helped protect sewer ratepayers' investments in the piped collection system.

City of Bellingham Public Works (COB) determined that the DIG project costs were equal to the annual vendor and staff costs of replacement of traditional vault or catch basin filters for the 80 downtown acres. Through a Washington State Department of Ecology grant in partnership with Sustainable Connections, a local sustainable business member organization, COB raised funds for the DIG project, with the adjacent businesses becoming project partners through the design, construction, and maintenance phases. Out of 60 feasible DIG locations, Sustainable Connections and the COB outreach yielded 36 participating business sites. During construction, the participating DIG stewards received free advertising in the form of signs and banners with logos.

O&M Strategies

The COB is the agency of record with the Washington State Department of Ecology, so they must oversee maintenance of the facilities. COB stormwater maintenance crews visit DIG sites periodically, every 6-12 months, to make sure they are functioning properly as part of the COB's stormwater collection system. Currently, COB helps set up volunteer work parties and provides training and oversight to DIG Stewards through Sustainable Connections. The Stewards are instructed to remove trash and invasive weeds, sweep sediment from the inlets/outlets, and water vegetation as needed. They are instructed to call COB if there are any other concerns. COB focuses on function-based maintenance using Puget Sound Partnership's Technical Guidance Manual for Puget Sound.

Lessons Learned

Mr Mackiewicz suggests that a next step should be to establish standardized continuing education green infrastructure design/maintenance classes for non-professionals, from which new workers would emerge to join the growing industry. He was not aware of additional training plan for COB staff, but said that plant identification and invasive removal was the biggest issue in regards to gaps in training. He stated that this is a good time in the industry to get new workers on line, ahead of when the Phase 2 Stormwater Permit rules will be in effect in December 2016. At that point, green infrastructure will be needed by homeowners, new home construction, commercial development, not to mention retrofit

projects; there will be so many projects coming on line that need contractors and maintenance crews to meet the demand.

COB is determining the line between function and aesthetics. COB staff are unionized, and some may worry that unpaid DIG Stewards might be encroaching on their paid scope of work; right now the line is whether the work requires a shovel or not. The term “aesthetics” is still too vague. They have an internal term, “aesthetic maintenance” to classify the DIG Stewards’ work, but they do not want the term to diminish the important work the adjacent businesses are doing to keep stormwater clean, versus just keeping the bioretention “pretty”. They believe that keeping the rain gardens weeded and free of trash will help ultimately with function downstream.

B.6 Port Townsend, Washington

Port Townsend, Washington

Kenneth Clow, Public Works Director

kclow@cityofpt.us

360-379-5090

Project Description

The City of Port Townsend initiated a capital project in downtown Port Townsend to create curb bulbs and roadside bioretention for compliance and code requirements to reduce stormwater flows to Puget Sound. The project is “a nice way to do the right thing,” according to the Public Works Director, Ken Clow.

O&M Strategies

Originally, the City of Port Townsend was responsible for the bioretention maintenance, using Parks Department crews, but due to budget cuts, the City could not afford these workers. Public Works Department did not have any trained staff to care for the aesthetic maintenance of the green infrastructure facilities. By using the “WA State Main Street Tax Credit Incentive Program,” through the State Department of Revenue for historic downtown areas, the City is able to provide funding towards the ongoing care of the facilities, which includes simple care (weeding, trash removal, etc.) since they were designed to be low maintenance. The City of Port Townsend signed a Memorandum of Agreement (MOA) with the Port Townsend Main Street organization (a non-profit 501 c3) to hire and train a staff person to care for the downtown rain gardens and keep them to a standard quality that meets the expectations of the adjacent businesses. The maintenance worker conducts simple care of the rain gardens, and is hired through the organization’s budget, which includes memberships, sponsorships, event income, and City contributions. Volunteers do not conduct any maintenance of these facilities.

Separately, the City of Port Townsend offers residents the opportunity to build voluntary roadside projects on residential streets through a partnership with Washington State University Extension office. Adjacent homeowners sign a MOA with the City that they will maintain the neighborhood roadside facilities.



Samantha Trone, City of Port Townsend development review engineer, admires a rain garden along Washington St. behind City Hall recently. Downtown rain gardens were constructed in 2011 as part of a downtown sidewalk improvement project. Photo: Nicolas Johnson

Lessons Learned

The City of Port Townsend Public Works would welcome an opportunity to participate in a formal program to teach new public works staff how green infrastructure functions, what to do to keep them working, and how to improve the aesthetic quality over time. On the residential side, the City would like to have more education and training opportunities available for residents who want to do more to improve the health of Puget Sound. Port Townsend anticipates increased interest from residents and businesses to build projects in the road right of way that reduce flooding and improve neighborhood streets.

