Arkansas Water Resources Center

STORMWATER POLLUTION PREVENTION BMP WORKSHOP, DEMONSTRATION AND EVALUATION

Project 700 FY01, CWA Section 319(h)

Final Report

Submitted to:
Arkansas Soil and Water Conservation Commission

By:
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Stormwater Pollution Prevention BMP Workshop, Demonstration, and Evaluation

Executive Summary

With the recent promulgation of Phase II of the National Pollution Discharge Elimination System (NPDES) Stormwater Pollution Control regulations, many construction companies, consulting engineers, architects, and regulating agency personnel are unaware of the new stormwater pollution reduction requirements. In addition, they are typically unaware of Best Management Practices (BMPs) that are available to mitigate stormwater discharge pollution and the proper methods of installing and maintaining BMPs.

The Water Quality Goals and Objectives were to train engineers, contractors, architects, and governmental officials on the new Phase II Storm Water NPDES regulations and Best Management Practices available for construction projects.

The Original Timeframe was to offer Erosion and Sediment Control workshops in Northwest Arkansas and Little Rock areas by February 28, 2002 and again by August 30, 2002. Both sets of workshops were conducted according to the original schedule. In addition, demonstrations of the effectiveness of four BMPs were to be conducted by June 30, 2003 and those demonstrations were conducted according to the original schedule.

The University of Arkansas and three manufacturers of BMPs were cooperators on this grant and all provided the needed cooperation. The construction site BMPs that were demonstrated were silt fence, straw wattle (fiber role), erosion control blanket, and straw mulch.

Funding for this project including developing a workshop for engineers, architects, and designers, a workshop for contractors, putting on both workshops, and demonstrating the BMPs was provided by the Arkansas Soil and Water Conservation Commission and the University of Arkansas for $141,311 and $77,547 respectively.

Table of Contents

Introduction
The final report includes the following documents for this project: the Work Plan (Appendix A), the Final Work Plan Report (Appendix B), the QAPP (Appendix C), the Final Quality Assurance Report (Appendix D), and the Workshop Workbook (Appendix E), list of workshop attendees (Appendix F), the computer code for the Erosion and Sediment Control webpage (Appendix G), and the raw BMP evaluation data (Appendix H).

Project Chronology
The major highlights of this project were the workshops, which were well attended by engineers, contractors, architects, and government officials. The BMP demonstrations provided convincing data that the construction BMPs that were tested would decrease the amount of pollutants in storm water.

The BMPs that were tested were: silt fence, straw wattle (fiber role), erosion control blanket, and straw mulch. Silt fence, erosion control blanket, and straw mulch were demonstrated because they are commonly specified and used BMPs. Straw wattle was demonstrated because Arkansas has a lot of rice straw that is currently utilized and that could be used to make straw wattles.

The major obstacle encountered for this grant was that the BMPs were to be demonstrated using natural rainfall. Due to an unusually dry year and storms during the early morning hours (1 AM to 5 AM), it was difficult, but not impossible, to demonstrate the effectiveness of these BMPs.

The key component of this grant was the workshops and they were very successful in that over 100 engineers, contractors, architects, developers, and governmental officials attended the workshops. In addition, the BMP demonstrations showed that the BMPs were effective at keeping sediment out of storm water.

Lessons Learned
The project was successful because we were able to get a very good turnout to the workshops. As mentioned above, over 100 engineers, contractors, architects, and governmental officials attended the workshops. Of course, we would have liked to have had more attendees at the workshops to reach an even larger audience, to make the project even more successful. We advertised in local trade magazines, local trade email listserves, by direct mailings to all engineering, architectural, construction, and development firms; as well as all local engineering governmental agencies. Possibly, more advertising would have brought in even more attendees.

The BMPs evaluated and compared against unprotected soil were, straw mulch, erosion control blanket, silt fence, and straw wattle (fiber role). The data showed that all of these BMPs were effective at reducing the amount of sediment and associated pollutants that would end up in stormwater runoff and therefore in the waters of the United States. Presented in Table 1 is the effectiveness of each of the BMPs to keep sediment and organic chemicals (chemical oxygen demand – COD) out of stormwater as compared to unprotected soil (see Appendix H for the raw data). Copper was used as an indicator of metals in the stormwater; but no significant concentrations of copper were found in any of the runoff samples, so the effectiveness of the BMPs to remove copper is not presented here.

Table 1. Effectiveness of Erosion and Sediment Control BMPs

BMP	Percent Removal (%)	
	Supended Solids	Chemical Oxygen Demand
Erosion Control Blanket	77	70
Straw Mulch	94	56
Silt Fence	19	29
Straw Wattle	27	34

As can be seen in Table 1 above, erosion control BMPs (erosion control blanket and straw mulch) are far better at keeping sediment and organic matter (COD) out of stormwater run off than sediment control BMPs (silt fence and straw wattle).

Technical Transfer

Attendees at the workshops included engineers, planners, contractors, developers, architects, and employees from city, county, and state agencies (see Appendix F for a list of workshop attendees). In addition, a web page, which can be added to the Arkansas Soil and Water Conservation Commission webpage, has been constructed to make available information on erosion and sediment control for construction sites. We are unaware of other projects that are currently in progress or on the drawing board that could benefit from this information

EPA Feedback Loop

The Principle Investigators have no suggestions on how EPA or other federal agencies could improve the NPS process.

Appendix A

Work Plan

for

Stormwater Pollution Prevention BMP Workshop, Demonstration, and Evaluation

Project 700 FY01 CWA Section 319(h)

Nonpoint Source Summary Page
Project 700 FY01 CWA Section 319(h)

1. **Title of Project:** Construction Site Erosion Control BMP Workshops, Demonstrations, and Demonstration of Effectiveness

2. **Project Goals/Objectives:** Educate professionals about the recently promulgated phase II stormwater regulations and current Best Management Practices (BMPs) for erosion control. Demonstrate the proper installation, operation, and effectiveness of construction site BMPs.

3. **Project Tasks:** 1) Prepare Workshop Materials; 2) Conduct Two Two-day PDH Workshops; 3) Prepare Quality Assurance Project Plan; 4) Conduct Erosion Control BMP Field Days; 5) Place BMPs for Demonstration of Effectiveness, 6) Monitor Effectiveness of Construction Site Erosion Control BMPs in NW Arkansas; 7) Technical Transfer; 8) Reporting and Record Keeping

4. **Measures of Success:** The educational segment of the project will be evaluated by the number of attendees of the workshops and site field days and by through participant evaluation forms. The BMP effectiveness demonstration will be evaluated by showing the effectiveness of pollutant removal from stormwater runoff to the receiving stream.

5. **Project Type:** Statewide (X) Watershed ( ) Demonstration ( )
6. **Waterbody Type:** River ( ) Groundwater ( ) Other (X)
7. **Project Location:** Arkansas
8. **NPS Management Program Reference:**
9. **NPS Assessment Report Status:** Impaired ( ) Impacted ( ) Threatened ( )
10. **Key Project Activities:** Hire Staff ( ) Monitoring ( ) Regulatory Assistance ( ) Technical Assistance ( ) Education (X) BMP Implementation ( )

    Demonstration Project (X) Other ( ) Planning ( )
11. **NPS Management Program Elements:**
12. **Project Costs:** Federal ($ 124,749) State/Local ($ 94,109) Total ($ 218,858)
13. **Project Management:** University of Arkansas
14. **Project Period:** April 1, 2001 to May 30, 2003

Project 700
Construction Site BMP Workshops, Demonstrations, and Evaluation of Effectiveness
University of Arkansas
FY 2001, CWA Section 319(h)

Problem/Need Statement

With the recent promulgation of Phase II of the Stormwater Pollution Control regulations, many construction companies, consulting engineers, architects, and regulating agency personnel are unaware of the new stormwater pollution reduction requirements. In addition, they are often unaware of Best Management Practices (BMPs) that are available to mitigate stormwater discharge pollution and the proper methods of installing and maintaining BMPs. Currently if any stormwater pollution prevention practices are implemented during construction, they are often improperly installed and inadequately maintained. The contractors often do not understand the necessity of proper installation and have not been adequately trained in the correct maintenance of the BMPs. The result is that tremendous amounts of sediment are needlessly eroded from construction sites and enter the waters of Arkansas. Training of engineers, architects, contractors, and governmental officials will provide the needed technology transfer to lessen the sediment runoff. Workshops and demonstrations conducted by professionals who are familiar with the new regulations and with the BMPs will provide the tools necessary to lessen the impact of construction on the environment. In addition, the effectiveness of BMPs is highly dependent upon the geologic and climatic setting; therefore, not all of EPA's BMPs will be effective in Northwest Arkansas. Demonstration of BMPs for construction sites in Northwest Arkansas will show how well some BMPs work in this geologic and climatic setting.

