



DEPARTMENT OF
ECOLOGY
State of Washington

IAA No. C1900143

INTERAGENCY AGREEMENT (IAA)

BETWEEN

THE STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY

AND

WASHINGTON STATE UNIVERSITY

THIS INTERAGENCY AGREEMENT (“Agreement” or “IAA”) is made and entered into by and between the state of Washington, Department of Ecology, hereinafter referred to as "ECOLOGY," and the Washington State University in Puyallup, WA hereinafter referred to as the "WSU" and “CONTRACTOR,” pursuant to the authority granted by Chapter 39.34 RCW.

THE PURPOSE OF THIS AGREEMENT is to test the effectiveness of mulch types to reduce weeds, provide carbon and retain moisture in bioretention facilities.

WHEREAS, ECOLOGY has legal authority (RCW 90.48 and WAC 173-220) and WSU has legal authority (RCW 90.48 and WAC 173-220) that allows each party to undertake the actions in this agreement.

WHEREAS, the WSU will use bioretention cells already established and equipment purchased.

THEREFORE, IT IS MUTUALLY AGREED THAT:

1) SCOPE OF WORK

WSU shall furnish the necessary personnel, equipment, material and/or service(s) and otherwise do all things necessary for or incidental to the performance of the work set forth in Appendix A, *Statement of Work and Budget*, attached hereto and incorporated herein. Purchased equipment will be owned by WSU.

2) PERIOD OF PERFORMANCE

The period of performance of this IAA shall commence on **July 1, 2019**, (or the date of final signature, whichever comes later,) and be completed by **April 30, 2022**, unless terminated sooner as provided herein. Amendments extending the period of performance, if any, shall be at the sole discretion of ECOLOGY.

3) COMPENSATION

Compensation for the work provided in accordance with this IAA has been established under the terms of RCW 39.34.130 and RCW 39.26.180(3). This is a performance-based agreement, in which payment is based on the successful completion of expected deliverables.

The source of funds for this IAA is **General Fund/ Private-Local account for Stormwater Action Monitoring**. Both parties agree to comply with all applicable rules and regulations associated with these funds.

The parties have determined that the cost of accomplishing the work identified herein will not exceed \$191,497, including any indirect charges. Payment for satisfactory performance of the work shall not exceed this amount unless the parties mutually agree via an amendment to a higher amount. Compensation for services shall be based on the terms and tasks set forth in Appendix A, *Statement of Work and Budget*. ECOLOGY will not make payment until it has reviewed and accepted the completed work.

4) BILLING AND PAYMENT PROCEDURE

Payment requests shall be submitted on state form, Invoice Voucher A19-1A. Invoices shall describe and document to ECOLOGY's satisfaction a description of the work performed, the progress of the work, and related costs. Each invoice voucher shall reference the Agreement (IAA) number and clearly identify those items that relate to performance under this Agreement. Payment will be made within thirty (30) days of submission of a properly completed invoice (form A19-1A) with supportive documentation. All expenses invoiced shall be supported with copies of invoices paid.

Send invoices to:

**State of Washington
Department of Ecology
Attn: Brandi Lubliner
P.O. Box 47600
Olympia, WA 98504-7600**

Payment requests may be submitted on a quarterly basis or at the completion of the work. Upon expiration of this Agreement, any claim for payment not already made shall be submitted to ECOLOGY within 30 days after the expiration date or the end of the fiscal year, whichever is earlier.

Payment will be issued through Washington State's Office of Financial Management's Statewide Payee Desk. To receive payment you must register as a statewide vendor by submitting a statewide vendor registration form and an IRS W-9 form at website, <https://ofm.wa.gov/it-systems/statewide-vendorpayee-services>. If you have questions about the vendor registration process, you can contact Statewide Payee Help Desk at (360) 407-8180 or email PayeeRegistration@ofm.wa.gov.

5) ALTERATIONS AND AMENDMENTS

This Agreement may be amended by mutual agreement of the parties. Such amendments shall not be binding unless they are in writing and signed by personnel authorized to bind each of the parties.

6) ASSIGNMENT

The work to be provided under this Agreement, and any claim arising thereunder, is not assignable or delegable by either party in whole or in part, without the express prior written consent of the other party, which consent shall not be unreasonably withheld.

7) ASSURANCES

Parties to this Agreement agree that all activity pursuant to this agreement will be in accordance with all the applicable current federal, state, and local laws, rules, and regulations.

8) CONFORMANCE

If any provision of this Agreement violates any statute or rule of law of the state of Washington, it is considered modified to conform to that statute or rule of law.

