Appendix 14 – Phase 3a Proposal Planning and Development Progress Meeting Documents 04202017

Modernizing Education and Outreach Strategies

Background

Introduction to BMP

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Problem Description

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Results of Prior Studies

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EW
Effectiveness Studies Development Project

(Heading TBD)

Key Project Team Members

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Project Schedule

Budgeting and Funding Sources

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Potential Management Changes Resulting from Research Findings

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Project Overview

Study Goal

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Study Description and Objectives

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Study Location and Target Population

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POPULATION
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Tasks Required to Conduct Study

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Data Needed to Meet Objectives

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Agency Logo

HDR

Appendix 15 – Phase 3a Proposal Planning and Development Progress Meeting

Eastern Washington Effectiveness Studies Phase 3a – Public Briefing; Yakima, Washington

May 16, 2017 10:00am – 12:00pm

STUDY COMMENTS:

Garland Avenue Stormgardens:

Name: *Matt Jabloner, PE* Organization: *U.S. Navy*
Phone #: *360.398.0050* Email: matt.jabloner@navy.mil

- *We (the US NAVY) are testing use of bone char for stormwater treatment in San Diego. Glad to get you information if you would like.*

Name: *Annie Alsheimer* Organization: *MIG/ SVR*
Phone #: *206.223.0326 ext 704* Email: aalshimer@mig.com

- *It would be interesting to see the plant lists & additional benefits of vegetation when grown in Biochar compost. Many gardeners use biochar compost for increased plant growth and reduced fertilizer requirements. One Question, is dust a problem with biochar?*

Modernize Education and Outreach Strategies:

Name: *Jim Elkins* Organization: *U of Idaho Extension*
Phone #: *208.292.1287* Email: jenkins@uidaho.edu

- *Project WET – Water Education for Teachers*
  Look into investigative learning, place-based & project-based learning-
  The Confluence Project, Adventure Learning, McCall Outdoor Science School

Mobile Contractor Illicit Discharge Education:

Name: *Jim Elkins* Organization: *U of Idaho Extension*
Phone #: *208.292.1287* Email: jenkins@uidaho.edu

- *My concern here will be in gathering honest responses*
  1. *These services may shy away from formal survey/research participation – this can lead to response bias*
  2. *You may talk with office staff who are trained to "say the right thing" – this may lead to confirmation bias*
  3. *A focus on barriers to participation might be most fruitful*

Stormwater BMP Awareness:

Name: *Jim Elkins* Organization: *U of Idaho Extension*
Phone #: *208.292.1287* Email: jenkins@uidaho.edu

- *It will be interesting to triangulate data from survey responses with focus group interviews – but the two will need to be carefully designed by someone well trained in qualitative survey/interview methods*
- *An easier way might be a targeted owner phone interview*
- *It will be interesting to see whether responses vary by socio-economic demographics*

Proposal Development Status

Status	Task	Timeline
☑	Kickoff Meeting with City of Spokane Valley (CoSV) and Proposed Lead Entities	March
☑	Develop Phase 3a Conceptual Study Design (revise Phase 1 Conceptual Study Design)	March - April
☑	Ecology buy off of Phase 3a Conceptual Study Design	April - May
☑	Public Briefing and Comment Period (including Study Poster development)	Mid May
☐	HDR team completes draft of 8 Detailed Study Design Proposals (Proposal) including Peer Review of each Proposal	May to mid-June
☐	CoSV, Lead Entity, and Participating Entities Proposal Review and Comment Period	June 12th to June 16th
☐	HDR incorporates comments	June 19th to 23rd
☐	HDR submits final Proposals to CoSV	June 23rd
☐	CoSV submits Proposals to Lead Entities	June 26th
☐	Lead Entities Finalize Proposals	June 26th to June 30th
☐	Lead Entities submit Proposal to Ecology	On or before June 30th

Eastern Washington
Stormwater Effectiveness Studies

Detailed Study Design Proposal

Long-term Permeable Pavement Sidewalk Infiltration Rate

Study Classification:

☑ Structural BMP ☐ Operational BMP ☐ Education & Outreach

Study Objective(s):

☑ Evaluate Effectiveness ☑ Compare Effectiveness
☐ Develop Modified BMP ☐ Develop New BMP

Prepared For:

City of Spokane Valley
Public Works Department
11707 East Sprague Avenue, Suite 106
Spokane Valley, Washington 99206-6124
(509)720-5018

Lead Entity
Department
Street Address
City, WA Zip Code
Phone Number

Prepared By:

HDR, Inc.
1401 E. Trent Ave., Suite 101
Spokane, WA 99202
(509)343-8500

Drummond Carpenter, PLLC
9085 Montezuma Ave.
Kalamazoo, MI 49009
(248)763-4099

Lead Entity Logo

Proposal Publication Information

Insert information about where the Proposal will be stored and accessible to the public (see section 15.2). Include a weblink and/or contact information.

Proposal Author and Contact Information

Donald D. Carpenter
Drummond Carpenter, PLLC
Principal
9085 Montezuma
Kalamazoo, MI 49009
dcarpenter@drummondcarpenter.com
248.763.4099

Proposal Peer Review and Contact Information

Aimee S. Navickis-Brasch
HDR, Inc.
Senior Stormwater Engineer
1401 E. Trent Ave., Suite 101
Spokane, WA 99202
(509)343-8515

QAPP Publication Information

This item will be completed for the QAPP.

QAPP Author and Contact Information

This item will be completed for the QAPP.

Signature Page

Approved by:

_____ Date

Donald D. Carpenter, Primary Author, Drummond Carpenter, PLLC

_____ Date

Aimee S. Navickis-Brasch, Proposal Peer Review, HDR, Inc.