General Project Description:

Task 1 - Prepare Workshop Materials. University personnel will prepare all necessary materials to conduct the Professional Development Hour (PDH) Workshops. These materials will include the presentation visuals and attendees notebooks.

Task 2 - Conduct Two Two-day PDH Workshops. Two two-day workshops will be offered, one in Little Rock and one in Fayetteville, AR. The workshops will be conducted with participation from local municipalities, Arkansas Department of Environmental Quality (AEQ), and US EPA. The following topics will be covered in the workshops. a) Today's stormwater regulatory and legal environment, b) Enforcement, c) Community drainage master planning, d) Hydrology, e) Hydraulics of drainage, f) Water quality, g) Design of pipes, channels, inlets, and culverts, h) Detention pond design, i) Best management practices (BMPs) for construction sites, j) Drainage materials and methods used in construction. The workshop instructors will include a national recognized leader in stormwater pollution prevent as well as representatives from EPA, ADEQ, consulting engineering practice, and academia. A nationally recognized leader in stormwater pollution prevention will be hired to be the key presenter at both workshops.

To encourage participation, each workshop will be accredited to provide 1.5 Continuing Education Units (15 hours of contact time) for engineers and architects.

Task 3 – Prepare Quality Assurance Project Plan. A Quality Assurance Project Plan (QAPP) will be prepared and submitted for approval to EPA for the collection of data, which will demonstrate the effectiveness of selected construction site BMPs for stormwater pollution prevention in Northwest Arkansas.

Task 4 – Conduct BMP Site Field Days. The proposed project will include on-site demonstrations of the effectiveness of construction BMPs for stormwater pollution prevention. The demonstrations will be conducted to show contractors, consulting engineers, architects, and government officials the correct methods of installation and maintenance of construction BMPs. These demonstrations will be conducted on active construction sites in Northwest Arkansas and will be coordinated with local city government, the construction site manager, and local engineering, architectural, construction companies. Construction sites in Northwest Arkansas will be selected to demonstrate the correct methods of installation and maintenance of erosion control BMPs (e.g. sediment barriers, settling ponds, mulching, mats/blankets).

Task 5 – Place BMPs for Demonstrate of Effectiveness. Appropriate construction site BMPs will be purchased and placed at long-term construction sites to demonstrate the effectiveness of the BMPs in the geologic and climatic conditions in Northwest Arkansas. Two construction sites will be selected to demonstrate the effectiveness of at least two BMPs (depending upon donations of equipment by BMP suppliers) at each site.

Task 6 – Monitor the Effectiveness of Construction Site BMPs in NW Arkansas. Two construction sites will be selected to demonstrate the effectiveness of at least two erosion control BMPs (depending upon donations of equipment by BMP suppliers) at each site by measuring a suite of traditional water quality parameters (e.g. suspended solids, total solids, selected metals, pH, dissolved oxygen, organic chemicals). Samples will be taken upstream and downstream of each BMP to demonstrate its effectiveness and therefore the amount of pollution that was prevented in the receiving stream. The effectiveness of the BMPs will be made available to the public through the technology transfer of Task 7.

Task 7 – Technology Transfer. To make the information gathered for the workshops and demonstrations available to engineers, architects, and contractors throughout Arkansas, the installation and maintenance procedures will be documented in written format and with digital photographs and video. This information will be disseminated to construction industry professionals through meetings and the Internet. A web page will be constructed to make the technology, photographs, and video readily available to the Arkansas construction community.

Task 8 – Reporting and Record Keeping. All quarterly, annual, and final reports will be prepared and submitted according to the grant requirements.

Tasks, Objectives, Subtasks, Schedules, Deliverables, and Estimated Costs

Task 1, Prepare Workshop Materials

Costs		
Federal	**Non-Federal Match**	**Total**
$ 12,897	$ 15,355	$ 28,252

Objectives: Develop the materials required to put on the workshops

Subtask 1.1 Coordinate with all presenters as to what material will be required

Subtask 1.2 Survey other States and USEPA for appropriate material

Subtask 1.3 Edit material to a master set for duplication

Subtask 1.4 print materials for workshop

Deliverables: Workshop materials.

Task 2, Conduct Two Two-day PDH Workshops

Costs		
Federal	**Non-Federal Match**	**Total**
$ 27,533	$ 12,673	$ 40,207

Objective:

Subtask 2.1 Conduct PDH workshops

Subtask 2.2 Evaluate success of workshops

Deliverables: Conduct PDH workshops.

Task 3, Prepare Quality Assurance Project Plan

Costs		
Federal	**Non-Federal Match**	**Total**
$ 1,777	$ 4,084	$ 5,862

Objectives: Approved QAPP.

Subtask 3.1 Obtain example QAPP

Subtask 3.2 Meet with Water Quality Lab and agree on testing plan

Subtask 3.3 Write QAPP

Subtask 3.4 Submit QAPP to EPA

Deliverables: Approved QAPP.

Task 4, Conduct BMP Field Days

Costs		
Federal	**Non-Federal Match**	**Total**
$ 8,986	$ 8,858	$ 17,844

Objective: To conduct BMP demonstrations

Subtask 4.1 Conduct BMP workshop with installation exercises

Subtask 4.2 Evaluate success of workshop

Deliverables: Conduct BMP workshop.

Task 5, Place BMPs for Demonstrate of Effectiveness

Costs		
Federal	**Non-Federal Match**	**Total**
$ 889	$ 842	$ 1,731

Objective: Place BMPs and collect data to evaluate effectiveness of BMPs

Subtask 5.1 Obtain agreements with owners of construction sites to evaluate BMPs

Subtask 5.2 Procure BMPs from suppliers

Subtask 5.3 Place BMPs

Task 6, Monitor Effectiveness of Construction Site BMPs in NW Arkansas

Costs		
Federal	**Non-Federal Match**	**Total**
$ 62,509	$ 42,273	$ 104,781

Subtask 6.1 Collect samples

Subtask 6.2 Evaluate samples in lab

Subtask 6.3 Analysis data

Deliverables: Collection of data per QAPP

Task 7, Technology Transfer

Federal	**Non-Federal Match**	**Total**
$ 7,447	$ 7,455	$ 14,902

Objective: Information dissemination

Subtask 7.1 Compile BMP information from research

Subtask 7.2 Compile photos and video

Subtask 7.3 Author webpage

Subtask 7.4 Email announcement of webpage to interested parties

Deliverables: Webpage on ASWCC site.

Task 8, Reporting and Record Keeping

Federal	Non-Federal Match	Total
$ 2,710	$ 2,569	$ 5,279

Objective:

Subtask 8.1 Write and submit quarterly reports

Subtask 8.2 Write and submit annual reports

Subtask 8.3 Write and submit final report

Deliverables: All quarterly, yearly, and final reports (including QAPP) completed.

Schedule of Tasks and Outputs:

Task	Subtask Number	Description	Start Date	Completion Date
1	**1.1**	Coordinate with all presenters as to what material will be required	7/1/2001	8/31/2001
	1.2	Survey other States and USEPA for appropriate material	7/1/2001	8/31/2001
	1.3	Edit material to a master set for duplication	8/1/2001	9/30/2001
	1.4	Print material for workshop	9/1/2001	9/30/2001
2	**2.1**	Conduct PDH workshops	10/1/2001	10/31/2001
	2.2	Evaluate success of workshops	10/1/2001	10/31/2001
3	**3.1**	Obtain QAPP requirements and example	7/1/2001	8/31/2001
	3.2	Meet with Water Quality Lab and agree on testing plan	7/1/2001	7/31/2001
	3.3	Write QAPP	8/1/2001	11/30/2001
	3.4	Submit QAPP to EPA	10/1/2001	10/31/2001
4	**4.1**	Obtain agreements with owners of construction sites to conduct demonstrations	8/1/2001	10/31/2001
	4.2	Procure BMPs from suppliers	8/1/2001	10/31/2001
	4.3	Conduct demonstrations	11/1/2001	1/31/2002
	4.4	Conduct success evaluations	1/1/2002	1/31/2002
5	**5.1**	Obtain agreements with owners of construction sites to evaluate BMPs	9/1/2001	11/30/2001
	5.2	Procure BMPs from suppliers	10/1/2001	12/31/2001
	5.3	Place BMPs	12/1/2001	1/31/2002
6	**6.1**	Collect samples	1/1/2002	5/31/2003
	6.2	Evaluate samples in lab	1/1/2002	5/31/2003
	6.3	Analysis data	2/1/2002	6/31/2003
7	**7.1**	Compile BMP information from research	11/1/2001	5/31/2003
	7.2	Compile photos and video	12/1/2001	5/31/2003
	7.3	Author webpage	4/1/2003	5/31/2003
	7.4	Announce webpage and availability of technology transfer to interested parties	6/1/2003	6/31/2003
8	**8.1**	Write and submit quarterly reports	8/1/2001	6/31/2003
	8.2	Write and submit annual reports	5/1/2002	6/31/2003
	8.3	Write and submit final reports	5/31/2003	6/31/2003

Coordination, Roles, and Responsibilities

Department of Civil & Environmental Engineering University of Arkansas: Project coordination, preparation of workshop documents, coordination of workshops and demonstrations, website authorship, and reporting.