B.7 Seattle, Washington

City of Seattle, Washington

Drena Donofrio, Seattle Department of Transportation

Green Stormwater Infrastructure O&M Asset Manager

drena.donofrio@seattle.gov

Project Description

Seattle Public Utilities (SPU) designs and builds green infrastructure projects in areas with top tier stormwater management challenges like combined sewer overflows (CSOs) and on-going damage to fragile creek systems. SPU has been implementing green infrastructure in Seattle since 2001. Today, Seattle manages nearly 100 million gallons of polluted runoff each year with green infrastructure, with a targeted goal of managing 700 million gallons each year through partnerships with KCWTD, and other public-private partnerships.

O&M Strategies

SPU stormwater crews manage all the hardscaping, pipes and structures, and any sedimentation removal that's done with a shovel; SPU staff do not maintain vegetation. The City of Seattle has Seattle Conservation Corps (SCC) under contract through 2020 for the vegetation management for every capital project that SPU builds in the right-of-way, including Delridge, Ballard, Venema, and SEA Streets.

The SCC, established in 1986, is a unique Parks and Recreation program that trains formerly homeless people for viable, living-wage jobs, and the Corps provides skilled work in Seattle Parks and other government agencies and employers on a contract basis. The program provides year-round employment with an annual budget of about \$4 million. Cathie Anderson and John Toczek manage the work plans and crews. Homeowners adjacent to SPU-built green infrastructure may direct the work of the SCC vegetation management crews, within reason. Barb Decaro and Karen Gault from Seattle Parks Department conduct training with SCC, specific to green infrastructure. There are LID Certificates offered through Washington State University (WSU) and the University of Washington (UW), and Herrera is running a free green infrastructure training program through a grant from the Washington State Department of Ecology.

Lessons Learned

Ms. Donofrio responds to adjacent homeowners' concerns about maintenance, and either directs to SPU or to SCC. She seeks to provide the same level of service across the city. She is working to find the balance between function and aesthetics, to determine who does what, and what level of aesthetics is manageable or unmanageable. These are city-owned stormwater facilities and should be treated differently than parklands or gardens. According to Donofrio, if the City funds catch basin cleaning or O&M of other hard systems, then the City should put taxpayer funding towards managing green infrastructure assets, including pruning trees and removing weeds in green infrastructure, which will give a higher quality of life downstream. If SPU does not manage for aesthetics, but only safety and

function, and the adjacent homeowners do not like the bushy nature of plant, then they might remove or harm the plant or facility.

Green infrastructure plant palettes are a natural system and sites are being used or affected by the communities in different ways, including garbage or people moving through them. Education is the only way forward; if people understand their purpose and function, then they will treat them more respectfully. Currently, the outreach has been web-based, but she recognizes that they need to do more outreach to adjacent homeowners and add interpretive signs. She has struggled with how to get a volunteer program to care for the assets that the city owns, which is why she has contracted with SCC. Donofrio is working to fine tune the specific level of effort and budget needed to care for green infrastructure facilities, and the longer SPU cares for the facilities the more experience they will have to care for them.

B.8 Kitsap County, Washington

Kitsap County, Washington

Clean Water Kitsap

Chris May, Senior Program Manager

Stormwater Division

cmay@co.kitsap.wa.us,

360-337-5777

Project Description

Clean Water Kitsap (CWK) is a partnership between Kitsap County Public Works Stormwater Division, Kitsap Public Health District (KPHD), Kitsap Conservation District (KCD), and Washington State University Kitsap County Extension. CWK has been actively involved with Green Stormwater Solutions (GSS) since 2010. The CWK team has been working on implementing GSS retrofit projects to reduce stormwater flows to Puget Sound, and as of 2015, have over 100 facilities across Kitsap County on public and private land.

O&M Strategies

In order to increase acceptance of GSS, the CWK program leadership wants to keep facilities looking great, what they call “Level A” maintenance. Kitsap County Public Works Stormwater Division Operations and Maintenance (O&M) crews, along with KCD plant/landscape professionals do all the maintenance. For training, the Kitsap County crews went to Portland, Oregon and shadowed the City of Portland BES crews. Observing how Portland handles their maintenance led to making adjustments to the design of GSS projects; for instance, using concrete forebays at the inlets of bioretention cells/swales to allow for easier sediment cleanout as well as less erosion and sediment deposition in planted areas. Initially they had only a 1-person crew to get trained on plant maintenance, and now they have a whole “green crew” of 3-5 staff (depending on season) who maintain their green infrastructure facilities, and cross-train all O&M staff to learn about plant care. Kitsap County continues its relationship with Portland to keep updated on new O&M approaches. “Adaptive management of O&M leads to better designs; if maintenance is easy, it’ll get done,” are truisms for managing Kitsap County’s growing GSS program. Kitsap Conservation District Master Gardeners train O&M staff through regularly-scheduled workshops, which are also open to the public.