_____ Date

Name, Proposed Lead Entity, Jurisdiction

_____ Date

Name, Participating Entity, Jurisdiction

_____ Date

Name, Participating Entity, Jurisdiction

_____ Date

Art Jenkins, City of Spokane Valley Grant Project Manager

_____ Date

Karen Dinicola, Ecology Gross Grant Project Manager, Ecology

_____ Date

Doug Howie, Structural BMP Proposal Approving Authority, Ecology

2.0 Executive Summary – QAPP Only

This section will be completed for the QAPP.

4.3 Study Location

This study will be conducted at residential and commercial sidewalk sites in the selected lead entities jurisdiction. The specific locations will be determined by the lead entity, considering both project objectives and sidewalk replacement needs. It is a paired investigation, so the environmental conditions of both the test and control sites will be similar.

5.3 Budget and Funding Sources

Commented [NA1]: To be completed by HDR

Task	Hours	Cost Per Hour	Equipment Fees	Total Cost Per Task
QAPP Development	100			
BMP Implementation				
Design four block-long PC sidewalk segments [1]				
Construct four block-long PC segments[2]				
Data Collection				
Infiltration measurements (at 10 per segment twice per year) for a total of 80 measurements per year for 10 years				
Visual assessment of pavement condition (same locations and duration as infiltration measurements) for a total of 80 of observations per year for 10 years				
Maintenance				
Perform routine maintenance on two test segments twice per year for a total of 40 maintenance activities				
Reporting				
Develop **Final Report** including data analysis	80			
Develop **Annual Report(s)** one per year for a total of 10	24			
			Total Estimated Study Cost	

1. The design cost include hours for the following items: designing four side sections that are 4' wide by 100' long, developing the PS&E package, and awarding work to the contractor.
2. This cost is based on $X/lineal foot of sidewalk. This does not include the cost to purchase any property.

6.0 Quality Objectives – QAPP Only

This section will be completed for the QAPP.

(8-12) Detailed Study Design Proposals (DSDP)

Study #	Proposed Study Title	Jurisdiction to Submit to DSDP by 6/30/2017
1	Modernizing Education and Outreach Strategies	City of Kennewick
2	Mobile Contractor Illicit Discharge Education	City of Wenatchee
9	BMP Inspection and Maintenance Responsibilities	Yakima County
14	Sharp Avenue Porous Pavement Study	City of Spokane
15	Street Sweeping and Catch Basin Cleaning Comparison	City of Ellensburg
24	Garland Avenue Stormgardens *	City of Spokane
28	Sand Filter Vault BMP	Spokane County
Atleast one more study from the following four DSDPs will need to be submitted to Ecology for approval by 6/30/2017		
7	Stormwater BMP Owner Awareness	tbd
16	Seasonal Differences in Street Sweeping Material Removal	tbd
20	Use of Non-vegetative Swale with Native Soils	tbd
29	Determining Pollutant Contributions from Municipal Stormwater in Eastern WA using GIS	tbd
Draft DSDPs for the following are being completed, however probably will not be advanced for Ecology approval at this time		
12	Long-term Permeable Pavement Sidewalk Infiltration Performance	-
18	Catch Basin Retrofit Device Placement	-
27	Media Thickness Study	-

* Formerly "Biochar Media Stormwater Treatment Study"

(8-12) Detailed Study Design Proposals (DSDP)

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15	Street Sweeping and Catch Basin Cleaning Comparison	City of Ellensburg
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18	Catch Basin Retrofit Device Placement	-
27	Media Thickness Study	-

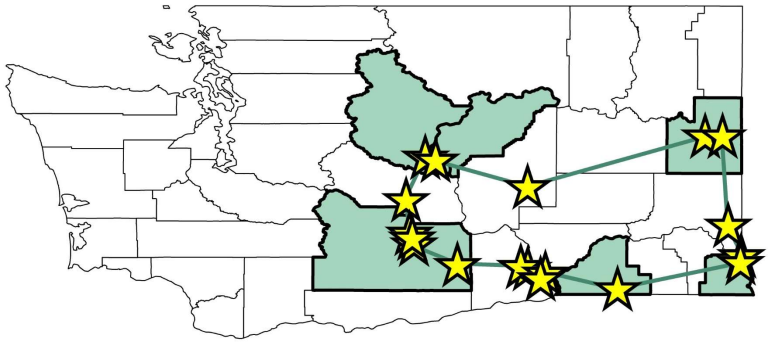
* Formerly "Biochar Media Stormwater Treatment Study"

Appendix 16 – Phase 3a Proposal Ecology Review Meeting Documents

EWA Effectiveness Studies Phase 3a

Study Concept Review Meeting

4/10/2017



Presentation Outline

- Introductions
- Meeting Goal
- Presentation of Updated Conceptual Study Design (Key Collaborator):
  1. Modernizing Education and Outreach Studies (City of Kennewick)
  2. BMP Inspection and Maintenance Responsibilities (Yakima County)
  3. Long-term Permeable Pavement Sidewalk Infiltration Performance (City of Richland)
  4. Seasonal Differences in Street Sweeping Material Removal (City of Spokane Valley)
  5. Use of Non-vegetative Swale with Native Soils (City of Pasco)
  6. Stormwater BMP Owner Awareness (City of Wenatchee)
  7. Catch Basin Retrofit Device Placement (Asotin County and City of Spokane Valley)
  8. Determining Pollutant Contributions from MS4 in EWA using GIS (City of Spokane Valley)

Introductions

Ecology:

- Karen Dinicola, Grant Project Manager
- Abbey Stockwell, E&O Review Lead
- Doug Howie, Structural & Operational BMPs
- Brandi Lubliner

City of Spokane Valley:

- Art Jenkins, Project Manager
  Ecology Grant Recipient

HDR Team:

- Aimee Navickis-Brasch, Principal Investigator
- Jay Decker, Project Manager
- Tom Dupuis, Lead Structural BMPs
- Roger Sutherland, Lead Operational BMPs
  Cascade Water Resources
- Don Carpenter, Lead Structural BMPs and E&O
  Drummond Carpenter
- Zack Holt, Lead WQ Monitoring System Design
  D&H Technology

Meeting Goal

Prior to Today's Meeting

As part of Phase 3a, Art Jenkins and the HDR team met with key collaborators for each study and updated the Phase 1 Conceptual Study Design to reflect their vision for the study in particular, the potential changes resulting from research findings.