Public Participation:

Announcements of the workshops and demonstrations will be sent to construction companies, architectural firms, and consulting engineering firms as well as city, county, and state regulating agencies. The workshop will be advertised in the appropriate newsletters and publications.

Specific aspects of the workshops will be planned in conjunction with the United States Environmental Protection Agency (EPA), Arkansas Department of Environmental Quality (ADEQ), and Arkansas Soil & Water Conservation Commission (ASWCC).

The City of Fayetteville has expressed an interest in participating in the proposed project and has indicated that it would be willing to make area contractors aware of the project and the benefits that the contractors could gain by participating in the project. It is anticipated that other municipalities and counties would also be willing to participate in the project.

Suppliers of commercially available construction site stormwater pollution prevention BMPs have also indicated that they would be willing to contribute expertise and materials to the project. In addition, these suppliers have the ability to contact contractors to inform them of the project.

Measures of Success and Performance

The educational segment of the project will be evaluated by the number of attendees of the workshops and field days and by participant evaluation forms. The BMP effectiveness demonstration will be evaluated by showing the effectiveness of pollutant removal from stormwater runoff to the receiving stream.

Reference to Project in the NPS Management Program

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List of Appendices:
Appendix 701 Estimated Project Budget
Appendix 702 Estimated “Other” Budget
Appendix 703 Project Budget Justification Worksheet,

Appendix 701
Estimated Project Budget

PROJECT PERIOD:					
Budget Category	Salary	m-yrs	Cost	Federal	Non Federal
Personnel					
Total Personnel					
Fringe Benefits %					
Travel					
In State					
Out of State					
Equipment					
Supplies					
Contractual					
Construction					
Other **I. University of Arkansas**			$ 218,858	124,749	$ 94,109
Total Direct Charges			$ 218,858	$ 124,749	$ 94,109
Indirect %					
Grand Total			$ 218,858	$ 124,749	$ 94,109

Appendix 702
Estimated "Other" Budget

PROJECT PERIOD:					
Budget Category	Salary	m-yrs	Cost	Federal	Non Federal
Personnel					
F. Edwards	$ 75,600	0.417	$ 31,500	$ 18,364	$ 13,136
T. Soerens	$ 75,600	0.042	$ 3,150	$ 1,888	$ 1,262
S. Burian	$ 75,600	0.25	$ 18,900	$ 10,810	$ 8,090
K. Steele	$ 88,000	0.042	$ 2,000	$ -	$ 2,000
M. Boyer	$ 72,000	0.042	$ 3,000	$ 1,799	$ 1,201
AWRC Personnel	$ 22,000	0.259	$ 5,700	$ 3,417	$ 2,283
Graduate Student I	$ 15,600	1.000	$ 15,600	$ 8,923	$ 6,677
Graduate Student II	$ 15,600	1.000	$ 15,600	$ 8,923	$ 6,677
Total Personnel			$ 95,450	$ 54,124	$ 41,326
Fringe Benefits varies %			$ 15,846	8,953	6,893
Travel					
In State			$ 3,049	$ 3,049	$ -
Out of State					
Equipment			$ 2,400	$ -	$ 2,400
Supplies			$ 5,547	$ 2,472	$ 3,075
Contractual			$ 34,500	$ 34,500	$ -
Construction			$ -	$ -	$ -
Other					
I.			$ -	$ -	$ -
Total Direct Charges			$ 156,792	$ 103,098	$ 53,694
Indirect 40.2 %			62,066	21,651	$ 40,415
Grand Total			$ 218,858	$ 124,749	$ 94,109

Appendix 703

PROJECT BUDGET JUSTIFICATION WORKSHEET

BUDGET CATEGORIES INFORMATION (FROM SF424A, SECTION B TOTALS) Enter Total Program Costs, i.e., Federal and Non-Federal Funds Combined (Attach Separate Sheets(s) if necessary)				
OBJECT CLASS CATEGORIES:				
a. Personnel: (Program Staffing - include and indicate vacant positions) Position Title	Number in Position Class	Annual Salary Rate	Work Years	Personnel Costs
(1)	(2)	(3)	(4)	(5)
Project Leader F. Edwards		$ 75,600	0.42	$ 31,500
T. Soerens		$ 75,600	0.04	$ 3,150
S. Burian		$ 75,600	0.25	$ 18,900
K. Steele		$ 88,000	0.02	$ 2,000
M. Boyer		$ 72,000	0.04	$ 3,000
Graduate Student 1		$ 15,600	1.00	$ 15,600
Graduate Student 2		$ 15,600	1.00	$ 15,600
AWRC personnel		$ 22,000	0.26	$ 5,700
Personnel Category Totals				$ 95,450

BUDGET CATEGORIES INFORMATION (FROM SF424A, SECTION B TOTALS) Enter Total Program Costs, i.e., Federal and Non-Federal Funds Combined (Attach Separate Sheets(s) if necessary)		
OBJECT CLASS CATEGORIES:		
b. Fringe Benefits: Total	$	15,847
c. Travel: Include estimates of In-State and Out of State travel including if appropriate, mileage in State or private vehicles, Per Diems, air fare and conference fees.		
In State		
Vehicle rental (16 d @ $50/d)	$	800
Mileage (2315 mi @ 0.28/mi)	$	648
per diem ($25/p/d * 4 p * 4d)	$	400
rooms ($100/p/d * 4 p * 3 d)	$	1,200
Out of State		
none		
TRAVEL TOTAL	$	3,048
d. Equipment:		
(1) List each item costing $5,000 or more to be purchased for this project:		
(2) List each item costing less than $5,000. You may list items by groups, as appropriate.		
digital video camera with tripod, extra memory, extra battery, case	$	2,400
COMBINED EQUIPMENT TOTAL	$	2,400
e. Supplies: List by groups, as appropriate		
workshop participant supplies ($41/p * 75 p)	$	3,075
sample bottles	$	500
filter papers and planchets	$	1,355
pH buffer	$	72
DO probe	$	250
pH probe	$	295
SUPPLIES TOTAL	$	5,547
f. Contractual: List each planned contract separately, type of service to be procured, proposed procurement method (I.e. small purchase, formal advertising, competetive negotiations or non-competative negotiations) and the estimated cost. Also, please indicate if the proposed contract performance period will go beyond the budget period of assistance for which this application is submitted.		
Water testing (COD, metals, TPH @ $170/set for 100 sets)	$	20,400
Speaker for workshops	$	13,100
Room for workshop in Little Rock	$	1,000
COMBINED CONTRACTUAL TOTAL	$	34,500

BUDGET CATEGORIES INFORMATION (FROM SF424A, SECTION B TOTALS) Enter Total Program Costs, i.e., Federal and Non-Federal Funds Combined (Attach Separate Sheets(s) if necessary)	
OBJECT CLASS CATEGORIES:	
g. Construction	
none	
CONSTRUCTION TOTAL	$ -
h. Other: Explain by major categories any items not included in above standard budget catagories. Caution: Do not include or porpose as a direct project cost, any cost that is	
indirect in nature (see OMB Circular A-87) or is included in the indirect cost pool on	
which the indirect cost rate (item j) is based.	
OTHER TOTAL	$ -
i. TOTAL DIRECT CHARGES: (Sum of Items a. through h.)	$ 156,792
j. INDIRECT COSTS: (Attach a compy of you latest indirect cost agreement)	62,066
k. TOTAL PROPOSED PROGRAM COSTS (Sum Items i. And j.)	$ 218,858
SHARE: FEDERAL 57%	124,749
GRANTEE 43%	$ 94,109

Project Personnel Justification Summary:

Not applicable

Appendix B

Work Plan Report

for

Stormwater Pollution Prevention BMP Workshop, Demonstration, and Evaluation

Project 700 FY01 CWA Section 319(h)

Work Plan Report

Project 700 FY01 CWA Section 319(h)

Stormwater Pollution Prevention BMP Workshop, Demonstration, and Evaluation

Findlay G. Edwards, Ph.D., P.E.