For voluntary projects on private property, Kitsap County offers \$1,000 cost-share rebates to residential property owners in Unincorporated Kitsap County for permeable pavers, green roofs, cisterns, rain gardens and more, and through a partnership agreement, Kitsap Conservation District provides site visits and assistance with the rebate application. Each year 50-100 people receive the rebate. Kitsap Conservation District staff inspects the projects annually and offers technical assistance including questions about maintenance. In the future, Clean Water Kitsap hopes that the residential rebates will be offered in Kitsap County cities like Port Orchard and Bremerton, which would exponentially increase GSS in Kitsap County.

Lessons Learned

Kitsap County had to develop its own green infrastructure O&M program by cobbling together green infrastructure/LID classes through Puget Sound Partnership, University of Washington, Washington State University, Master Gardeners, plus the Portland on-the-job training. Their staff would benefit from a one-stop shop for green infrastructure training that is a certificate, like Temporary Erosion and Sediment Control (TESC) training, with regional standards and a universally agreed-upon curriculum that contractors go through to be hired on Kitsap County projects. If this type of training existed, then private/commercial property owners could also hire a certified green infrastructure maintenance crew to do the green infrastructure O&M work, and there would be a certainty about what would get done, accepted O&M plans, the level of care, and regional standards.

B.9 Pierce County, Washington

Pierce County, Washington
Dawn Anderson, Project Manager
Pierce County Public Works
danders@co.pierce.wa.us
253-798-4671

Project Description

Pierce County Surface Water Management (SWM) has built a phased project on public land in partnership with Pierce County Parks at Spanaway Lake Park. This project is funded primarily by stormwater retrofit grants from the Washington State Department of Ecology to comply with Federal Clean Water Act, which requires communities to prevent pollution from entering impacted waterbodies. SWM also worked with the Parks Department on retrofitting Sprinkler Recreation Center. The project includes installation of bioretention areas (large, engineered rain gardens), permeable pavement and pavers, and stormwater filters. Benefits include reducing direct stormwater runoff discharge to Spanaway Lake and Spanaway Creek, providing water quality treatment, and recharging groundwater.

O&M Strategies

Pierce Conservation District provides training on how to care for the facilities. Parks Department staff is conducting maintenance on the project. In the future Pierce County SWM plans on coordinating volunteers through outreach with the school system.

Lessons Learned

Currently, only a few Pierce County staff have received training on green infrastructure/LID O&M. Pierce County staff and the industry as a whole would benefit from formal training on how green infrastructure/LID functions, what to do to keep them working, and how to improve the aesthetic quality over time. Ms. Anderson recognizes the future of green infrastructure in Washington State, and wants young adults entering the workforce to know that there is money to be made in this industry and our State needs a concerted effort to train people to do this work, ideally starting with students in public school. A partnership with Pierce Conservation District and Washington Stormwater Center could include additional workshops on care for green infrastructure projects that are geared for Public Works staff and their community partners.

B.10 Sandra K. Husband, Union Apprenticeship Consultant

Sandra K Husband, Union Apprenticeship Consultant
12806 Gateway Drive South
Seattle, WA 98168
206-835-1028

Through the unions, there are pathways for workers into industry trades. Ms. Husband's program can provide information on how to set up an apprentice program through the state, as well as resources for women and veterans. She can also assist with developing a green infrastructure construction/maintenance apprentice program.

B.11 South Seattle College

South Seattle College

Peter Lorz, VP of Instruction

Holly Moore, Executive Dean, Georgetown Campus

Bob Glatt, Landscape Horticulture Program

Vicky Hardy, Bachelor of Applied Science (BAS) in Sustainable Building Science Technology (SBST) program

Building Trades Apprentice - Journey-Level Programs

South Seattle's current program offerings could provide pathways to careers in green infrastructure design, construction, and O&M. They are building alliances through STEM high school programs. Their Landscape Horticulture program, located at South Seattle College's main campus in the Delridge neighborhood, is already a successful gateway to landscape careers. Their Bachelor of Applied Sciences and Building Trades Apprentice programs at the South Seattle College's Georgetown Campus include Labor Apprentice programs and Trowel Trades, which could be applied to concrete formwork and permeable pavements/hardscaping aspects of green infrastructure.

B.12 Lessons Learned

This assessment is a starting point since only six municipalities were interviewed. In some cases the organizations are large, and the interviewees were not able to answer all of the questions. In many cases the agencies' management was not included and the statements made by staff are not to be construed as speaking for the entire utility. Despite that, our interviews helped us understand interviewees' beliefs and perceptions about best practices for ongoing care and maintenance of their facilities, and their thoughts on education, training, and access to the emerging green infrastructure industry.