Today's Meeting Goal

Provide an overview of the Updated Conceptual Study Designs (since Phase 1) and solicit input from Ecology prior to starting Detailed Study Design Proposals

Next Step

Review Ecology's comments with Key Collaborator, Finalize Phase 3a Conceptual Study Designs, and Develop Detailed Study Design Proposal

Modernizing Education and Outreach Strategies *(E&O)*
Problem Statement

1. The way people receive, process, and interact with educational materials is changing as technology evolves. As such, strategies for disseminating information that were effective in the past (i.e., brochures or posters), may not be as effective now.
2. Many existing SW educational programs were developed without specific learning objectives and/or it is unknown whether these programs are effective at achieving the learning objective (i.e. increasing the target audience's awareness of the impacts of stormwater pollution).

Modernizing Education and Outreach Strategies *(E&O)*
Study Duration, Location, Target Population, & Sample Size

Study Duration
- One-year: Collect Survey Responses

Study Location
- Communities in EWA *(Potentially Quad Cities)*
- Existing outreach opportunities: Schools, Fair, Website, Home & Garden Show, Meetings with engineers/landscapers/developers

Target Population
- Varies: depends on target population for E&O program

Desired sample size
- However many people respond to survey

Modernizing Education and Outreach Strategies *(E&O)*
Research Goal & Potential Management Changes

Study Goal

1. Evaluate the effectiveness of existing SW E&O programs. Effectiveness will focus on whether:
   - The learning objective of the educational program is achieved
   - Educational materials are being received and read using existing outreach strategies
2. Identify methods and successful examples for modernizing outreach strategies

Potential Management Changes Resulting for Research Findings

Based on the study results:

- Modernized outreach will be incorporated into the jurisdictions' outreach programs
- Used to improve the jurisdictions' existing stormwater education programs
- Develop recommendation for a tag or slogan that could be disseminated using modernized outreach strategies

Modernizing Education and Outreach Strategies *(E&O)*
Conceptual Research Approach

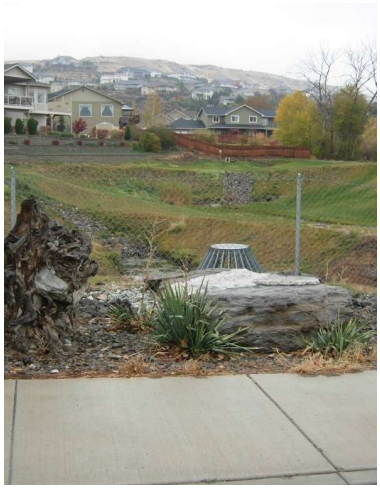
1. Develop inventory of existing SW E&O programs:
   - Lessons plans and/or educational materials
   - The target audience
   - Typical locations for outreach
2. Identify methods for modernizing outreach strategies:
   - Literature search
   - Contacting other jurisdictions
3. Design a survey for the target population:
   - Awareness of the educational program
   - Understanding of the program learning objectives
   - How they received educational materials
   - The most common way they receive information
   - Demographics
4. Administered survey during existing public outreach opportunities
5. Analyze responses

BMP Inspection & Maintenance Responsibilities *(E&O; Operational)*
Problem Statement

Privately-owned structural BMPs represent a unique problem for ensuring long-term maintenance:

- Complications from access issues for inspection
- Failure to maintain structural BMPs
- BMP owner (private party) is responsible for all maintenance

There maybe other strategies or models, such as public ownership and maintenance responsibility which could support better long- term performance of BMPs.



BMP Inspection & Maintenance Responsibilities *(E&O; Operational)*
Research Goal & Potential Management Changes

Study Goal

Develop recommendations for a prototype program for operation and maintenance (O&M) of privately owned structural BMPs.

Potential Management Changes Resulting for Research Findings

More effective models for ensuring that privately owned BMPs are maintained on a regular basis may be identified through the proposed research effort. Based on the study results, recommendations will be developed for a prototype or draft O&M Manual that could be adopted by EWA jurisdictions

BMP Inspection & Maintenance Responsibilities *(E&O; Operational)*

Study Duration, Location, Target Population, & Sample Size

Study Duration

- Less than one-year

Study Location

- Municipalities in WA state and other semi-arid seasonal regions

Target Population

- Stormwater Managers

Desired Sample Size

- 15-20
- Surveys and potentially focus groups

BMP Inspection & Maintenance Responsibilities *(E&O; Operational)*

Conceptual Research Approach

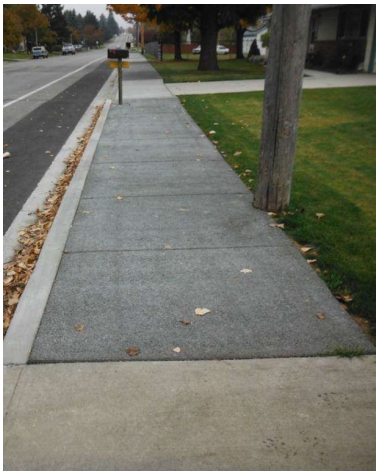
Survey target population to determine how they address long-term needs of privately-owned structural BMPs. The survey will cover:

- Jurisdictions Strategy for inspection and maintenance responsibility
- Estimated number of structural BMPs in the jurisdiction
- Number of structural BMPs inspected each year
- Number of enforcement actions taken as a result of those inspections
- Funding mechanisms
- Inspection or enforcement cost savings through implementation of the selected strategy
- Issues with access or other private property legalities
- Issues of local traditions or "culture" that could affect O&M
- Issues with enforcement or implementation strategies by different agency programs

Survey Monkey (or similar software) may be used to collect responses. Focus groups may also be used in lieu of or in addition to surveys.