June 25, 2003

Introduction
The following is a brief inventory of work plan tasks and relative success in accomplishing goals of the work plan. The document is intended to accompany the workshop workbook, final Quality Assurance Report, and the Final Report for Project 700 FY01. The tasks outlined below were completed on schedule, except approval of the QAPP by EPA, which was approved in June 2002. The following is a listing of the tasks and completion schedule/times.

Task 1 - Prepare Workshop Materials. University personnel prepared all necessary materials to conduct the Professional Development Hour (PDH) Workshops. A copy of the workbook accompanies this Work Plan Report. Task 1 was completed on November 30, 2001.

Task 2 - Conduct Two Two-day PDH Workshops. Two two-day workshops were offered, one in Little Rock and one in Fayetteville, AR. The workshops were conducted with participation from local municipalities, Arkansas Department of Environmental Quality (AEQ), and US EPA. The following topics were covered in the workshops. a) Today's stormwater regulatory and legal environment, b) Enforcement, c) Community drainage master planning, d) Hydrology, e) Hydraulics of drainage, f) Water quality, g) Design of pipes, channels, inlets, and culverts, h) Detention pond design, i) Best management practices (BMPs) for construction sites, j) Drainage materials and methods used in construction. The workshop instructors included a national recognized leader in stormwater pollution prevent as well as representatives from EPA, ADEQ, consulting engineering practice, and academia. A nationally recognized leader in stormwater pollution prevention was hired to be the key presenter at both workshops. To encourage participation, each workshop was accredited to provide 1.5 Continuing Education Units (15 hours of contact time) for engineers and architects. Task 2 was completed on February 10, 2001.

Task 3 – Prepare Quality Assurance Project Plan. A Quality Assurance Project Plan (QAPP) was prepared and submitted for approval to EPA for the collection of data, which demonstrated the effectiveness of selected construction site BMPs for stormwater pollution prevention in Northwest Arkansas. The Quality Assurance Project Plan was approved by the USEPA in June 2002.

Task 4 – Conduct BMP Workshop with Installation Exercises. A two-day workshop will be offered in Fayetteville, AR. The following topics will be covered in the workshop. a) Today's stormwater regulatory and legal environment, b) Enforcement, c) Community drainage master planning, d) Hydrology, e) Hydraulics of drainage, f) Water quality, g) Design of pipes, channels, inlets, and culverts, h) Detention pond design, i) Best management practices (BMPs) for construction sites, j) Drainage materials and methods used in construction. The workshop will include installation exercises to show participants the correct methods of installation and maintenance of construction BMPs. To encourage participation, 15 Professional Development Hours (PDHs) will be awarded for participation.

Task 5 – Place BMPs for Demonstrate of Effectiveness. Appropriate construction site BMPs will be purchased and placed at a long-term construction site to demonstrate the effectiveness of the BMPs in the geologic and climatic conditions in Northwest Arkansas. One construction site will be selected to demonstrate the effectiveness of four BMPs (depending upon donations of equipment by BMP suppliers).

Task 6 – Monitor the Effectiveness of Construction Site BMPs in NW Arkansas. Monitor the Effectiveness of Construction Site BMPs in NW Arkansas. A construction site will be selected to demonstrate the effectiveness of BMPs (depending upon donations of equipment by BMP suppliers) on four demonstration plots as compared to a control demonstration plot by measuring the total amount of sediment, a selected metal, pH, and organic chemicals (using BOD or COD). The amount of pollutants captured or retained by the BMPs will show the amount of pollution that was prevented from getting into the receiving stream. The effectiveness of the BMPs will be made available to the public through the technology transfer of Task 7.

Task 7 – Technology Transfer. To make the information gathered for the workshops and demonstrations available to engineers, architects, and contractors throughout Arkansas, a web page was be constructed to make the technology, photographs, and video readily available to the Arkansas construction community. Task 7 was completed on June 24, 2003.

Task 8 – Reporting and Record Keeping. All quarterly, annual, and final reports were prepared and submitted according to the grant requirements.

Appendix C

Quality Assurance Project Plan (QAPP)

For

Stormwater Pollution Prevention BMP Workshop, Demonstration, and Evaluation

Project 700 FY01 CWA Section 319(h)

Element A1

Stormwater Pollution Prevention BMP Workshop, Demonstration, and Evaluation

By

University of Arkansas
Civil Engineering Department

Quality Assurance Project Plan
FY 01 Task 700
Grant # C999610309
Qtrack #

Principal Investigator
Findlay G. Edwards

Findlay G. Edwards, P.E., Ph.D. Principle Investigator University Of Arkansas Civil Engineering Department	_____ Signature _____ Date
Robert Morgan, P.E. Project Engineer ASWCC Nonpoint Source Pollution Section	_____ Signature _____ Date
Bart Dudley ASWCC Project Leader ASWCC Water Management Section	_____ Signature _____ Date
Sue Filat-Alami Quality Assurance Officer ASWCC Water Management Section	_____ Signature _____ Date
Leonard Pardee Region VI USEPA State Project Officer	_____ Signature _____ Date
_____ Region VI USEPA Water Quality Management Branch	_____ Signature _____ Date

Effective Date: _____

Element A2
Table of Contents

Element A3

Distribution List

The following list of individuals and their respective organizations will receive a finalized, signed, USEPA Region VI approved QAPP, and copies of subsequent revisions from ASWCC:

Individual	Associated Agency
Robert Morgan	Arkansas Soil and Water Conservation Commission
Mike Whitis	Arkansas Soil and Water Conservation Commission
Bart Dudley	Arkansas Soil and Water Conservation Commission
Findlay G. Edwards	University of Arkansas, Civil Engineering Department
Len Pardee	United States Environmental Protection Agency, Region 6

Element A4

Project/Task Organization

Robert A. Morgan, P.E. ASWCC Project Officer	Responsible for approving and accepting final products and deliverables and making reports to EPA
Mike Whitis ASWCC QA Officer	Responsible for adherence to QAPP QA/QC procedures
Bart Dudley ASWCC Project Leader	ASWCC Point of Contact
Leonard Pardee USEPA Region VI USEPA Project Officer	Responsible for grant administration from USEPA Region VI, QAPP review and approval, and final report approval
Findlay G. Edwards University of Arkansas, Civil Engineering Department Principle Investigator	Responsible for preparation of QAPP, supervision and assistance for data acquisition, data analysis, and reporting (including final report).