Each municipality, regardless of size, has developed their own approach to maintaining their green infrastructure facilities based on existing staff skills, budgets, and regulatory requirements. O&M for

green infrastructure includes managing the care for the pipes, utility vaults, hardscaping, and other parts intrinsic to the function of the system, as well as the vegetation (trees, shrubs and grasses) and litter and other concerns in the neighborhood. Below are some themes and a summary of lessons learned.

Planning O&M needs during the design:

- Be strategic about planning operations and maintenance needs, including what utility staff and/or contractors must do, what community organizations are allowed to do, and what adjacent residents want to see as far as aesthetics.
- Determine the line between *function* and *aesthetics*. The term “aesthetics” is still too vague. Some utilities use the term, “aesthetic maintenance” to classify the work done by voluntary stewards, but they do not want the term to diminish the important work the adjacent businesses are doing to keep stormwater clean, versus just keeping the bioretention “pretty.” They believe that keeping the rain gardens weeded and free of trash will help ultimately with function downstream.
- Find the balance between function and aesthetics, to determine who does what, and what level of aesthetics is manageable or unmanageable. These are city-owned stormwater facilities and should be treated differently than parklands or a garden. If a municipality funds catch basin cleaning or O&M of other hard systems, then they should put taxpayer funding towards managing green infrastructure assets, including pruning trees and removing weeds in green infrastructure, which will give a higher quality of life downstream. If SPU does not manage for aesthetics, but only safety and function, and the adjacent homeowners do not like the way green infrastructure looks, then they might remove or harm the plant or facility.

For utility staff:

- All interviewees would welcome opportunity to participate in a formal program to teach new public works staff how green infrastructure functions, what to do to keep them working, and how to improve the aesthetic quality over time.
- Each municipality now has to develop its own green infrastructure O&M program by cobbling together green infrastructure classes through Puget Sound Partnership, University of Washington, Washington State University, Master Gardeners, Conservation Districts, and/or on-the-job training.
- Utility staff would benefit from a one-stop shop for green infrastructure training that’s a certificate, like Temporary Erosion and Sediment Control (TESC) training, with regional standards and a universally agreed-upon curriculum that contractors go through to be hired on projects. If this type of training existed, then private/commercial property owners could benefit by hiring a certified green infrastructure maintenance crew to do the green infrastructure O&M work, and there would be a certainty about what would get done, accepted O&M plans, the level of care, and regional standards.
- Form a partnership with Conservation Districts and Washington Stormwater Center to include additional workshops on care for green infrastructure projects that are geared for Public Works staff and their community partners.

- Green infrastructure plant palettes and soils are a natural system and training needs to cover these technical aspects of the landscapes.
- Most interviewees agreed that plant identification and invasive removal was the biggest gap in existing training.

For developing voluntary stewardship program:

- Build partnerships with adjacent residents and businesses, as well as local/citywide NGO or CBO partners early in the process so there is a supportive group that builds interest early in the design and construction process for each area where the city plans to work.
- Create simple tracking systems for volunteer/stewards to count and measure volunteer time, hours needed to complete tasks, materials needed, and more.
- More outreach is needed to adjacent homeowners and to add interpretive signs about how green infrastructure functions, detailed info about plants and how the facilities are part of a larger clean-water system.

For developing future green infrastructure workforce, as well as community stewards:

- This is a good time in the industry to get new workers on line now, ahead of when the Phase 2 Stormwater Permit rules will be in effect in December 2016. At that point, green infrastructure will be needed by homeowners, new home construction, commercial development, not to mention retrofit projects; there will be so many projects coming on line that need contractors and maintenance crews to meet the demand.
- Young adults entering the workforce need to know that there is money to be earned in this industry and our State needs a concerted effort to train people to do this work; ideally starting with students in public school.
- Establish standardized continuing education green infrastructure design/maintenance classes for non-professionals, from which new workers would emerge to join the growing industry.
- On the residential side, more education and training opportunities are needed for residents who want to do more to improve the health of Puget Sound. Our region anticipates increased interest from residents and businesses to build retrofit projects on private property, as well as in the road right of way that reduce flooding and improve neighborhood streets.
- Education is the only way forward; if people understand the purpose and function of green infrastructure, then they will treat the facilities more respectfully.

Appendix C: Agency/Organization Stakeholder Interviews to Explore Approaches for Establishing a Duwamish Valley Green Infrastructure Job Training Program

Research conducted by Just Health Action on behalf of Urban Systems Design

This page left intentionally blank.