Long-term Permeable Sidewalk Infiltration Performance *(Structural)* *Problem Statement*

- Permeable pavement is more expensive than conventional paving materials; so its function as a stormwater BMP in addition to being a viable and long-lasting surface is critical for its cost justification.
- Permeable pavement usage for sidewalks is becoming more common in EWA. However, there are concerns that the infiltration performance and durability of the pavement may be reduced because of Eastern Washington's (EWA) harsh climate, limiting its effectiveness as a stormwater BMP.
  - Large seasonal temperature variation (freeze-thaw cycling) may shorten the durable lifespan of the surface
  - Wind-blown deposition of fine sediments may cause clogging and reduction in infiltration rate



Long-term Permeable Sidewalk Infiltration Performance *(Structural)* *Research Goal & Potential Management Changes*

Study Goal

Evaluate the effectiveness of permeable pavement sidewalk as a BMP in EWA. The effectiveness evaluation will focus on the useful life span with respect to:

- *The infiltration performance over time at sites with and without any maintenance*
- *Durability (visual observations) of surface deterioration compared to conventional pavement*

Results may be used to improve permeable pavement design guidance for sidewalks and recommend O&M procedures for EWA.

Potential Management Changes Resulting for Research Findings

If the infiltration performance of permeable pavement sidewalk applications holds up over time, with little or no maintenance in EWA, permeable pavement may be adopted by *jurisdictions* as a stormwater BMP in appropriate locations.

Long-term Permeable Sidewalk Infiltration Performance *(Structural)*
Study Duration, Location, & Sample Size

Study Duration

- 10-years (collect field data)

Test Site Location

- One community is EWA *(Potentially City of Richland)*
- Residential or Commercial
- Four block long test segments
- Locate test sites between grass buffer strip and roadway

Sample Size:

- For each test segment: 10 infiltration samples per year
- Annual visual observations

Long-term Permeable Sidewalk Infiltration Performance *(Structural)*
Conceptual Research Approach

- Construct block-long test segments of permeable pavement sidewalks in at approximately four locations with similar land use areas.
  - Two control sites with routine maintenance
  - Two test sites without maintenance.
- Infiltration rate of sidewalk segments will be measured two times per year
- Infiltration measurements will be taken at 10 locations to account for spatial variability in infiltration rate.
- Infiltration rate over time will be graphed to determine if, and how fast, a decrease in infiltration rate occurs.
- Visual observations of the condition of the pavement will be made on an annual basis. These evaluations will consist of a qualitative assessment.

Seasonal Differences in Street Sweeping Material Removal *(Operational)*
Problem Statement

- Street sweeping is a proven technique for removing solids and associated pollutants from roadways
- A number of studies correlate higher pollutant removal with greater sweeping frequency.
- Most studies were performed in urbanized areas and focused on evaluation of the effectiveness of street sweeping at regular sweeping intervals
- No studies address climate conditions and considerations
- Few studies addressed removing winter sediment built up during the spring thawing period
- Routine sweeping may not be the most cost-effective strategy in areas with large seasonal fluxes; Strategies for maximizing the effectiveness maybe driven more by region and time of year
- *A targeted study for EWA could help stormwater managers make more informed decisions about where and when to focus their efforts to optimize street sweeping effectiveness.*

Seasonal Differences in Street Sweeping Material Removal *(Operational)*
Research Goal & Potential Management Changes

Study Goal

Evaluate seasonal and potentially regional differences in sediment and pollutant accumulations (using pollutant removal through sweeping as a surrogate measure). The information collected will be used by permittees to optimize the cost-effectiveness of their street sweeping programs.

Potential Management Changes Resulting for Research Findings

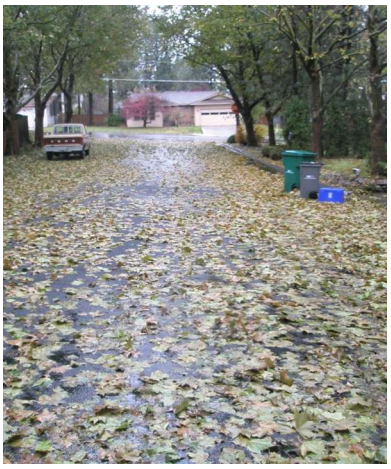
- The timing of street sweeping events may be better focused on the time(s) of year when it will have the greatest effect on material removal which is when accumulations are high.
- This may improve the effectiveness of street sweeping programs by increasing the amount of material removed, and may save jurisdictions money, because they can scale back street sweeping when it will have less impact which could be during the dry summer months.

Seasonal Differences in Street Sweeping Material Removal *(Operational)*
Study Duration, Location, & Sample Size

Study Duration
- 2-years

Study Location
- Up to four communities in EWA
- Test site: arterials and local roadways

Sample Size:
- For every street sweep
  - Measure weight and volume of material collected
- Minimum four samples per year
  - Sieve, PSD, organic fraction, Cu, Zn



Seasonal Differences in Street Sweeping Material Removal *(Operational)*
Conceptual Research Approach

1. *Arterials and representative local roadways in each selected community would be swept on a monthly basis (half the community every two weeks)*
2. *For each sweeping event, the amount of material collected will be weighed and its volume estimated and recorded (per mile of roadway)*
3. *A minimum of four total samples per year of at least 1000 grams will be collected during the course of the study:*
   a. *Samples will be mechanically sieved and analyzed to establish their PSD and organic material fraction (weigh and volume).*
   b. *The sediment fractions will be composited back into three fractions (>63μ; 63 to 250 μ; and 250 to 2000 μ) and analyzed for specific pollutants (e.g., copper and zinc).*
   c. *Nutrient analysis will be conducted on the organic fraction retained by the 2000μ sieve.*