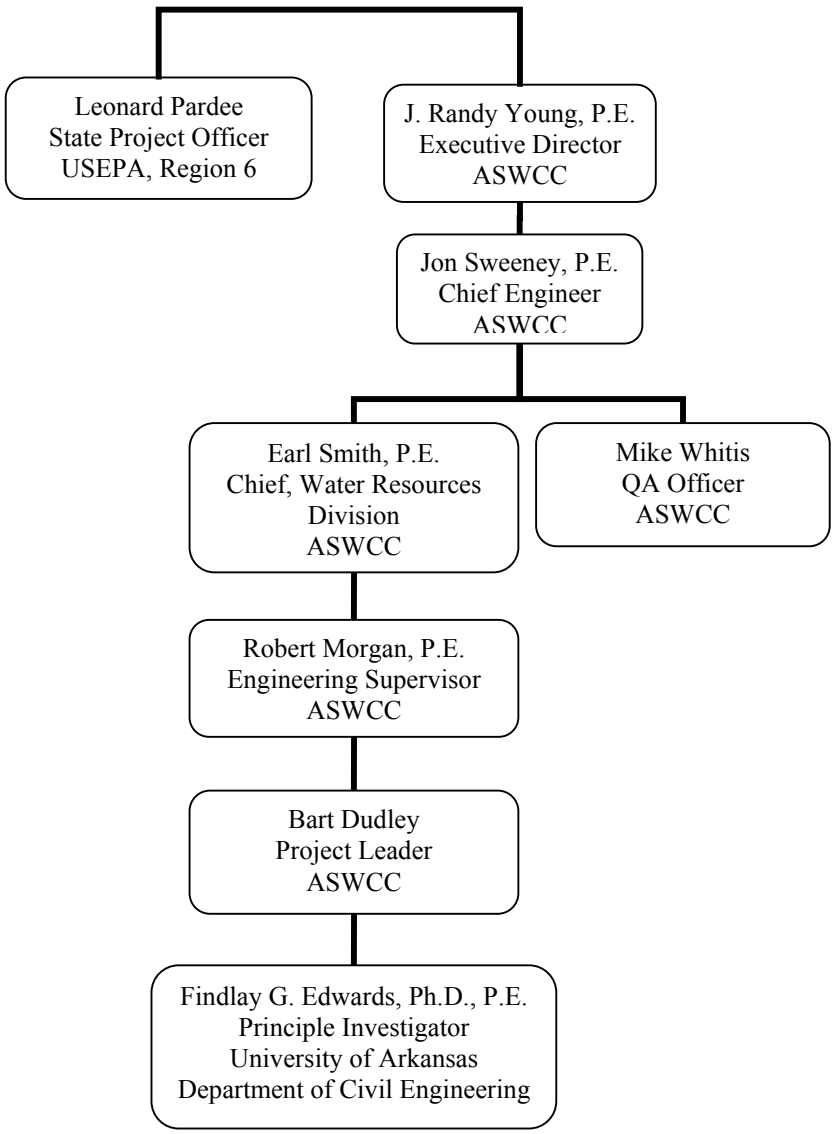

Figure 1. Project Communications Flow Chart

Element A5

Problem Definition/Background

With the recent promulgation of Phase II of the National Pollution Discharge Elimination System (NPDES) Stormwater Pollution Control regulations, many construction companies, consulting engineers, architects, and regulating agency personnel are unaware of the new stormwater pollution reduction requirements. In addition, they are typically unaware of Best Management Practices (BMPs) that are available to mitigate stormwater discharge pollution and the proper methods of installing and maintaining BMPs. Currently, if any stormwater pollution prevention practices are implemented during construction, they are often improperly installed and inadequately maintained. The contractors often do not understand the necessity of proper installation and have not been adequately trained in the correct maintenance of the BMPs. The result is that tremendous amounts of sediment are needlessly eroded from construction sites and enter the waters of Arkansas. Training of engineers, architects, contractors, and governmental officials will provide the needed technology transfer to lessen the sediment runoff. Workshops and demonstrations conducted by professionals who are familiar with the new regulations and with the BMPs will provide the tools necessary to lessen the impact of construction on the environment. In addition, the effectiveness of BMPs is highly dependent upon the geologic and climatic setting; therefore, not all of EPA's BMPs will be effective in Northwest Arkansas. Demonstration of BMPs for construction sites in Northwest Arkansas will show how well some BMPs work in this geologic and climatic setting.

Element A6

Project/Task Description

Task 1 - Prepare Workshop Materials. University personnel will prepare all necessary materials to conduct the Professional Development Hour (PDH) Workshops. These materials will include the presentation visuals and attendees notebooks.

Task 2 - Conduct Two Two-day PDH Workshops. Two two-day workshops will be offered, one in Little Rock and one in Fayetteville, AR. The workshops will be conducted with participation from local municipalities and Arkansas Department of Environmental Quality (AEQ). The following topics will be covered in the workshops. a) Today's stormwater regulatory and legal environment, b) Enforcement, c) Community drainage master planning, d) Hydrology, e) Hydraulics of drainage, f) Water quality, g) Design of pipes, channels, inlets, and culverts, h) Detention pond design, i) Best management practices (BMPs) for construction sites, j) Drainage materials and methods used in construction. The workshop instructors will include a national recognized leader in stormwater pollution prevent as well as representatives from EPA, ADEQ, consulting engineering practice, and academia. A nationally recognized leader in stormwater pollution prevention will be hired to be the key presenter at both workshops. To encourage participation, each workshop will be accredited to provide 1.5 continuing education units (15 professional development hours) for engineers and architects.

Task 3 – Prepare Quality Assurance Project Plan. A Quality Assurance Project Plan (QAPP) for the collection of information, which will demonstrate the effectiveness of selected construction site BMPs for stormwater pollution prevention in Northwest Arkansas, will be prepared and submitted to EPA for approval.

Task 4 – Conduct BMP Workshop with Installation Exercises. A two-day workshop will be offered in Fayetteville, AR. The following topics will be covered in the workshop. a) Today's stormwater regulatory and legal environment, b) Enforcement, c) Community drainage master planning, d) Hydrology, e) Hydraulics of drainage, f) Water quality, g) Design of pipes, channels, inlets, and culverts, h) Detention pond design, i) Best management practices (BMPs) for construction sites, j) Drainage materials and methods used in construction. The workshop will include installation exercises to show participants the correct methods of installation and maintenance of construction BMPs. To encourage participation, 15 professional development hours (PDHs) will be awarded for participation.

Task 5 – Place BMPs to Demonstrate Effectiveness. Appropriate construction site BMPs will be purchased and placed at a long-term construction site to demonstrate the effectiveness of the BMPs in the geologic and climatic conditions in Northwest Arkansas. One construction site will be selected to demonstrate the effectiveness of four BMPs (depending upon donations of equipment by BMP suppliers).

Task 6 – Monitor the Effectiveness of Construction Site BMPs in NW Arkansas. A construction site will be selected to demonstrate the effectiveness of BMPs (depending upon donations of equipment by BMP suppliers) on four demonstration plots as compared to a control demonstration plot by measuring the total amount of sediment, a selected metal, pH, and organic chemicals (using BOD or COD). The amount of pollutants captured or retained by the BMPs will show the amount of pollution that was prevented from getting into the receiving stream. The effectiveness of the BMPs will be made available to the public through the technology transfer of Task 7.

Task 7 – Technology Transfer. To make the information gathered for the workshops and demonstrations available to engineers, architects, and contractors throughout Arkansas, the installation and maintenance procedures will be documented in written format and with digital photographs and video. This information will be disseminated to construction industry professionals through meetings and the Internet. A web page will be constructed to make the technology, photographs, and video readily available to the Arkansas construction community.

Task 8 – Reporting and Record Keeping. All quarterly, annual, and final reports will be prepared and submitted according to the grant requirements.

Element A7

Data Quality Objectives for Measurement Data

The purpose of this project is to educate engineers, contractors, developers, architects, and regulatory personnel about the new stormwater regulations, types of best management practices (BMPs) available, effectiveness of these BMPs in Northwest Arkansas, proper installation of these BMPs, and proper inspection and maintenance of these BMPs.

The data quality objectives are to collect data to demonstrate the effectiveness of construction BMPs in preventing pollutants (sediment, organic chemicals) from entering the waters of Arkansas. Commonly used water quality testing methodologies will be used to demonstrate effectiveness of the BMPs.

Samples will be collected from demonstration plots with typical construction BMPs and from a demonstration plot without any BMPs. The samples will be tested for total solids, organic chemicals (using COD), and a representative metal (copper).

Total solids will be determined gravimetrically from the total amount of solids captured in the runoff.

All samples will be analyzed for chemical oxygen demand (COD) and copper by the AWRC-Water Quality laboratory (WQL). The WQL will assure data quality by conforming to its EPA approved QALP (Quality Assurance Laboratory Plan). Ninety percent completeness for all data collected will be acceptable.

Field and laboratory Quality Control (QC) checks, described in ELEMENT B5, will assure precision and accuracy. A field notebook will be maintained to assure that all field QC procedures associated with the sampling process are completed. To be acceptable, data must be accompanied by complete field QC, sample custody documentation, and lab QC documentation. The Water Quality Laboratory will provide estimates of precision and accuracy for all data reported. Data will be acceptable if they conform to the criteria for precision, accuracy, and completeness listed in Table 1.

Table 1. Data Quality Criteria.

Parameter	Source/ Method	Units	PQL*	% Spike Recovery
Chemical Oxygen Demand (COD)	Standard Methods 5550D	mg/l	28	85-115%
Copper	EPA/200.7	mg/l	.032	85-115%

* Practical Quantification Limit

Element A8

Special Training Requirements/Certification

There are no additional special training requirements and no additional certification requirements for this project.

Element A9

Documentation and Records

Field log books and photographs will be maintained, organized, and kept current in the office of the Principal Investigator, which is in the Department of Civil Engineering at the University of Arkansas. Copies of historical data acquired and electronically stored versions of data and up to date data analysis will be kept at the Principle Investigator's office at the University of Arkansas Department of Civil Engineering.

Chain of custody forms will be initiated when the samples are collected and will accompany the samples. These forms or copies thereof will be delivered to the principal investigator and ASWCC QA officer along with analysis results.

Water Quality Laboratory personnel will maintain records of the time and dates when samples are received and analyzed. SOPs for analysis operations will be kept in the lab and followed at all times. Detailed records of all lab spikes, duplicates, blanks and other QC checks will be kept for inclusion in the QA report. Water Quality Laboratory personnel will develop standardized data reporting packages acceptable to the investigator. They will include, at a minimum, time and date of sample receipt, digestion and analysis, concentrations for all analytes for each sample and QC information. Copies of these reports will be retained as permanent records of the labs, copied to the principal investigator as either electronic (when possible) or paper format, and also copied to the ASWCC QA officer electronically (when possible) and paper copy. Data reports will be available no later than 6 weeks after analysis is complete. Also kept on file at the WQL for a minimum of five years will be all the raw data used to provide the final analytical concentrations such as digestion volumes, dilutions, peak areas, and absorbance values.