C.1 Purpose

Conduct five key informant interviews of local government agency and non-governmental organization (NGO) partners that may be interested in the establishment of the Duwamish Valley Green Infrastructure Job Training Program. This job training program would provide care and stewardship of green infrastructure and open spaces. The program could also provide mentorship, career, and educational pathways to jobs within the green/gray infrastructure, landscaping, construction, planning and design industries.

C.2 Methods

We established a list of more than 30 organizations (see Table C-1) to interview based on our Duwamish Valley contacts and their recommendations.⁷ We prioritized the five stakeholder organizations below because of their already existing strong involvement with ongoing and future green infrastructure projects in the Duwamish Valley. We made initial contact with the five organizations through a phone conversation inquiring about their interest in conducting a one hour in-person interview. In some cases, the people we contacted referred us to another individual as a starting point for the interview. We then e-mailed each person or group of people to be interviewed a 2-page document that contained background discussion and the survey instrument (see Table C-2).

Organization; Names of interviewees; Date of interview:

- The Boeing Company (Boeing); Brian Anderson, Geologist; July 30, 2015
- City of Seattle (City); Dave Trovato, Human Resources; September 10, 2015
- King County Wastewater Treatment Division (KCWTD); Mary Wohleb, John Phillips, Kristine Cramer, Cindy Clark, Abraham Araya; September 3, 2015
- Port of Seattle (POS); George Blomberg, Roy Kuroiwa, Jon Sloane; July 28, 2015
- Seattle Parks Foundation (SPF); Becca Aue, Sean Watts; August 6, 2015

C.3 Results

The interview process was semi-structured. Due to the size of each agency/organization, not all questions could be answered by the person(s) interviewed. The results below are generalized, but provide a picture of the state of the interviewed organizations' understanding of green infrastructure projects in the Duwamish Valley and their interest in a more permanent maintenance program.

Q1. What kinds of green infrastructure projects have your organization completed, or will be completed over the next 10 years in the Duwamish Valley? (Including but not limited to: tree planting/beautification, rain gardens/bioretention, stormwater swales, permeable paving, green roofs, water catchment/harvesting, etc.)

⁷ Principal consultants for Urban Systems Design and Just Health Action collaborated on this methodology, and Just Health Action conducted the interviews and developed the summary. Just Health Action also provided review of the entire document.

Three organizations (POS, Boeing, and SPF) questioned whether they fit the green infrastructure definition. There are numerous “green projects” being conducted in the Duwamish Valley that range from standard green infrastructure projects (rain gardens/bioretention, stormwater swales, permeable paving, water catchment/harvesting) to shoreline habitat restoration following remediation of uncontaminated or contaminated soils and sediments, trail development, enhancement and improvement of lands.

We recommend that another term other than “green infrastructure” be used unless KCWTD is only interested in focusing on green infrastructure job training programs in the Duwamish Valley.

Q2. What is your organization’s current operations and maintenance plan for your existing landscape facilities? Does it include your own employees, trained/organized volunteers, or hiring outside contractors?

Boeing contracts out all of their O&M work to private companies.

For the City, the interviewee referred us to other departments to answer this question.

For POS, O&M is associated with a specific set of acreage. A pot of money is set aside to maintain a site and the interest is used for maintenance.

KCWTD is fined by Ecology on CSO control projects if they do not have a maintenance plan.

For SPF, standard O&M plans are associated with a capital project. However, after the capital project is over, the money for maintenance runs out and that is considered problematic.

Q3. How does your organization foresee maintaining future projects that you build?

Yes, maintenance is needed in the future and there are needs. For the City, KCWTD, POS, it could be the agency itself or it will be contracted out, or a little of both. For Boeing and SPF, it will be contracted out.

Q4. Do you have difficulty finding trained/skilled people for operations and maintenance? If yes, why? Do you think there is a lack of skilled workers to maintain present and future projects? If yes, why?

Yes, all interviewees identified a strong need to find skilled people.

The biggest problem is that people who are hired understand operations more than they understand maintenance, especially the long-term care for sites. There is a gap between the civil aspects of projects versus “landscaping” aspects. Landscaping is considered the “beautification” parts of projects, but in green infrastructure and restoration the landscaping is the design and these workers need to have a higher status on project teams.

Furthermore, people who are currently hired to do O&M are not skilled in problem solving (POS and Boeing), particularly around maintenance issues. Examples given: knowing what plants to plant; why

wood chips need to be placed; Canada geese eating plants; and wave energy issues from small vessel traffic on the river causing erosion of their restoration sites.

Several interviewees recommended specific curriculum development to teach people about the context of issues. Where and how can that be done?

The City is strongly allied with community colleges and recommends meeting with community colleges to explore potential collaboration. Other agencies are open to the community college approach as well.

Urban Systems Design (USD) and colleagues have been developing curriculum modules as a part of DIRT Corps. USD curriculum could be formalized and used at community colleges or independently.