Seasonal Differences in Street Sweeping Material Removal *(Operational)*
Conceptual Research Approach Continued

4. Statistical analysis will be used to identify whether there are significant factors (e.g., timing, region) affecting the amount of material removed by each sweeping event (a surrogate for sediment deposition rate).
5. Graphical analysis will be used to characterize the volume and weight of material and associated pollutants removed with each sweeping event to help identify patterns or differences between regions.
6. If possible, sweepers of the same type (e.g., high efficiency or regenerative air) and age should be used in each of the selected communities where the study would be conducted to allow for comparability of results among communities. *However, because the study is only looking at mass pick up in individual communities, and not efficiency (percent of deposited load removed), the sweepers do not have to be the same.*

Use of Non-Vegetative Swale with Native Soils *(Structural)*
Problem Statement

- BMPs in the SW Management Manual for EWA (e.g. bioinfiltration swales and vegetated filter strips) include installation of plants as part of the design.
- While plants may enhance pollutant removal and infiltration capacity they create extra maintenance needs.
- Dryer parts of EWA - irrigation water required for plants during the summer months often exceeds the annual regional rainfall by tenfold.
- Drought years - the availability of irrigation water is severely restricted, resulting in survivability issues for the plants.
- Some BMPs require engineered soils (i.e. bioretention ponds) which requires jurisdictions to remove and replace native soils
- *If these BMPs could provide adequate treatment without plants and using native soils, they would be more suitable for EWA and constructed more cost effectively.*

Use of Non-Vegetative Swale with Native Soils *(Structural)*
Research Goal & Potential Management Changes

Study Goal

1. Test the feasibility of a 'no plants' option for an infiltration BMP that are typically vegetated and determine what pollutants they will treat in arid and xeriscaping locations
2. Develop a design specification for using native soils in lieu of engineered soils for providing treatment of stormwater runoff.

Potential Management Changes Resulting for Research Findings

A new BMP design guidance *(that does not include plants and defines the range of properties in native soils that are suitable for providing treatment of SW runoff)* and maintenance guidance that is approved for general use for future projects.

Use of Non-Vegetative Swale with Native Soils *(Structural)*
Study Duration, Location, & Sample Size

Study Duration

- 3-years

Study Location

- One community in EWA (potentially Pasco)
- Test site: commercial or light industrial

Sample Size:

- WQ sampling for 12 qualifying events
  - TSS, Cu, Zn, TP, TPH
- Infiltration testing every four months
- After every rainfall event document visual observations of site:
  - Weed growth, vandalism, impacts of blowing sand

Use of Non-Vegetative Swale with Native Soils *(Structural)*

Conceptual Research Approach

1. Develop a specification that defines the suitable physiochemical properties (or range of properties) of native soils for providing stormwater treatment. This includes conducting an extensive literature search and identifying properties based on common citations in the literature.
2. Verify (through analytical testing) that the properties of the native soils at the proposed test site are within the range of properties identified in the specification.
3. Design and construct an infiltration BMP (i.e. bioinfiltration swale or bioretention pond) following the design guidance in the Ecology SW Manual for EWA (or an equivalent manual) with the following exceptions: Use native soils (that meet the new specification) and no plants will be installed.
4. Equip BMP with an automated water quality monitoring system capable of collecting influent and effluent water quality samples.
5. Follow the typical jurisdiction maintenance on the BMP.

Use of Non-Vegetative Swale with Native Soils *(Structural)*

Conceptual Research Approach Continued

6. The infiltration rate would be measured every four months for two years.
7. Collect stormwater influent and effluent samples from 12 qualifying rainfall events. Submit samples to Ecology certified lab for analytical testing.
8. Following each rainfall event visual observation of the site will be documented including weed growth, evidence of vandalism, impacts to the BMP from blowing sands, etc.
9. The data will be evaluated to determine which pollutants meet Ecology's treatment performance requirements defined in TAPE.

Stormwater BMP Owner Awareness *(E&O)*

Problem Statement

- Permit specifies the property owner is responsible for upkeep & ensuring continued function of structural SW BMPs
- Many property owners are unaware of these responsibilities; new owner may not know the BMP exists.
- Municipal staff have difficulty conducting permit specified inspections of BMPs because property owners are not aware inspections are required and they do not want inspectors on their property.
- Increasing property owner's awareness of the obligation and need to routinely maintain structural BMPs to ensure their proper function, may help improve the condition and long-term performance of BMPs.
- This problem is nation-wide and is not limited to EWA, so the results of this study may have wide-reaching impacts.

Stormwater BMP Owner Awareness *(E&O)*

Research Goal & Potential Management Changes

Study Goal

1. Gauge the current level of property owner awareness of maintenance needs, and responsibilities for structural BMPs on their property.
2. Assess the effectiveness of public outreach for increasing awareness of BMP maintenance responsibility.

Potential Management Changes Resulting for Research Findings

Based on the results of this study, and other studies identifying effective outreach practices, a targeted education campaign could be developed to address, specifically, the awareness shortcomings of BMP owners identified by this survey. Results from this study may also be used to develop more stringent ordinances that address BMP maintenance responsibility on private property.

Stormwater BMP Owner Awareness

Study Duration, Location, Target Population, & Sample Size

Study Duration

- Less than one-year

Study Location

- Pilot Test in one EWA Community

Target Population:

- Private Property Owners with Structural BMPs
- Commercial or Residential

Desired sample size

- However many people respond to survey
- Face to face surveys & potentially focus groups

Stormwater BMP Owner Awareness *(E&O)*

Conceptual Research Approach

Phase 1: Background data will be collected to determine how other agencies are addressing BMP owner maintenance needs/responsibilities. This information will be used to develop survey questions for BMP owners and define an approach for collecting data (i.e. a survey, focus group, etc.). Example questions include:

- Do you have any stormwater treatment or flow control (BMPs) on your property?
- Where is the BMP located?
- What is the purpose of the BMP?
- How did you obtain information about the BMP on your property?
- How frequently is the BMP maintained? What does that maintenance entail?
- Who maintains the BMP?
- Have municipal staff ever asked you if they may inspect the BMP? Did you let them?