9) DISPUTES

Parties to this Agreement shall employ every effort to resolve a dispute themselves without resorting to litigation. In the event that a dispute arises under this Agreement that cannot be resolved among the parties, it shall be determined by a Dispute Board in the following manner. Each party to this Agreement shall appoint one member to the Dispute Board. The members so appointed shall jointly appoint an additional member to the Dispute Board. The Dispute Board shall review the facts, agreement terms, and applicable statutes and rules, and then make a determination of the dispute. The determination of the Dispute Board shall be final and binding on the parties hereto, unless restricted by law. The cost of resolution will be borne by each party paying its own cost. As an alternative to this process, if state agencies, either of the parties may request intervention by the Governor, as provided by RCW 43.17.330, in which event the Governor's process will control. The parties may mutually agree to a different dispute resolution process.

10) FUNDING AVAILABILITY

ECOLOGYS ability to make payments is contingent on availability of funding. In the event funding from state, federal, or other sources is withdrawn, reduced, or limited in any way after the effective date and prior to completion or expiration date of this Agreement, ECOLOGY, at its sole discretion, may elect to terminate the Agreement, in whole or part, for convenience or to renegotiate the Agreement subject to new funding limitations and conditions. ECOLOGY may also elect to suspend performance of the Agreement until ECOLOGY determines the funding insufficiency is resolved. ECOLOGY may exercise any of these options with no notification restrictions, although ECOLOGY will make a reasonable attempt to provide notice.

In the event of termination or suspension, ECOLOGY will reimburse eligible costs incurred by the CONTRACTOR through the effective date of termination or suspension. Reimbursed costs must be agreed to by ECOLOGY and the CONTRACTOR. In no event shall ECOLOGYS reimbursement exceed ECOLOGYS total responsibility under the agreement and any amendments.

11) GOVERNING LAW AND VENUE

This Agreement is entered into pursuant to and under the authority granted by the laws of the state of Washington and any applicable federal laws. The provisions of this Agreement shall be construed to conform to those laws. This Agreement shall be construed and interpreted in accordance with the laws of the state of Washington, and the venue of any action brought hereunder shall be in the Superior Court for Thurston County.

12) INDEPENDENT CAPACITY

The employees or agents of each party who are engaged in the performance of this Agreement shall continue to be employees or agents of that party and shall not be considered for any purpose to be employees or agents of the other party.

13) ORDER OF PRECEDENCE

In the event of an inconsistency in the terms of this Agreement, or between its terms and any applicable statute or rule, the inconsistency shall be resolved by giving precedence in the following order:

- a. Applicable federal and state of Washington statutes, regulations, and rules.**
- b. Mutually agreed upon written amendments to this Agreement.

- c. This Agreement, number C1900143.
- d. Appendix A, *Statement of Work and Budget*.
- e. Any other provisions or term of this Agreement, including materials incorporated by reference or otherwise incorporated.

14) RECORDS MAINTENANCE

The parties to this Agreement shall each maintain books, records, documents, and other evidence that sufficiently and properly reflect all direct and indirect costs expended by either party in the performance of the service(s) described herein. These materials shall be subject to inspection, review, or audit by personnel of both parties, other personnel duly authorized by either party, the Office of the State Auditor, and federal officials so authorized by law. All books, records, documents, and other materials relevant to this Agreement must be retained for six years after expiration of this Agreement. The Office of the State Auditor, federal auditors, and any persons duly authorized by the parties shall have full access and the right to examine any of these materials during this period. Each party will utilize reasonable security procedures and protections for all materials related to this Agreement. All materials are subject to state public disclosure laws.

15) RESPONSIBILITIES OF THE PARTIES

Each party of this Agreement hereby assumes responsibility for claims and/or damages to persons and/or property resulting from any act or omissions on the part of itself, its employees, its officers, and its agents. Neither party will be considered the agent of the other party to this Agreement.

16) RIGHTS IN DATA

Unless otherwise provided, data which originates from this Agreement shall be "work made for hire" as defined by the United States Copyright Act, Title 17 U.S.C. section 101 and shall be owned by state of Washington. Data shall include, but not be limited to, reports, documents, pamphlets, advertisements, books magazines, surveys, studies, computer programs, films, tapes, and/or sound reproductions. Ownership includes the right to copyright, patent, register, and the ability to transfer these rights.

17) SEVERABILITY

If any provision of this Agreement or any provision of any document incorporated by reference shall be held invalid, such invalidity shall not affect the other provisions of this Agreement which can be given effect without the invalid provision, if such remainder conforms to the requirements of applicable law and the fundamental purpose of this Agreement, and to this end the provisions of this Agreement are declared to be severable.