Q5. What job training/career mentoring opportunities, if any, could your organization participate in, as a way to recruit new employees from local populations of young adults?

City and KCWTD do some mentoring but not necessarily around maintenance. POS, Boeing, and SPF do not.

Q6, Q8, Q9, Q10, and Q11 (combined): What are your thoughts about some type of stewardship fund where government agencies/organizations could commit to a yearly donation contribution to support community maintenance of green projects?

None of the interviewees answered this question directly but they presented an assortment of ideas that we have organized below:

- Approach each agency independently: Develop a proposal for what a green stewardship program would look like at their organization and present it to a specific person or board at organization X.
- Boeing – suggested developing an idea/proposal, specifically around stormwater in the community and approaching Shyla Miller at Boeing Community grants, and asking for the funding.
- POS – suggested development of a proposal around a piece of acreage (e.g., the future restoration site at T-117), prove you can do it, and then ask for more acreage after showing success.
- Or wait for a funding cycle and apply.
- Or go to a POS commissioner with problem and idea and get them to adopt the maintenance idea.
- City – Ask Steve Lee (Mayor’s office and part of the Interdepartmental Team working on Duwamish Cleanup Resolution (January 28, 2015); possibly expanding the Duwamish River Opportunity Fund (DROF) to include developing this idea further.
- KCWTD – Funding – RFP process or Waterworks grant. KCWTD staff suggested the idea of community ambassadors who have received training around specific stormwater issues and would “adopt” green infrastructure facilities to focus on the aesthetics; this is like a volunteer-

based stewardship model (Green street Stewards) founded in Portland, Oregon, but could be modified as a paid program to work alongside contracted KCWTD utility staff or contractors as a job training program.

- SPF – (or another NGO) houses the DIRT Corps program to provide fund raising, administration and program development.

The organizations above could be approached with non-profit, for profit, or public/private partnership organizational models; see examples below.

- SPF Non-profit model – SPF could act as fiscal sponsor of a pool of funding that could come from multiple sources including above. SPF thinks they could attract individual donors and private foundations as well.
- Private company model – USD (or another company) runs DIRT Corps as a business, making it eligible for bidding, contracting, and teaming agreements with other firms for Duwamish Valley projects (and beyond); DIRT Corps would identify and seek certification as MWBE/DBE firm for Federal, State and local government contracts.
- Public/private partnership model – Prince George’s County in Maryland contracted out 1,000 acres of green infrastructure.
- Approach Lower Duwamish Waterway Group (LDWG) since Boeing, City of Seattle, King County, and Port of Seattle are responsible parties. Can a green stewardship program be instituted as part of the LDWG Superfund Cleanup and possibly align with some of the recommendations that came out of the University of Washington *Health Impact Assessment: Proposed Cleanup Plan for the Lower Duwamish Waterway Superfund Site* (September 2013). Ideally, a community-based, non-profit model would be best for this approach.

Note: We learned through our interviewing process as well as running the DIRT Corps program, that there is confusion about all the different job programs that USD (young adults), DRCC (youth), JHA (youth and adults) and others are doing in the Duwamish Valley. SPF suggests developing one unified program to avoid funding confusion.

Q7. Are there any other organizations or people we should be talking to?

Yes, multiple. See Table C-1.

C.4 Summary

This assessment is incomplete since we only interviewed five organizations. In some cases the organizations are so large, the interviewees were not able to answer all of the questions and management has not been included. Despite that, our interviews helped us understand interviewees' beliefs and perceptions about the residents of the Duwamish Valley and the potential establishment of a permanent program including:

- All respondents agreed that residents of the Duwamish Valley are underemployed relative to the rest of the City of Seattle and King County, and there is eagerness and passion by all interviewees to assist in remedying this situation.
- There are many green infrastructure projects being built in the Duwamish Valley, and those will only increase in the future; voluntary, community-led projects are increasing due to recent funding (DROF, Green Grants, and now Waterworks), so the assumption is there will be more demand for both stewardship of sites and a need to coordinate the care and maintenance.
- Who will conduct maintenance/stewardship of these sites is in question by all.
- There is a lack of skilled maintenance/stewardship workers who understand the context of maintenance issues and know how to problem-solve.
- Developing and teaching a curriculum on maintenance/stewardship topics is important and could be done at the community college level or with an independent company like USD.
- Cultivating Duwamish Valley residents to be leaders in their communities to develop and host maintenance plans as “ambassadors” for sites in need of care would be ideal.
- Generally, interviewees encourage the idea of a pooled funding mechanism but are not confident that it will really happen. As a result, they have suggested alternative models as described in Q6 above.