Results will be evaluated to determine the level of awareness and where there may be information gaps in BMP owner awareness. If Phase 1 results do not indicate that BMP owner awareness is a problem, an educational campaign for increasing BMP owner awareness will not be developed.

Stormwater BMP Owner Awareness *(E&O)*

Conceptual Research Approach Continued

Phase 2: If Phase 1 results indicate that lack of BMP owner awareness is a common reason for BMP failure or lack of maintenance, a follow-up education campaign will be initiated. A targeted education campaign could be developed to specifically address information gaps identified by this survey. The education campaign may incorporate the effective outreach practices through some of the other proposed effectiveness studies.

Future Studies: The survey developed during Phase 1 could be administered again to the BMP owners some length of time after an education campaign is delivered to assess the effectiveness of the education strategy.

Catch Basin Retrofit Device Placement *(Structural)*

Problem Statement

- Catch basin retrofits (i.e. hoods/snouts, downturned elbows, & tees) are thought to improve the effectiveness of catch basins for removing floatables & gross solids & the pollutants associated with them.
- Catch basins without these devices are thought provide little removal, because the primary removal mechanism of a typical catch basin sump is settling.
- These retrofits cause difficulties for maintenance, especially in smaller catch basins. The devices may be removed & may not be reinstalled correctly, or at all.
- A study would help determine how retrofits can be applied most effectively to maximize their benefit and minimize maintenance burdens, and provide more cost-effective treatment (e.g., $/lb of gross solids removed).

Catch Basin Retrofit Device Placement *(Structural)*
Research Goal & Potential Management Changes

Study Goal

- Evaluate gross solids removal differences between two, similarly sized and located catchments; one in which a downturned elbow type retrofit is only installed at the most downstream catch basin and one in which retrofits are installed at multiple catch basins.
- The study would also provide key information on how catch basin retrofits can be used in combination with other management practices, such as source controls and sweeping, to achieve water quality goals such as 80% removal of solids.

Potential Management Changes Resulting for Research Findings

If targeted application (i.e., downstream installations) of downturned elbows is shown to be equally effective:

- Identifying locations within the MS4 where these retrofits have the greatest benefit (would help to prioritize where they are used)
- Inform catch basin design to facilitate compatibility and reasonable maintenance procedures, and optimize cost-effectiveness ($/lb.).

Catch Basin Retrofit Device Placement *(Structural)*
Study Duration, Location, & Sample Size

Study Duration

- TBD (potentially 2-years)

Study Location

- Community in EWA
- Test Site and Control Site
- Small paired catchments
  - Two sides of the same street or large parking lots

Desired Sample Size

- TBD
- Sample Collection at specific intervals (i.e. monthly)
  - Gross Solids (may include: TSS, PSD, Turbidity)

Catch Basin Retrofit Device Placement *(Structural)*

Conceptual Research Approach

1. Select catchments that contain a series of catch basins connected to the same endpoint. In one catchment, each catch basin would contain a retrofit device; in the other, only the final catch basin in the series would be retrofitted.
2. At specific intervals (e.g., monthly) the quantity of gross solids will be estimated in each of the catch basins in both test catchments.
3. The total amount of material removed would be quantified for each system, with the area normalized to account for differences in drainage area between the watersheds, and compared.
4. Depending on the sites selected, the means of quantifying gross solids might vary (i.e. periodic manual removal and weighing of material collected, turbidity measured in runoff in and out of the catchment or basin, etc.).
5. The research will document the typical installation costs, along with O&M costs, so that a cost-effectiveness evaluation ($/lb. removed) can be included in the findings.

Determining Pollutant Contributions from Municipal Stormwater in EWA using GIS *(E&O, Structural, Operational)*

Problem Statement

- Federal and State regulators have assumed (based on NURP) that communities with a population greater than 10,000, discharge a certain baseline quantity of pollutants to surface waters through SW runoff, sufficient to require permitting.
- However, not all jurisdictions have the same conditions (climate, topography, population density, impervious density, discharge type and locations) as those studied previously.
- As such the assumptions related to permitting in these areas may not be applicable or appropriate, thereby resulting in costs that may be unnecessary or not cost-efficient to meet SW requirements.

Determining Pollutant Contributions from Municipal Stormwater in EWA using GIS *(E&O, Structural, Operational)*

Research Goal & Potential Management Changes

Study Goal

This study effort would compare communities to show differences, if any, from studies in successful pollutant removal or outfall disconnection from surface waters, helping both jurisdictions and regulators to prioritize resources to assist where the larger problems are occurring. With this prioritization, the research will demonstrate effectiveness on a $/lb of pollutant removed for the overall jurisdiction.