Water sample test results will be maintained in hard copy and electronic copy (where appropriate) at the office of the Principal Investigator, which is in the Department of Civil Engineering at the University of Arkansas.

Corrective actions or other actions to assure data quality will be made or approved by Findlay G. Edwards. Any corrective actions performed will be reported quarterly to ASWCC.

Element B1

Sampling Process Design

The demonstration will start upon coming to an agreement with a contractor to allow access to a construction site and to conduct a demonstration of the effectiveness of construction stormwater best management practices. A series of four plots will be set up with BMPs and one plot without a BMP. Runoff will be collected from two storms to show the effectiveness of the BMPs to remove the pollutants of concern.

Water samples will be collected from the six demonstration plot sample collection buckets. Samples will be collected after each rain event that is large enough to cause runoff and that does not cause the sample collection system to overflow. It will be imperative to collect samples within one day of a runoff event. The collected water will be analyzed for the following parameters: 1) total solids, 2) chemical oxygen demand (COD), and 3) copper.

There are no special sampling or analytical methodologies required for this sampling process. Routine grab sampling according to Standard Methods for Examination of Water and Wastewater 19th Edition (National Public Health Association) will be used. Analytical methodologies listed in Table 2. will be used and do not require method validation. The analytical methodologies were taken from Test Methods for Chemical Analysis of Water and Waste (EPA-600/4-79-020) and Standard Methods for Examination of Water and Wastewater 19th Edition.

Sampling equipment required for this project is listed below:

- Sample bottles with sample preservation
- Funnel
- Composite carboys
- Digital camera
- Field Book and pen
- Wash water
- Brush

Table 2. Sample handling protocol for water chemical parameter.

Parameters	Source/ Method	Container	Volume	Holding Time	Preservation
Chemical Oxygen Demand	Standard Methods 5220D	polyethylene	50 ml	48 hours	Refrigerate (4^{o}C), H_2SO_4 pH<2
Copper (unfiltered)	EPA/200.7	polyethylene	50 ml	6 months	HNO_3 pH<2

Element B2

Sampling Methods Requirements

Proper sampling techniques must ensure that the sample is representative of the pond water quality, and that the sample is not altered or contaminated by sampling and handling procedures. To ensure a consistent method for collecting samples is used, all runoff from each plot will be directed through a trough to be captured in clean polyethylene bottles. For those storms that cause runoff but do not overfill the polyethylene bottles, the total sediment captured will be determined and grab samples will be collected in clean, 500 milliliter, polyethylene bottles for COD and copper analysis. The sample bottles will contain the necessary sample preservative for the various parameters as listed in Table 2.

All sample containers, new (unless purchased pre-cleaned) or previously used, will be cleaned by washing with phosphate-free detergent and rinsing twice with tap water and three times with deionized water.

Provided in the following paragraphs are procedures for decontamination of various tools and equipment used in performing the field investigations during the course of the project. Provided below is a standard protocol for all equipment:

- Scrub equipment thoroughly with tap water, a soft bristle brush, and a low sudzsing detergent (i.e. Alconox).
- Rinse equipment with tap water by submerging and/or spraying.
- Rinse equipment with distilled water by spraying until dripping.
- Place equipment on plastic and allow to air dry for 5 to 10 minutes.
- Wrap equipment in plastic for handling and/or storage until next use.

Personnel taking samples will follow all the procedures noted above. In the case that any of these procedures cannot be followed, the problem will be detailed in the field notebook and reported to the investigator (prior to be beginning of analysis) who will decide that the questionable samples are acceptable or order the sampling event repeated.

Element B3

Sample Handling and Custody Requirements

After collection, samples will be immediately iced and kept iced until delivered for analysis. Samples will remain in the custody of the collecting individual until delivery. At collection the collector will make appropriate entries in the field notebook, fill out a chain of custody form and label each sample bottle. The custody form will contain information about the sample: time, date and location at which taken; and name and signature of sample taker. When a sample arrives at the appropriate laboratory, the time and date of arrival will be added to the custody form and the delivering and receiving individuals will sign the form. Appendix A contains an example of the custody form, which will be used for this project. Custody forms will be retained in the laboratory.

Samples bottle will be labeled using waterproof ink on label tape designed for the purpose. The labels will include the pond ID (Element B1), bottle # (e.g. 1 of 6, 2 of 6, etc.) date and time, and preservative, if any.

Element B4

Analytical Methods Requirements

Analytical methods are listed in Table 1 along with specific performance requirements. All analytical methods will be conducted under the AWRC-WQL Quality Assurance Plan in which there is a specific SOP for each method. All methods fall under specific quality control requirements outlined in this Quality Assurance Plan. Any failure in the analytical systems will be the responsibility of the AWRC-WQL staff for corrective action. The chain of responsibility for systems failures are the AWRC-WQL instrument technician reports the inability to prove system control, AWRC-WQL Chief Chemist reviews the system and recommends corrective actions, AWRC-WQL technician repeats analysis providing sufficient sample and holding time. If the system is not in control before the sample is consumed or exceeds holding time, the AWRC-WQL QA Officer will review the failure and provide a report to the principal investigator and ASWCC QA Officer.

Element B5

Quality Control Requirements

Field Quality Control Checks

A field duplicate sample will be collected with every 10th sample or at least once for each sampling expedition. One contamination blank (distilled water passed through or into the sampling equipment) will be prepared prior to each sampling expedition.

Laboratory Quality Control Checks

A laboratory duplicate sample analysis will be performed on every 10th sample or at least once for each sample group. A laboratory sample fortified (spiked) sample analysis will be performed on every 10th sample or at least once for each sample group. Specific quality control requirements for each method is addressed in the AWRC-WQL Quality Assurance Laboratory Plan and these requirements will be followed for the project and be the responsibility of the AWRC-WQL.

Element B6

Instrument/Equipment Testing, Inspection and Maintenance Requirements

1. Non-dedicated sampling equipment will be washed and solvent rinsed after each use. It will be visually inspected before each use.

2. All WQL laboratory equipment is the responsibility of the Water Quality Laboratory and is covered under their Quality Assurance Plan.

Documentation will be maintained covering each instrument used.

Element B7

Instrument Calibration and Frequency

AWRC-Water Quality Laboratory:

All equipment used in the laboratory is the responsibility of the AWRC Water Quality Laboratory. Instrument calibrations are covered by written SOPs on file in the laboratory and at ASWCC.

Lab Instruments:

Scales will be checked against standards weekly. Calibration logs are kept for each instrument.

Element B8

Inspection/Acceptance Requirements for Supplies and Consumables

The principle investigator will be responsible for the purchase and assurance of quality in all supplies and/or consumables. Supplies will be purchased using standard University of Arkansas procedures. All supplies and consumable will be inspected for damage upon receipt from the shipper. Following receipt but prior to payment all received goods will be compared to requisition specification and the supplier will be contacted regarding any discrepancies. The person receiving the goods will sign, date, and mark the packing slip regarding the completeness of the requisition. Payment will be made for any requisition after items meeting requisition specifications are received in acceptable condition. Any grievance will be handled according to University of Arkansas procedures.

Element B9

Data Acquisition Requirements (Non-Direct Measurements)

No data acquisition will be required.

No regulatory actions are anticipated as a result of this study.

Element B10

Data Management

Electronic versions of the data and analyses will be backed up on a regular basis (at least monthly) as modifications to data and analysis is performed. Electronic backup copies will be stored in the Principle Investigator's office and at least one off-site location to avoid data loss. Data will be randomly inspected for manual input or other errors. If errors are found, the entire data set will be inspected for errors.

The spreadsheet software used is included in the Microsoft Office™ suite. All files and backups will be from an IBM compatible computer system. Copies of data and backups will be stored according to procedures mentioned above.

Reports will be compiled and stored on computer disk in Microsoft Word™ format.

Element C1

Assessments and Response Actions

A management audit will be performed each year by the project QA Officer to evaluate the QA plan and its implementation. The audit will consist of the following tasks.

a. Examination of data and assurance of proper storage and backup procedures
b. Assurance that reporting requirements are met
c. Evaluation and commentary on analytical methods
d. Corrective actions as necessary

Results from the audit will be reported to the Principle Investigator. The Principle Investigator will be responsible for implementing corrective actions as well as documentation, validation and verification of any such actions. In any instance where corrective action is necessary, a report will be sent to the Project Leader at ASWCC documenting the action.

Element C2

Reports to Management

Reports to USEPA and/or ASWCC will be submitted as outlined in the project work plan on appropriate milestone due dates. The Principle Investigator will complete quarterly QA reports, quarterly progress reports, annual QA reports, and annual project evaluation reports to the ASWCC QA Officer and will include documentation of any corrective actions necessary during the reporting period.