18) SUBCONTRACTORS

CONTRACTOR agrees to take complete responsibility for all actions of any Subcontractor used under this Agreement for the performance. When federal funding is involved there will be additional contractor and subcontractor requirements and reporting.

Prior to performance, all subcontractors who will be performing services under this Agreement must be identified, including their name, the nature of services to be performed, address, telephone, WA State Department of Revenue Registration Tax number (UBI), federal tax identification number (TIN), and anticipated dollar value of each subcontract. Provide such information to ECOLOGY's Agreement manager.

19) TERMINATION FOR CAUSE

If for any cause, either party does not fulfill in a timely and proper manner its obligations under this Agreement, or if either party violates any of these terms and conditions, the aggrieved party will give the other party written notice of such failure or violation. The responsible party will be given the opportunity to correct the violation

or failure within fifteen (15) business days. If failure or violation is not corrected, this Agreement may be terminated immediately by written notice of the aggrieved party to the other.

20) TERMINATION FOR CONVENIENCE

Either party may terminate this Agreement without cause upon thirty (30) calendar day prior written notification to the other party. If this Agreement is so terminated, the parties shall be liable only for performance rendered or costs incurred in accordance with the terms of this Agreement prior to the effective date of termination.

21) WAIVER

A failure by either party to exercise its rights under this Agreement shall not preclude that party from subsequent exercise of such rights and shall not constitute a waiver of any other rights under this Agreement unless stated to be such in a written amendment to this Agreement signed by an authorized representative of the parties.

22) AGREEMENT MANAGEMENT

The representative for each of the parties shall be responsible for and shall be the contact person for all communications, notifications, and billings questions regarding the performance of this Agreement. The parties agree that if there is a change in representatives that they will promptly notify the other party in writing of such change, such changes do not need an amendment.

The ECOLOGY Representative is:	The WSU Representative is:
Name: Brandi Lubliner, P.E. Address: P.O. Box 47600 (standard mail) 300 Desmond Dr. SE (UPS or FedEx) Olympia, WA 98504-7600 Phone: 360-407-7140 Email: Brandi.Lubliner@ecy.wa.gov	Name: Ani Jayakaran, Ph.D., P.E. Address: 2606 W Pioneer Ave Puyallup WA, 98371 Phone: 253-445-4523 Email: anand.jayakaran@wsu.edu

APPENDIX A STATEMENT OF WORK AND BUDGET

Title: The effects of mulch on stormwater treatment and maintenance effort in bioretention systems

Background

Stormwater that flows into bioretention or rain garden system first contacts the mulch layer before any other component in that system. However, effects of mulch in bioretention systems have not been evaluated.

A well-chosen mulch can prevent weeds and invasive species. Given that repeated weeding and invasive removal is a costly addition to operations and maintenance budgets for any municipality, we aim to provide information to optimize mulch choice to minimize maintenance efforts.

In addition, an appropriate mulch likely improves water retention and provides a slow release of carbon and nutrients to the bioretention soil mix (BSM) layers, eventually helping plant survival and growth.

As part of the proposed work, three treatment types of mulch will be evaluated against a control of no mulch in bioretention cells built for this study. The three types of mulch that will be tested are:

- Bark mulch (fir)
- Shredded bark mulch (cedar)
- Arborist wood chips

The first two of these mulches are included because they are common choices of commercial landscapers and homeowners. However, because they are both bark products, they are waxy and not easily colonized by roots and mycorrhizae fungi. Their reduced ability to absorb water make them susceptible to floating when the bioretention system is full of water. However, these are still widely used in western Washington, and deem further investigation.

On the other hand, an arborist wood chip mulch is capable of absorbing water and of being colonized by roots and fungi. Once colonized, a wood chip mulch will theoretically remain in place and will not be washed away as bark mulches can be.

This study will utilize sixteen replicated bioretention cells located at the WSU-Puyallup Low Impact Development (LID) test facilities. All sixteen bioretention cells were retrofitted in early summer 2017 and were replanted in fall 2018 with a common plants. The BSM used for these cells conforms to Washington State Department of Ecology's recommended 60:40 (sand: compost) mix and will have aged for 2 years by the time this study is underway. Twelve of the 16 cells will be mulched with the three types of *treatment* mulches, with each treatment replicated four times. Four *control* cells will have no mulch. The system will be dosed with natural and artificial storms over two wet winter seasons (August 2019 to April 2021)

Stormwater runoff will be collected from 72,084 ft² of impervious surface in WSU-Puyallup facility and stored in a common dosing cistern. Stored stormwater will then be augmented with additional ‘pollution’ to meet the typical range of influent loading rates to represent urban stormwater pollutant concentrations¹.