Potential Management Changes Resulting for Research Findings

- Estimate how effective, using a metric such as $/lb removed, SW management programs are in reducing polluted runoff from impervious surfaces to receiving water bodies.
- Allow jurisdictions to focus priority on areas that contribute pollutant loads to surface waters.
- *A specific outcome could be that the geographic area of permit coverage is limited to the portion of the jurisdiction served by the MS4 outfalls to surface waters. That could be included in the next iteration of the MS4 permits.*

Determining Pollutant Contributions from Municipal Stormwater in EWA using GIS *(E&O, Structural, Operational)*

Study Duration, Location, & Sample Size

Study Duration

- TBD (potentially 1-year)

Study Location

- TBD number of Communities in EWA
- Cities comparable to EWA in semi-arid regions

Desired Sample Size

- TBD
- Actual WQ outfall data from comparable cities

Determining Pollutant Contributions from Municipal Stormwater in EWA using GIS *(E&O, Structural, Operational)*

Conceptual Research Approach

1. Use existing mapping of storm sewer systems and outfall locations. Initial data collection would focus on GIS SW Mapping along with information needed to characterize potential SW pollutants including:
    - information on land use(s), topography, climate
    - basins discharging to surface waters
    - Outfall disconnection since a given baseline year
    - SW programs costs; to be used for effectiveness demonstration (e.g., $/lb. removed).
2. Initial contribution of pollutants will be estimated using WQ data from monitoring programs and studies that report relevant regional and national averages of SW characteristics (i.e. pollutant types and concentrations) from similar land uses (e.g., Boise area monitoring data).
3. Pollutants of concern will be focused on those often targeted by TMDL or similar watershed water quality improvement plans.
4. Comparative analyses & graphics (i.e. "heat" maps) will be developed that represent larger and smaller cities, in various climate types, and with varying degrees of outfall disconnectedness. These will include total pollutant loads from the jurisdiction, unit loads, and $/lb removed for the entire jurisdiction compared to the portion of the jurisdiction with outfalls.

Meeting Minutes

Date | Time | 4/10/17; 10:00AM-11:30PM
4/18/17; 1:00PM-2:00PM
4/19/17; 9:15AM-9:30AM

Location | GoTo Meeting Broadcast from the City of Spokane Valley or the HDR Spokane Office

Project | EWA Effectiveness Studies Phase 3a – Concept Study Design Review Meetings

Meeting Reference Documents:

1. Modernizing Education and Outreach Studies, *City of Kennewick*
2. BMP Inspection and Maintenance Responsibilities, *Yakima County*
3. Long-term Permeable Pavement Sidewalk Infiltration Performance, *City of Richland*
4. Seasonal Differences in Street Sweeping Material Removal, *City of Spokane Valley*
5. Use of Non-Vegetative Swale with Native Soils, *City of Pasco*
6. Stormwater BMP Owner Awareness, *City of Wenatchee*
7. Catch Basin Retrofit Device Placement, *Asotin County and City of Spokane Valley*
8. Determining Pollutant Contributions from MS4 in EWA using GIS, *City of Spokane Valley*

Attendees:

Ecology:
Karen Dinicola, Grant Project Manager
Abbey Stockwell, Reviewer E&O Studies
Doug Howie, Reviewer Structural & Operational BMP Studies
Brandi Lubliner, Reviewer Monitoring System Design

City of Spokane Valley:
Art Jenkins, Project Manager & Ecology Grant Recipient

HDR Team:
Aimee Navickis-Brasch, PI
Jay Decker, Project Manager
Tom Dupuis, Lead Structural BMPs
Roger Sutherland, Lead Operational BMPs
Cascade Water Resources
Don Carpenter, Lead Structural BMPs; E&O
Drummond Carpenter
Zack Holt, Lead WQ Monitoring Design
D&H Technology

Meeting Minutes

The Concept Study Design Review Meetings meeting opened with the *attendees introducing themselves*. As noted below, attendees at the meeting varied along with the specific study that was the focus on discussion.

- **4/10/17 (studies 1-5):** Karen Dinicola, Abbey Stockwell, Doug Howie, Brandi Lubliner, Art Jenkins, Aimee Navickis-Brasch, Jay Decker, Roger Sutherland, Don Carpenter, Zack Holt
- **4/18/17 (studies 7-8):** Karen Dinicola, Doug Howie, Brandi Lubliner, Art Jenkins, Aimee Navickis-Brasch, Jay Decker, Tom Dupuis
- **4/19/17 (study 6):** Karen Dinicola, Abbey Stockwell, Brandi Lubliner, Art Jenkins, Aimee Navickis-Brasch

A summary of Ecology's feedback, as well as comments from the group, are noted on the following pages which are organized by the study title.

1. **City of Kennewick – Modernizing Education and Outreach Studies**
    - *Sample Size* - Need to define a target or goal for sample size in the Proposal
    - *Selection of E&O programs for study* – in the screening criteria, verify that the target audience for the study will be in attendance at one of the jurisdictions outreach opportunities in which data will be collected
    - *Data Collection* - It is important to track demographics with respect to how information is received as it could vary depending on age, gender, etc.
2. **Yakima County – BMP Inspection and Maintenance Responsibilities**
    - *Criteria for Selecting Target Population* – develop criteria such that jurisdictions with both successful and unsuccessful programs are selected for the study; if jurisdictions are surveyed outside WA, verify whether they have the same permit requirements for BMP inspection and maintenance as EWA so that the data collected is comparable`
    - *In the study design*; consider how you will adjust study approach if the first 10 respondents all define problems with their program
    - *Target Population* - Considering the test subject is person; will need to address confidentiality issues
    - *The EWA effectiveness studies purpose*: meant to assist Ecology in understanding the jurisdiction needs and how they are improving their program
    - *In the study design*, consider *messaging*: encouraging target population to respond (i.e. explain why they should spend time responding to question, specifically how it might benefit them)
3. **City of Richland - Long-term Permeable Pavement Sidewalk Infiltration Performance**
    - *Test-Site Selection* – because of winter plowing and piling snow onto sidewalks; site selecting should give preference to including a grass buffer between the road and the sidewalk
    - *Test-Site Selection* – Ecology encouraged the selection of a test site in a commercial area as well as a residential area
    - *Test-Site Selection* – select sites adjacent to each other; test and control sites should be located within close proximity to each other.
    - *Data Collection* – increase sample collection during winter months in consideration of winter road maintenance practices which may influence sediment accumulation
    - *Data Collection* – as part of the inspection process, make an effort to categorize deposition on roads to sidewalks which may cause clogging
4. **City of Spokane Valley – Seasonal Differences in Street Sweeping Material Removal**
    - *Sample Size* – for some parameters (i.e. PSD) more than four samples maybe collected because the testing is less expensive.
    - *Collaborate between studies* - the City of Ellensburg study and this study should collaborate so that the results provide complimentary information
    - *Question to consider with respect to study findings* - if the study identifies how to best time street sweeping, will it be logistically possible to provide all the street sweeping during this time period (i.e. is there sufficient personnel and equipment). A response from the group was that contract employees are often hired to provide this service or the folks who are on staff to sweep are focused on other jurisdictional tasks