Element D1

Data Review, Validation and Verification Requirements

The Principle Investigator will review all data and results of analyses for accuracy, completeness and validity.

Field.

1. Each sample must be associated with calibrations for all field instruments.
2. There must be a complete field notebook entry associated with each sample.
3. There must be copy of the Sample Custody Form for each sample.

Laboratory.

1. There must be a Sample Custody Form on file for each sample.
2. There must be a lab Sample Tracking from on file for each sample.
3. Documentation must be on file certifying the competency of each lab analyst who ran samples.
4. Date and time of sample receipt, extraction (if any) and analysis for each analyte must be on file.
5. Record of storage (location) and storage QC (temperature readings) must be on file.
6. Documentation of lab QC must be on file, which associates each sample with adequate QC.
7. QC data associated with samples must conform to Data Quality Criteria specified in Element A7.

Reporting.

1. All data must be reported with estimates of accuracy and precision.
2. Instrument result sheets or files must match report sheets.
3. Report sheets must be signed by appropriate lab personnel.

Element D2

Validation and Verification Methods

Field:
The Principal Investigator will be responsible for examining all field notebooks for completeness. Any missing entries will be discussed with the Project Leader and a decision will be reached as to the impact of each omission on data validity. The Principal Investigator will also be responsible for checking and validating calibration logs for field instruments and for inspecting the Sample Custody forms associated with samples. Problems found will be remedied with corrective actions. Problems found from these checks will go into the QA report. This will be an ongoing process to avoid repetition of correctable mistakes. TheWQL Chief Chemist will validate field instrument logs for the WQL and check Sample Custody Forms associated with samples delivered to the WQL. Problems will be corrected immediately. Problems and corrective actions taken will be included in the QA reports.

Laboratory:
The WQL Chief Chemist will certify that all lab records specified in Element D1 are on file and are adequate. QC data at the WQL will be examined by the WQL Chief Chemist and submitted to the project Principal Investigator who will certify that the Data Quality Criteria have been met.

Reporting:
The WQL Chief Chemist will verify that all lab results have been accurately transferred to report sheets. The Principal Investigator will be responsible to see that all data reports are accompanied by estimates of accuracy and precision. and that all report sheets are signed. The results will be conveyed to the data users in several forms, the final report, fact sheets, workshops, and journal publications.

Electronic versions of data will be crosschecked with original or copies of original documents to assure accuracy. Modifications made to data to assure consistency of units or other modifications will be examined and checked for validity. Analytical techniques including trend analyses will be examined for validity using yet to be determined limits.

Element D3

Reconciliation with Data Quality Objectives

The data for this project must be of high enough quality to demonstrate that construction BMPs reduce the amount of pollutants that are transported by surface runoff. During the course of the project the Principal Investigator and all involved personnel will make every effort to assure that the data collection process functions to meet the stated quality criteria. At the end of the project the Project Leader, the Principal Investigator, and the ASWCC QA Officer will review all of the data and use their best professional judgment to reconcile the quality of the data collected with the project's initial Data Quality Objectives. The final report for the project will include a discussion of the results of this review

Schedule of Tasks and Outputs:

Task	Subtask Number	Description	Start Date	Completion Date
1	**1.1**	Coordinate with all presenters as to what material will be required	7/1/2001	9/31/2001
	1.2	Survey other States and USEPA for appropriate material	7/1/2001	9/31/2001
	1.3	Edit material to a master set for duplication	8/1/2001	10/30/2001
	1.4	Print material for workshop	11/1/2001	12/30/2001
2	**2.1**	Conduct PDH workshops	1/1/2002	2/28/2002
	2.2	Evaluate success of workshops	1/1/2002	2/28/2002
3	**3.1**	Obtain QAPP requirements and example	7/1/2001	8/31/2001
	3.2	Meet with Water Quality Lab and agree on testing plan	7/1/2001	9/31/2001
	3.3	Write QAPP	8/1/2001	4/15/2001
	3.4	Submit QAPP to EPA	5/20/2001	8/30/2001
4	**4.1**	Conduct BMP workshop with installation exercises	6/1/2002	8/30/2002
	4.2	Evaluate success of workshop	6/1/2002	8/30/2002
5	**5.1**	Obtain agreements with owners of construction sites to evaluate BMPs	9/1/2001	11/30/2001
	5.2	Procure BMPs from suppliers	10/1/2001	12/31/2001
	5.3	Place BMPs	4/1/2001	4/30/2002
6	**6.1**	Collect samples	9/1/2002	8/31/2003
	6.2	Evaluate samples in lab	9/1/2002	9/30/2003
	6.3	Analysis data	9/1/2002	9/30/2003
7	**7.1**	Compile BMP information from research	11/1/2001	5/31/2003
	7.2	Compile photos and video	12/1/2001	5/31/2003
	7.3	Author webpage	4/1/2003	5/31/2003
	7.4	Announce webpage and availability of technology transfer to interested parties	6/1/2003	6/30/2003
8	**8.1**	Write and submit quarterly reports	8/1/2001	6/30/2003
	8.2	Write and submit annual reports	5/1/2002	6/30/2003
	8.3	Write and submit final reports	5/31/2003	6/30/2003

APPENDIX A

AWRC-WQL SAMPLE CUSTODY FORM

SAMPLE IDENTIFICATION: _____

NUMBER OF CONTAINERS: _____

COLLECTED BY (name and sig): _____

DATE AND TIME COLLECTED: _____

DATE AND TIME RELEASED: _____

(INITIAL)

CUSTODIAN NAME	DATE RECEIVED	INITIAL (indicates acceptance	SAMPLE LOCATED AT:	DATE RELEASED	INITIAL (indicates release)

n.b. Custodian initials verify that all sample containers are intact and well labeled, unless exceptions are noted below and initialed

Appendix D

Final Quality Assurance Report

for

Stormwater Pollution Prevention BMP Workshop, Demonstration, and Evaluation

Project 700 FY01 CWA Section 319(h)

Quality Assurance Report

Project 700 FY01 CWA Section 319(h)

Stormwater Pollution Prevention BMP Workshop, Demonstration, and Evaluation

Submitted by:

Findlay G. Edwards, Ph.D., P.E.

June 25, 2003

Introduction

The following is a Quality Assurance Report for Project 700 FY01 CWA Section 319(h)**,** "Stormwater Pollution Prevention BMP Workshop, Demonstration, and Evaluation." The project has not met with any irresolvable quality assurance issues from inception to date. This is the final quality assurance report and accompanies the Final Report as required. Below is a line item description of quality issues as outlined in the QAPP.

QAPP Element		Comments
A1	Title and Approval Sheet	N/A
A2	Table of Contents	N/A
A3	Distribution List	N/A
A4	Project/Task Organization	N/A
A5	Problem Definition/Background	N/A
A6	Project/Task Description	N/A
A7	Data Quality Objectives for Measurement Data	Information successfully acquired
A8	Special Training Requirements/Certification	N/A
A9	Documentation and Records	All data stored as required
B1	Sampling Process Design	Data collected as designed
B2	Sampling Methods Requirements	Samples taken as required
B3	Sample Handling and Custody Requirements	Conducted according to QAPP
B4	Analytical Methods Requirements	N/A
B5	Quality Control Requirements	Conducted according to QAPP
B6	Instrument/Equipment Testing, Inspection and Maintenance Requirements	N/A
B7	Instrument Calibration and Frequency	Completed according to QAPP
B8	Inspection/Acceptance Requirements for Supplies and Consumables	No problems encountered
B9	Data Acquisition Requirements (Non-Direct Measurements)	N/A
B10	Data Management	Data inspected for errors and backed up
C1	Assessment and Response Actions	No problems with date encountered
C2	Reports to Management	Reporting requirements up to date
D1	Data Review, Validation and Verification Requirements	No issues to date
D2	Validation and Verification Methods	Limits documented
D3	Reconciliation with Data Quality Objectives	No issues to date

In conclusion, the goals of this project have been met and the data is of good quality and the results are valid.

