



## **AMENDMENT NO. 1**

TO

Contract NO. C2000041

BETWEEN THE

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

AND

WASHINGTON STATE UNIVERSITY

PROJECT TITLE: Evaluation of Hydraulic Control Approaches for Bioretention Systems

**PURPOSE:** To amend the Agreement between the state of Washington, Department of Ecology, hereinafter referred to as “ECOLOGY,” and Washington State University, hereinafter referred to as “WSU” or “Contractor.”

**WHEREAS,** the original Contract No. C2000041 provided funding for the first phase of this project. Additional funds are required to complete the second phase of the project. The tasks in the second phase were originally proposed as part of a single project, but the project was then divided into phases and only the first phase was funded under the original Contract No. C2000041.

IT IS MUTUALLY AGREED the Agreement is amended as follows:

- 1) The Period of Performance is amended to read as follows:  
The expiration date is extended from April 30, 2022 to December 31, 2022.
- 2) The Scope of Work shall be amended to add the following tasks:
  - **Under Task 3: Monitoring Study Implementation,**
    - The following monitoring events shall be added:
      - Normal Operating Phase:
        - Event #4: December 2021
        - Event #5: February 2022
        - Event #6: April 2022
      - Special Testing:

- Event #3: February 2022

Monitoring events shall be performed as described in the QAPP.

- The following Deliverables shall be added:
  - Deliverable 3.4: Progress Report #4 summarizing water quality event #4 and O&M observations.
    - Target Date: January 30, 2022
    - Cost: \$20,762
  - Deliverable 3.5: Progress Report #5 summarizing water quality event #5, special testing event #3, and O&M observations.
    - Target Date: March 30, 2022
    - Cost: \$20,763
  - Deliverable 3.6: Progress Report #6 summarizing water quality event #6 and O&M observations.
    - Target Date: May 30, 2022
    - Cost: \$20,763

- **Under Task 4: Modeling Study, the following shall be added:**

The research team will conduct a modeling study to expand monitoring results to assess the potential impacts of hydraulic control approaches on idealized case studies in Western Washington. All modeling will be conducted using the most recent update to the Western Washington Hydrology Model (WWHM). The following tasks will be completed as part of this modeling study:

- Stage-storage-discharge relationships will be developed for both Standard BSM and Alternative BSM with and without outlet controls based on field monitoring data. These will be compared to the default stage-storage-discharge relationships in WWHM. If significant differences are noted, those based on monitoring results will be used in all further modeling.
- Idealized scenarios will be developed for Bioretention with Underdrains for both Standard BSM and Alternative BSM with and without outlet controls. These scenarios will consider two underlying soil infiltration rates and two sizing approaches. Soil infiltration rates will reflect two representative values within the range of Glacial Till soils because underdrains are more likely to be used on Glacial Till than Glacial Outwash. Sizing scenarios will include a typical application sized to meet water quality treatment standards for 1-acre of new impervious surface and a BMP sized to half of this size (i.e., a constrained retrofit example). In total, sixteen idealized scenarios will be developed (2 media types x 2 outlet control configurations x 2 soil types x 2 sizing approaches).
- Each of the idealized scenarios will be analyzed using WWHM to assess 1) long term capture efficiency of runoff, 2) long term volume reduction, and 3) flow control benefits.

- Capture efficiency and volume reduction results will then be combined with water quality monitoring results to estimate the total impact of outlet controls on pollutant loading for the different scenarios.

The following deliverables will be completed as part of Task 4: Modeling Study:

**Deliverable 4.1:** Modeling Study Plan summarizing the modeling approach that will be used. The Modeling Study Plan will be reviewed by the Technical Advisory Committee, updated based on feedback received, and then submitted to Ecology. The research team does not anticipate modifying the modeling study approach following submission of the Modeling Study Plan to Ecology.

- Target date: June 30, 2022
- Cost: \$5,000

**Deliverable 4.2:** Draft Modeling Study Report summarizing the modeling approach, idealized scenarios, and modeling results. The Draft Modeling Study Report will be submitted as an Appendix to the Draft Final Project Report.

- Target date: August 30, 2022
- Cost: \$15,000

**Deliverable 4.3:** Final Modeling Study Report which will consist of an update to the Draft Modeling Report based on feedback received from Ecology. The Final Modeling Study Report will be submitted as an Appendix to the Final Project Report.

- Target date: November 30, 2022
- Cost: \$5,000

- **Under Task 5: Reporting, the following shall be added:**

The research team will complete data analysis, present results in a final presentation, prepare draft and final reports, compile data into a database and submit to Ecology, and complete an executive summary.

The following Deliverables shall be added:

**Deliverable 5.2:** Presentation to TAC and Stormwater Work Group. Following completion of data analysis, a presentation will be delivered to the TAC and the Stormwater Work Group. This presentation is anticipated to be in person. Feedback received during this presentation will be incorporated into future reporting deliverables.

- Target Date: June 30, 2022
- Cost: \$11,500

**Deliverable 5.3:** Draft Final Report summarizing monitoring activities, monitoring results, data analysis, and implications for stormwater management. The Draft Final Report will include several appendices including water quality monitoring data, hydraulic monitoring data, and the Draft Modeling Study Report. The Draft Final Report will be submitted to Ecology for review.

- Target Date: August 30, 2022
- Cost: \$24,000

**Deliverable 5.4:** Final Report which will incorporate comments received by Ecology.

- Target Date: November 30, 2022
- Cost: \$12,000

**Deliverable 5.5:** Project results database which will include water quality and hydraulic monitoring data. These data will be compiled into a database and submitted to Ecology.

- Target Date: December 30, 2022
- Cost: \$5,070

**Deliverable 5.6:** Executive Summary which will consist of a 2-page summary and “take-home” messages from this project.

- Target Date: December 30, 2022
- Cost: \$2,000

3) The Budget is amended to increase the total budget by \$141,858. A breakdown of increased costs is presented in Table 1.

Task	WSC		Geosyntec		Direct Costs <sup>1</sup>	WSC F&A <sup>2</sup>	Total <sup>3</sup>
	Months FTE	Budget	Hours	Budget			
Task 1 - Planning and QAPP	Not part of this amendment.						
Task 2 - Install and Startup	Not part of this amendment.						
Task 3 - Study Implementation	9.0	\$36,837	85	\$15,000	\$51,837	\$10,451	<b>\$62,288</b>
Task 4 – Modeling Study	0.0	\$0	140	\$25,000	\$25,000	\$0	<b>\$25,000</b>
Task 5 – Reporting	1.7	\$18,900	170	\$30,000	\$48,900	\$5,670	<b>\$54,570</b>
<b>Project Total</b>	<b>10.7</b>	<b>\$55,737</b>	<b>395</b>	<b>\$70,000</b>	<b>\$125,737</b>	<b>\$16,121</b>	<b>\$141,858</b>

1 – Direct Costs are summed WSC budget + Geosyntec budget

2 – WSU Facilities and Administration for State-funded projects is 30% on WSU salaries and benefits.

3 – Total costs are summed Direct Costs + WSU F&A

State of Washington Department of Ecology  
Contract no. C2000041, Amendment 1  
Washington State University

All other terms and conditions of the original Agreement including any other amendments remain in full force and effect, except as expressly provided by this Amendment.

This Amendment is signed by persons who represent that they have the authority to execute this Amendment and bind their respective organizations to this Amendment.

This Amendment is effective on the Ecology signature date.

IN WITNESS WHEREOF, the parties below, having read this Amendment in its entirety, including any attachments, do agree in each and every particular as indicated by their below signatures.

**State of Washington  
Department of Ecology**

By:

By:

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