5. **City of Pasco - Use of Non-Vegetative Swale with Native Soils**
    - *Ecology Approval Process* – This study will need to follow TAPE process for Ecology approval of general use on future projects
    - *Study Variables* – Ecology expressed concern that this study would change two variables (i.e. soil mix and remove plants). Because two variables have been changed, they expressed concern about the usefulness of the study results. Their recommendation was to use the 60:40 mix without plants instead and focus on the treatment performance without plant (compared to studies with plants).
    - *Current Soil Suitability Criteria* – Consider starting with the existing soil suitability criteria for treatment soils and building up that for this study.
    - *Similar Study* – Ecology expressed concern that there is a similar study that will be conducted in WWA as part of the RSMP. They requested that the experimental design for this study consider how the results of the WWA may influence the need for this study, specifically they would prefer that EWA use the results from the WWA study to determine which soils are suitable for treatment. Ecology also indicated that they would not pay for a duplicate study. After reading the WWA study proposal, Aimee expressed concern that the WWA study was focused on defining a spec that defines the optimum properties of a bioretention soil mix however in EWA the study is focused on defining properties for soils that are suitable for treatment. As such she was concerned that the WWA study may inadvertently exclude native soils that can provide sufficient treatment. In addition, the WWA study focus is on creating a spec for bioretention soils that will support plant growth; since the EWA study will not include, vegetation the properties of suitable soils maybe different. The result of this discussion is that in the Proposal Aimee will emphasize the need to define suitable properties for native soils and consider how that may be different than the WWA study. In addition, Aimee will also emphasize the need to build on the results from the WWA where applicable. Ecology indicated that would consider a separate study if we could provide a compelling reason.
6. **City of Wenatchee – Stormwater BMP Owner Awareness**
    - *Sample Size* - Need to define a target or goal for sample size in the Proposal
    - *General* - Ecology indicated the conceptual study was well designed.
    - *Study Outcome* – consider outcomes that may include educating the realtor
    - *Conceptual Study Design* – add creating an inventory of existing Education Programs before starting the study
7. **Asotin County and City of Spokane Valley – Catch Basin Retrofit Device Placement**

    The study design changed based on the discussion with Ecology on 4/17. On 4/18 Ecology requested that they review the revised conceptual study design before the HDR team proceeds with developing the Proposal for this study. As a result, the revised conceptual study design will be submitted for Ecology review during the week of 4/24.
    - *Data Collection* – include measuring solids captured in the catch basin sumps upstream of the final catch basin; also consider what is being settling the CB as well as what is removed.
    - *Test Setup* – use standard size CB for the storm sewer series except an oversized CB will be used for the retrofit (improve ease of access for maintenance). The volume of

the CB sumps in the storm sewer systems at the test-site and the control-site will be equal so that the systems are comparable

- *Data Collection* – measure flow rates going into the CB because flow can influence resuspension of solids.
- *Things to consider when developing the experimental design* - studies have shown that when the sump has more than 50% sediment, the solids can become resuspended and transport sediment with runoff to the downstream CBs; studies have also shown that sump materials are more likely to become mobile during large storm events
- *Data Collection* – since the purpose of the CB retrofit is to reduce the transport of oil and grease, Ecology recommended that samples be collected to measure the change in oils concentration. Since the standard testing methods for collecting this parameter are via grab sample, which is known to be highly variable, the group discussed to potential for creating a mock up and using a fire hose to run this testing so that sample collection could be better timed to collect oils in stormwater runoff.
- Test-Site - Ecology also suggested that a site like the WSU extension campus might be ideal for constructing a mockup. A constructed test site could also be used to conduct future investigations that focus on sediment accumulation and transport in CB sump.
- *Data Collection* - Also consider measuring turbidity and TSS from each grab sample.

8. **City of Spokane Valley – Determining Pollutant Contributions from Municipal Stormwater in Eastern WA using GIS**

Discussions for this study occurred on both 4/17 and 4/18. The discussion focused on redesigning the study to align with the goals for a stormwater effectiveness study. On 4/18 Ecology requested a second meeting (schedules for 5/1) to discuss the revised conceptual study design. The subsequent notes do not include the 5/1 discussion.

- *GIS Mapping* – Ecology noted that GIS mapping was conducted to identify illicit discharges. They suggested that a study that focuses on mapping might consider additional benefits that mapping has provided jurisdictions have improved their stormwater program. Also consider including an adaptive management loop in the study design/stormwater management changes.
- *Study Design* – Ecology emphasized that the study design needs to focus on how the following items listed as *potential management changes* will be addressed in the conceptual study design write up: Estimate how effective, using a metric such as $/lb removed, SW management programs are in reducing polluted runoff from impervious surfaces to receiving water bodies; and Allow jurisdictions to focus priority on areas that contribute pollutant loads to surface waters.
- *Rule vs Permit* – Ecology discussed the differences between operation by permit (stormwater permit only covers discharges to receiving water bodies) and operation by rule (the UIC rule focuses on protecting ground water and drinking water especially related to the aquifer in Spokane). The current stormwater permit requirements assume that if the surface water body is protected then groundwater is as well. If the study is designed to focus on jurisdictions that have limited to no outfalls, then the targeted stormwater program would focus on developing a program around the UIC rule.

- *Targeted Stormwater Program* – there may be other constituents that should be considered to protect ground water. Consider what regulations are driving stormwater management practices and consider how effective they are in a given location.