Table C-1. Interviewee List – Revised September 2015

Contact	Interviewer	Interview Status
Agencies Interviewed		
Port of Seattle: Jon Sloan, Roy Kuroiwa; George Blomberg	Gould	July 28, 2015
The Boeing Company: Brian Anderson Shyla, community grants manager	Gould	July 30, 2015
King County Wastewater: John Phillips; Cindy Clark; Christine Kramer; Mary Wohleb; Abraham Araya	Gould, Simson	September 3, 2015
Seattle Parks Foundation (SPF): Becca Aue and Sean Watts	Gould	August 6, 2015

Contact	Interviewer	Interview Status
City of Seattle: Dave Trovato heads up City of Seattle workforce development (he works for citywide Human Resources) and is aware of a lot of the jobs and training programs the City partners with/has.	Gould	September 10, 2015
Other Potential Agencies to Interview		
Seattle Parks and Recreation: 'Cheryl Eastberg (Cheryl.Eastberg@seattle.gov)'; 'David Graves (David.Graves@Seattle.Gov); Other possible contacts recommended by Cheryl: Cathie Andersen – Parks - Seattle Conservation Corps contact: (684-1090) Chukunki Salisbury – youth green corps (684-4122) Deb Heiden (SPU) – swale projects – (386-1802) Brian DePlace (233-3855) or Shannon Glass (375-1181). Hires habitat restoration company called Bluefield Holdings – www.bluefieldholdings.com John Jainga – Green Seattle Partnership- (233-5019) Joelle Hammerstad (733-9704) Sustainable operations manager (new, not as highup)	Gould	Phone con with Cheryl on July 28. E-mail sent to Cheryl and David with info on July 28th.
Seattle City Light: The City's project manager (Allison Crowley, P.E., Seattle City Light) is responsible for internal City coordination of contracting and construction management of the T-117 remedial action	Gould	Left message. Crowley referred LG to Sheila Strehle
Seattle Public Utilities: Drena Donofrio; SDOT. Shared operations and maintenance. <i>Seattle Conservation Corps</i>		
14th Avenue Business district (aguilamaravilla@hotmail.com)		
ECOSS: Stephen; Vicky; Multicultural Outreach Team; Powerful Neighborhoods		

Contact	Interviewer	Interview Status
SeaMar Community Health Centers:		
Daniel A. Montanez, M.H.A. Director of Business Development Sea Mar Community Health Centers 1040 S. Henderson St. Seattle, WA 98108 P 206.763.5277 C 303.505.5230 danielmontanez@seamarchc.org		
Renata de Carvalho Garcia - RenatadeCarvalhoGarcia@seamarchc.org		
King County Roads: Jim Markus		
Green-Duwamish Watershed Strategy (Tracy Stanton, USFS; city/county leadership)		
GCC: Robin Tomazic and or Holly Krejke rmtomazic@hotmail.com		
Georgetown Merchants Association: Emilie Shepherd emilieshepherd43@gmail.com		
Marra Farm Coalition: Irene Stupka irene.stupka@gmail.com		
Friends of Oxbow Park or Georgetown Urban Farm and Food (GUFF) georgetownartcenter@gmail.com		
Richard Conlin: Consultant to Department of Neighborhoods (DON) Duwamish River Opportunity Fund (DROF)		
WTD recommendations from Sept 3 interview:		
Jeff Stern; Beth Schmoyer; Sheila Strehle		
Boeing recommendations from July 30 interview:		
Shyla Miller at Boeing		

Contact	Interviewer	Interview Status
<p>City recommendations from Sept 10 interview:</p> <p>SDOT</p> <p>SPU</p> <p>Parks</p> <p>Seattle City Light: Keith Gulley (206-684-3598) is the manager of City Light's talent acquisition team in HR and would be a good point of contact.</p> <p>Chris Peguero (206-684-8956) is City's Light's Environmental Justice person and may be interested in this program from an environmental equity lens.</p> <p>South Seattle CC: Veronica Wade</p> <p>Anna Pavlik – Financial and Administrative Services (FAS)</p> <p>Workforce Development Council</p> <p>Seattle Jobs Initiative</p> <p>Skill Up WA</p> <p>Got Green</p>		
<p>Darren Morgan, IDT Duwamish group; SDOT street trees Darren.Morgan@seattle.gov</p> <p>Paul Humphries, Paul.Humphries@seattle.gov</p> <p>Michelle Caulfield, OED Michelle.Caulfield@seattle.gov</p> <p>Jana Dilley, SDOT Trees for Neighborhoods: Jana.Dilley@seattle.gov</p>		
<p>Erika Melroy, Community relations Recology emelroy@recology.com</p>		

Table C-2. Exploring the possibility of establishing a Duwamish Valley permanent green infrastructure training program⁸