**Task 1 Project management
(Total Cost = \$ 10,741)**

WSU staff will lead project administration. This includes initiating agreements, subcontracting with project partners, tracking progress of deliverables, reimbursing partner project work based on detailed reports on deliverables, and semi-annual reports to Ecology. WSU will provide updates and reporting to Ecology semi-annual or as requested and required by the contract.

WSU will develop a Technical Advisory Committee (TAC) for this project. The TAC including at least one permittee stormwater manager or coordinator will advise the project team on technical issues and concerns. TAC will continue to meet as needed throughout the project.

Semi-annual reports will include status of the contract tasks and decisions related to the tasks made during the calls, meetings and coordination with the advisory committees and communication with Ecology as appropriate. The semi-annual reports 1.1 through to 1.4 will include project updates, data quality assurance review, results and findings to date.

Deliverable 1.1: Semi-annual report 1: Document activity, coordination with team, and communications with Ecology.

Cost = \$ 2,685 Target date: December 31, 2019

Deliverable 1.2: Semi-annual report 2: Document activity, coordination with team, and communications with Ecology.

Cost = \$ 2,685 Target date: June 30, 2020

Deliverable 1.3: Semi-annual report 3: Document activity, coordination with team, and communications with Ecology.

Cost = \$ 2,685 Target date: December 31, 2020

Deliverable 1.4: Semi-annual report 4: Document activity, coordination with team, and communications with Ecology.

Cost = \$ 2,686 Target date: June 30, 2021

¹ Hobbs, W., B. Lubliner, N. Kale, and E. Newell. 2015. Western Washington NPDES Phase 1 Stormwater Permit: Final Data Characterization 2009-2013. Washington State Department of Ecology, Olympia, WA. Publication No. 15-03-001. <https://fortress.wa.gov/ecy/publications/SummaryPages/1503001.html>

Task 2 Quality Assurance and Project Protocol (QAPP) development (Total Cost \$ 11,268)

A QAPP will be created before instruments are deployed or any measurements taken. The QAPP will list the number of sensors that will be deployed, plant species selection procedure, the type of data, how often data are collected, maintenance protocols for the system, how data will be managed, and lastly how data will be analyzed. Costs associated with QAPP development are related to time taken to write and revise QAPP document.

For QAPP development, the WSU shall use the QAPP template provided by the SAM coordinator and follow the Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies, July 2004 ([Ecology Publication No. 04-03-030](#)). Submit the QAPP to Ecology's SAM Coordinator for review and approval *before* the start of the work.

Deliverable 2.1: Draft QAPP

\$5,634 Target Date: July 31, 2019

Deliverable 2.2: Final Approved QAPP

\$5,634 Target Date: August 30, 2019

Task 3 Bioretention system preparation and instrumentation (Total Cost \$ 10,400)

The bioretention cells are already built and instrumented with flow measuring instrumentation and weather sensors. Soil moisture sensors will be purchased for this project and owned by WSU.

All 16 cells are planted with a common plants described below.

Planting and Plant Species

Zone 1

1. Primary deciduous woody element: *Physocarpus opulifolius* 'Tiny Wine' is a dwarf ninebark with disease resistance and capacity to withstand both summer drought and some winter flooding.
2. Primary evergreen woody element: *Mahonia aquifolium* 'Compacta' is a dwarf cultivar of our native tall Oregon-grape that has a tidy habit and grows about 2-2.5 feet. Very tough in all conditions (as long as it's in full to mostly-full sun).
3. Bunching grasses/grass-like plants: *Pennisetum* a. 'Burgundy Bunny' *Carex testacea*
4. Non-aggressive rhizomatous species:
 - i. *Iris tenax* (evergreen)
 - ii. *Juncus ensifolius*

Side slopes (approximately Zones 2-3):

5. Evergreen: *Lonicera pileata* (straight species, no cultivar)
6. Deciduous but densely twiggy: *Symphoricarpos x chinaltii* 'Hancock'

Deliverable 3.1: A memo demonstrating with photos the completed instrumentation of sixteen bioretention cells at the study site. Appendices will include receipts for the soil moisture sensors and other low value incidental equipment to complete instrumentation of the bioretention cells.
\$ 10,400 Target Date: July 31, 2019

**Task 4 Quantifying maintenance effort and plant survival
(Total Cost \$ 57,311)**

Replicated maintenance protocols for each of the three mulch treatments such as pruning, weed removal will be compared to controls (no mulch). Maintenance effort will be measured in terms of person hours spent on an activity. Plant success will also be measured as an associated metric of maintenance effort. Plant survival and death rates will be monitored at least monthly. Growth rates will be measured bi-monthly by monitoring height and width of each plants using a quadrat. Visual assessment of crown health and common plant growth index will be used.

