



OREGON DEPARTMENT OF TRANSPORTATION

Research Unit
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SPR Quarterly Progress Report
April 1, 2009 through June 30, 2009

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1. Project

Copper Toxicity and ESA Listed Salmon
SPR # 663

2. Key Dates

Start Date for ODOT: September 10, 2007
Completion Date for ODOT: October 31, 2009

3. Principal Investigator

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Friend of the Committee

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4. Progress

- During the last quarter we collected samples from 2 additional storms at the continuous monitoring site in Corvallis (4/12 and 5/13). There have been a few thunderstorm events in June and July, but due to the relatively low probability of rain, the sampler was not deployed. In collecting and processing the samples, the same procedures have been followed as in the past. All analyses have been performed with the exception of the copper speciation. Aliquots of the samples have been frozen for preservation prior to future analysis.
- We received and analyzed one new composite sample from the Wemme site managed by Herrera. We have performed all water quality analyses with the exception of copper speciation via voltammetric titration. Remaining sample has been frozen for future testing.
- Data from composite samples collected at all four sites have been statistically analyzed to identify major trends and correlations between water quality parameters and roadway and storm characteristics. In general, the I-5 stormwater contains higher concentrations of most constituents and was statistically different from the other three sites. However, there have not been statistically significant differences in stormwater quality from the three lower ADT sites. Dissolved copper appears to be significantly correlated with the dissolved organic carbon concentration. Other relationships have not been as clear. Although there are general trends between dissolved copper and various other water quality, site and storm characteristics, many of these trends are not statistically significant with the current data. In all the samples collected at the Corvallis site, there has been pronounced first flush behavior for most water quality parameters. First flush samples have also been analyzed for these same trends.
- We spent much of the last three months calibrating and verifying the analytical method for determining copper speciation. As mentioned in the previous report, we have been working on modifying a published method for use at lower ionic strength and lower pH, typical of our stormwater samples. A great deal of effort went into the calibration phase as there have been several difficulties. In the end, I believe we have been successful in determining the appropriate parameters necessary to complete the speciation analysis at a variety of conditions. There is some possibility that we will need to go back and expand some of this analysis if we are forced to use different conditions during the speciation analysis. During this last quarter we have made significant progress, but not without some recent major setbacks. These problems are described below.
- We have continued work on the final report. An outline of the final report has been completed and the introduction/literature review sections are essentially complete. Continuing efforts are detailed below.

5. **Problems**

- As stated above, we spent a large portion of the last three months calibrating and verifying the analytical method for copper speciation. Very recently, we were very pleased to see some promising results when applying the analytical technique to look at copper speciation in Willamette River water as a test of the method. Results indicated that greater than 99.9% of the dissolved copper (approximately 1 µg/L) was

complexed with dissolved organic carbon. However, as we have moved to analyzing the backlog of stormwater samples, we have encountered problems. We have applied the method to several grab samples collected early in the sampling campaign and the results have been quite strange. At present, we have not determined the cause of these problems, but are pursuing several leads to try to address the problems. (1) We are re-running Willamette River samples to verify that the method does appear to be working in that medium. (2) We are examining alternative buffer solutions to keep our solutions at pH 6.8. We thought that we were going to be able to work around some problems that arose when we first made the move to pH 6.8, but it appears that in the actual stormwater, we may not be able to avoid those issues. (3) We are consulting with electro-analytical chemists here at OSU and with the authors of the original method developed for seawater in hopes of identifying possible solutions. (4) We are taking a careful look back at our recent results to see if there are any clues there.

- A few corollaries to the above problems are that (1) we are very limited in the volume of sample that we have to run the speciation analysis and (2) we are approaching the end of the project period. With only approximately 200-300 mL of each first flush and composite sample, we have just enough for a single speciation analysis. In other words, there is little room for error and samples will not be able to be run twice if something doesn't work. As such, we have stopped analyzing preserved stormwater samples until we can resolve the issues with the analytical method. As a result of these setbacks, we have fallen behind schedule. At this point, it is hard to estimate how long it will take to resolve some of these issues. I believe that we are taking the appropriate path to resolve these issues, but we are certainly open to suggestions and comments from the TAC.

6. Work Planned for Next Quarter

- We will continue our efforts in earnest to resolve the issues we are seeing with the analytical method. This work consists of many of the items listed above.
- Upon resolution of the issues with the analytical method, we will continue testing of the stormwater. This effort will be paralleled by analysis of the data and writing of the results section pertaining to copper speciation.
- We will continue work on the final report. Ongoing work consists of completing the methods sections and results pertaining to the analysis of the general stormwater quality characteristics and trends that we have identified during the sampling campaign.
- We are continuously monitoring the weather in hopes of collecting some mid-summer storms.

7. Finances

SPR Project Summary

VENDOR	FY'08	FY'09	FY'10	FY11	TOTALS
ORIGINAL BUDGET	\$ 120,000	\$ 240,000	\$ 28,000		\$ 388,000
REVISED BUDGET	\$ 89,592	\$ 123,312	\$ 175,300		\$ 388,204
EXPENDITURES - VENDOR	\$ 89,592	\$ 101,409	\$ -	\$ -	\$ 191,001
BALANCE	\$ -	\$ 21,903	\$ 175,300	\$ -	\$ 197,203

ODOT	FY'08	FY'09	FY'10	FY11	TOTALS
ORIGINAL BUDGET	\$ 4,000	\$ 5,000	\$ 3,000		\$ 12,000
REVISED BUDGET	\$ 5,044	\$ 3,068	\$ 3,000		\$ 11,112
EXPENDITURES - ODOT	\$ 5,044	\$ 3,068	\$ -	\$ -	\$ 8,112
BALANCE	\$ -	\$ -	\$ 3,000	\$ -	\$ 3,000

PROJECT	FY'08	FY'09	FY'10	FY11	TOTALS
ORIGINAL BUDGET	\$ 124,000	\$ 245,000	\$ 31,000	\$ -	\$ 400,000
REVISED BUDGET	\$ 94,636	\$ 126,380	\$ 178,300	\$ -	\$ 399,316
EXPENDITURES - PROJECT	\$ 94,636	\$ 104,477	\$ -		\$ 199,113
BALANCE	\$ -	\$ 21,903	\$ 178,300	\$ -	\$ 200,203