#	Questions
Q1.	What kinds of green infrastructure projects have your organization completed, or will be completed over the next 10 years in the Duwamish Valley? (Including but not limited to: tree planting/beautification, rain gardens/bioretenion, stormwater swales, permeable paving, green roofs, water catchment/harvesting, etc.)
Q2.	What is your organization's current Operations and Maintenance plan for your existing landscape facilities? Does it include your own employees, trained/organized volunteers, or hiring outside contractors?
Q3.	How does your organization foresee maintaining future projects that you build?
Q4.	Do you have difficulty finding trained/skilled people for operations and maintenance? If yes, why? Do you think there is a lack of skilled workers to maintain present and future projects? If yes, why?
Q5.	What job training/career mentoring opportunities, if any, could your organization participate in, as a way to recruit new employees from local populations of young adults?
Q6.	What are your thoughts about some type of stewardship fund where government agencies/organizations could commit to a yearly donation contribution to support community maintenance of green projects?
Q7.	Are there any other organizations or people we should be talking to?
Q8.	Do you have any recommendations for what that stewardship model might look like?
Q9.	Do you have any recommendations for who or what organization might be willing to run a stewardship fund like that?
Q10.	Do you think your organization would be open to giving to a stewardship fund, and what might that relationship look like?
Q11.	Is there anything else you wish to add?
Q12.	Name: _____ What is your role at your organization?

⁸ The interview process was semi-structured. During the interview process, Questions 6, 8, 9, 10, and 11 were often combined depending on the interviewee's knowledge of the situation.

C.5 References

Environmental Protection Agency, “Green Infrastructure for Climate Resiliency” (2014)

http://water.epa.gov/infrastructure/greeninfrastructure/upload/climate_res_fs.pdf

Environmental Protection Agency, “Why Green Infrastructure”

http://water.epa.gov/infrastructure/greeninfrastructure/gi_why.cfm

Accessed 9/1/15

Green for All in partnership with American Rivers, “Staying Green: Strategies to Improve Operations and Maintenance of Green Infrastructure in the Chesapeake Bay Watershed”

<http://www.americanrivers.org/newsroom/resources/staying-green-joint-reports-on-operations-and-maintenance-of-green-infrastructure-in-the-chesapeake-bay/>

Accessed 3/1/15

Green for All in partnership with American Rivers, “Staying Green and Growing Jobs: Green Infrastructure Operations and Maintenance as Career Pathway Stepping Stones”

<https://www.americanrivers.org/assets/pdfs/reports-and-publications/staying-green-and-growing-jobs.pdf>

Accessed 3/1/15

Washington State Department of Ecology LID Resources:

<http://www.ecy.wa.gov/programs/wq/stormwater/municipal/LID/Resources.html>

Accessed 7/3/15

YouTube videos illustrating the LID resources:

<https://www.youtube.com/playlist?list=PL8BmI4b96dKaO00KU9g4hQuVlgS5l-oeI>

Accessed 7/3/15

Washington State University Technical Workshop Series:

<http://cm.wsu.edu/ehome/lidworkshops13/77408/?&>

Accessed 7/3/15

2012 LID Technical Guidance Manual for Puget Sound:

http://www.psp.wa.gov/downloads/LID/20121221_LIDmanual_FINAL_secure.pdf

Accessed 7/3/15

Clean Water Kitsap “Virtual Tour” <https://vimeo.com/44949566>

Accessed 7/3/15

Clean Water Kitsap: Manchester Stormwater Retrofit Park

<http://kitsap.paladinpanoramic.com/project/2231/44030>

Accessed 7/3/15

Portland, Oregon Bureau of Environmental Services (BES) GreenStreet Steward Maintenance Guide

<https://www.portlandoregon.gov/bes/52501>

Accessed 9/30/15

Groundwork Portland: <http://www.groundworkportland.org/>
Accessed 5/5/15

Health Impact Assessment: Proposed Cleanup for the Lower Duwamish Superfund Cleanup Site (2013)
http://deohs.washington.edu/sites/default/files/research/HIA_final_report_10-15-13_low_res.pdf

King County Determinants of Equity Baseline Project:
http://www.kingcounty.gov/~media/elected/executive/equity-social-justice/2015/The_Determinants_of_Equity_Report.ashx?la=en

Social determinants of health: employment conditions:
http://www.who.int/social_determinants/themes/employmentconditions/en/

Corvias Announces Public-Private Partnership Agreement with Prince George's County
<http://stormwater.wef.org/2014/11/corvias-announces-public-private-partnership-agreement-prince-georges-county/>

District of Columbia Department of Energy and Environment's green infrastructure programs.
<http://insight.gbig.org/green-roofs-in-washington-dc-are-expanding/>
and <http://doee.dc.gov/>