Maintenance activities include, but not limited to:

1. Quantifying time for system operational check
2. Quantify time needed to weed (weeding once per month)
4. Counting total number of weeds, divided by type if possible (i.e. annual vs. perennial)
5. Fresh and dry weight of weeds for weed biomass per treatment.
6. Replacement cost and effort associated with replacing plants when around 25% of the population do not survive.

Deliverable 4.1: A memo that describes and compares the total effort associated with monitoring of maintenance at 16 bioretention cells at the study site. Included with the memo will be a draft analysis of maintenance effort relating mulch choices to plant success, weeding effort, and plant replacement costs.

\$ 57,311 Target Date: April 30, 2021

**Task 5 Quantifying mulch effects on water quality and water quantity
(Total Cost \$ 91,036)**

We will test 7 chemical parameters for each storm dosing event in both the influent and effluent from the bioretention cells.

1. Nitrate-Nitrite (target influent value: 0.3 mg/L)
2. Total phosphorous (target influent value: 0.3 mg/L)
3. Dissolved copper (target influent value: 0.1 mg/L)
4. Dissolved zinc (target influent value: 0.1 mg/L)
5. Total petroleum hydrocarbon (target influent value: TPH 15 mg/L)
6. Total suspended solids (target influent value: 150 mg/L)
7. Dissolved organic carbon (measured only in effluent)

Pollutant removal efficiencies will be quantified by measuring inflow volume, outflow volume, initial contaminant concentrations based on dosing of the cistern, and contaminant concentration at the bioretention cell outlet. Volumes of inflow and outflow will be used to characterize how mulch affects water retention in each cell. Results will represent full bioretention water quality and quantity treatment (not only the mulch layer).

Deliverable 5.1: Draft analysis and presentation shared with TAC meeting # 2 that outlines the total effort associated with water quality remediation by mulch at 16 bioretention cells.
 \$ 86,037 Target Date: May 15, 2021

Deliverable 5.2: Revised analysis and revised report shared with TAC meeting # 3
 \$ 4,999 Target Date: June 15, 2021

**Task 6 Communication
 (Total Cost \$ 10,741)**

Deliverable 6.1: Draft report of the whole study that integrates water quality treatment water quantity retention, soil moisture, maintenance effort and plant survival for the three mulch types tested. The draft will also include a data quality review and usability statement
 \$ 4,500 Target Date: July 15, 2021

Deliverable 6.2: Final Report with complete appendices and Excel file of all QA reviewed data collected over the project period
 \$ 3,242 Target Date: October 15, 2021 (3 months after draft)

Deliverable 6.3: Two presentations – one for the Stormwater Work Group, and another for regional stormwater related conference or workshop.
 \$ 1,500 Target Date: October 31, 2021

Deliverable 6.4: Draft fact sheet per SAM format for stormwater managers who seek information on the project.
 \$ 1,500 Target Date: November 30, 2021

Target dates referenced in above tasks may be adjusted with written approval from Ecology, but task dates may not exceed the Period of Performance end date.

Budget Detail by Task

Budget may be shifted between tasks, with written approval from Ecology, but the total budget may not be exceeded without an approved amendment from Ecology.

Task Description	Salaries	Benefits	Supplies	Travel	Indirect	Total Task
Task 1 Project management	\$6,830	\$1,763	-	-	\$2,148	\$10,740
Task 2 QAPP development	\$7,165	\$1,849	-	-	\$2,254	\$11,268
Task 3 Bioretention system preparation and instrument	-	-	\$10,400	-	-	\$10,400
Task 4 Quantifying maintenance effort and plant survival	\$37,456	\$7,994	-	\$500	\$11,362	\$57,312
Task 5 Quantifying mulch effects on water quality & quantity	\$11,684	\$2,593	\$72,690	\$500	\$3,570	\$91,037
Task 6 Communication	\$6,830	\$1,763	-	-	\$2,148	\$10,741
Total by Object	\$69,964	\$15,962	\$83,090	\$1,000	\$21,481	\$191,497