Appendix E

Workshop Workbook

for

Stormwater Pollution Prevention BMP Workshop, Demonstration, and Evaluation

Project 700 FY01 CWA Section 319(h)

See folder on CD for Workshop Workbook

Appendix F

Workshop Attendees

for

Stormwater Pollution Prevention BMP Workshop, Demonstration, and Evaluation

Project 700 FY01 CWA Section 319(h)

Fayetteville, AR Workshop February 4-5, 2002

No.	Name	Address	City
1	Balk, Everett	Crafton Tull & Assoc./PO Drawer 549	Rogers
2	Beavers, Jim	City Engineer, City of Fayetteville, 113 West Mountain	Fayetteville
3	Boettcher, Gregg	City of Fayetteville/113 W. Mountain	Fayetteville
4	Boyles, Gary	Basic Construction/1695 Electric Ave	Springdale
5	Bryant, Bob	McClinton-Anchor/PO Box 1367	Fayetteville
6	Bunch, Mandy	EB Landworks/ 758 N. Fowler	Fayetteville
7	Christie, Patsy	City of Springdale/ 201 Spring St.	Springdale
8	Clark, Steve	Private Consulant/109 Spring St.	Springdale
9	Coleman, Randy	Mickle/Wagner/Coleman/3434 Country Club Ave.	Ft. Smith
10	Crider, Lane	McGoodwin, Williams & Yates/ 909 Rolling Hills Dr.	Fauetteville
11	Davis, Gary	Sam Walton Development Complex/2001 So. E. 10th St	Bentonville
12	Dickerson, Robert	Entergy/1100 White Bluff	Redfield, AR
13	Fox, Gerald	Atkins Benham Inc/117 Parkwood St	Lowell
14	Gabbard, Leonard	Landtech/PO Box 1080	Springdale
15	Grelle, Lucanda	LJBG Engineering/ 900 E. Plentwood	Bentonville
16	Hancock, Shawn	City of Prairie Grove/PO Box 255	Prairie Grove
17	Hein, Aaron	Mickle/Wagner/Coleman/3434 Country Club Ave.	Ft. Smith
18	Hillis, Don	Landtech Engineering/PO Box 1080	Springdale
19	Jefcoat, Tom	Milholland Co/205 W. Center St.	Fayetteville
20	Jones, Carole	McClelland Consulting Engrs/1810 N College Ave.	Fayetteville
21	Kauffman, Christopher	Northwest Excavation/PO Box 277	Rogers
22	Keeling, Mark	Keeling Co/1203 Carley	Springdale
23	Lee, Van W.	City Engineer, City of Ft. Smith/PO Box 1908	Ft. Smith
24	Milholland, Melvin	Milholland Co/205 W. Center St.	Fayetteville
25	Oelrich, Larry	City of Prairie Grove/PO Box 255	Prairie Grove
26	Prieur, Al	Hoffman-Prieur & Assoc./320 O'Bryan Lane/Van Buren, AR	Van Buren, AR
27	Rudasill, William B.	WBR Eng. Assoc./1780 N. Woolsey	Fayetteville
28	Scott, Homer	Consolidated Land Services/2113 Hwy 62 East Suite B	Mountain Home
29	Selby, Ken	Northwest Excavation/PO Box 277	Rogers
30	Sherman, Fred	Basic Construction/1695 Electric Ave	Springdale
31	Slyter, Andrew	CEI Engineering Assoc. Inc./110 W. Central Ave.	Bentonville
32	Snodgrass, Stan	City of Ft. Smith/PO Box 1908	Ft. Smith
33	Sorrells, Jeff	McClinton-Anchor/PO Box 1367	Fayetteville
34	Steenbergen, Michael	All Around Landscaping/1632 S. 56th St	Springdale
35	Stringer, Fred	US Consolidated Farm SVC Agcy/3913 Brooken Hill Dr	Ft. Smith
36	Tarvin, Jo	McClelland Consulting Engrs/1810 N College Ave.	Fayetteville
37	Thompson, Curtis	City of Springdale/ 201 Spring St.	Springdale
38	Watson, Charlie	McGoodwin, Williams & Yates/ 909 Rolling Hills Dr.	Fayetteville
39	Wolff, Alan	Red Deer Construction, Inc./PO Box 691	Springdale
40	Yong Fook Ho	CEI Engineering Assoc. Inc./110 W. Central Ave.	Bentonville

Little Rock, AR Workshop February 6-7, 2002

No.	Name	Address	City
41	Black, Will	Langston Excavating/13204 Altenwood	N. Little Rock, AR
42	Bonds, Jim	Entech Consulting Engineers/950 Hogan Lane, Suite #10	Conway
43	Bonefield, Ryan	Genesis Environmental /400 Base Line Road	Little Rock, AR
44	Boren, Barry	Varco/PO Box 6868	Pine Bluff, AR
45	Bown, Ken	Genesis Environmental /400 Base Line Road	Little Rock, AR
46	Buercklin, John	Consultant/ 12 Valley Road	Cabot, AR
47	Carr, Steven	Varco/PO Box 6868	Pine Bluff, AR
48	Chatman, Bob	Miller Newell Engineers, PO Box 717	Newport, AR
49	Clayton, Micheal	Sherwood City Engineer/2199 E. Kiehl Ave	N. Little Rock, AR
50	Cotter, Ken	Consolidated Land Services/2113 Hwy 62 East Suite B	Mountain Home, AR
51	Dather, Brent	Federal Highway Dept/700 W. Capital Rm 3130	Little Rock, AR
52	Dean, Bill	Civil Design Inc./15104 Cantrell Rd	Little Rock, AR
53	Dwyer, Austin	Varco/PO Box 6868	Pine Bluff, AR
54	Edwards, Brian	Genesis Environmental /400 Base Line Road	Little Rock, AR
55	Fleming, Jack	Marlar Engineering Co./5318 John F Kennedy Blvd #A	N Little Rock, AR
56	Gunter, Dale	AGFC/10825 Financial Center Parkway	Little Rock, AR
57	Hyman, Firdina	Entergy/425 W. Capitol Ave.	Little Rock, AR
58	Kin, Hong	Little Rock AFB/528 Thomas Ave	Little Rock Air Force Base
59	Kupper, Chris	Landscape Associates, Inc/PO Box 7524	Little Rock, AR
60	Looney, Randal	Federal Highway Dept/700 W. Capital Room 3130	Little Rock, AR
61	Marlar, Jack	Marlar Engineering Co./5318 John F Kennedy Blvd #A	N Little Rock, AR
62	Martin, Scott	Cromwell Architects & Eng Inc./101 South Spring Street	Little Rock, AR
63	Noble, Oren	Sherwood City Engineer/2199 E. Kiehl Ave	N Little Rock, AR
64	Owens, William C	Willicam C. Ownes Assoc./65 Lake Ridge Pl	Russellville
65	Page, Keith	Miller Newell Engineers, PO Box 717	Newport, AR
66	Palmer, Ronnie	Varco/PO Box 6868	Pine Bluff, AR
67	Peterson, John	Cromwell Architects & Eng Inc./101 South Spring Street	Little Rock, AR
68	Price, Brenda	Arkansas Highway Dept./P.O. Box 2261	Little Rock, AR
69	Redder, Mark	Holloway Engr/200 Casey Dr.	Maumelle, AR
70	Richburg, Scott	Richburg Rickett Consulting- #10 Shackleford Plaza, Suite 100	Little Rock, AR
71	Rickett, Mark	Richburg Rickett Consutling - #10 Shackleford Plaza, Suite 100	Little Rock, AR
72	Page, Keith	Miller Newell Engineers, PO Box 717	Little Rock, AR
73	Snow, Barry	Entergy/425 W. Capitol Ave.	Little Rock, AR
74	Spillyards, Jeff	Entergy/425 W. Capitol Ave.	Little Rock, AR
76	Toombs, George	Cromwell Architects & Eng Inc./101 South Spring Street	Little Rock, AR
76	Wieda, Ray	FTN Assoc LTD/3 Innwood Circle # 220	Little Rock, AR
77	Wilson, Amanda	Genesis Environmental Consultant/11400 Baseline RD	Little Rock, AR
78	Winter, Carroll	Private Consultant/49 Crystal Mountain Lane	Maumelle, AR

Fayetteville, AR Workshop August 12-13, 2002

No.	Name	Address	City
79	Al-Madhoun, Shawki	Northstar Engineering Consultants, Inc., 211 So. Main Street	Bentonville, AR
80	Carnahan, Gary	Atkins Benham, Inc, 117 Parkwood St.	Lowell, AR
81	Casey, Matt	City of Fayetteville, City Engineering Office, 113 W. Mountain St.	Fayetteville
82	Clark, Steve	Clark Counsulting, 109Spring St. Suite #1	Springdale, AR
83	Elliott, Lee	City of Lowell, PO Box 979	Lowell, AR
84	Fox, Gerald	Atkins Benham, Inc., 117 Parkwood St.	Lowell, AR
85	Gregory, Larry	Sand Creek Engineering & Landscape, 1610 N. W. 12th	Bentonville, AR
86	Hennelly, Tom	Tomlinson Asphalt Co., Inc, 1411 W. Van Asche Dr.	Fayetteville
87	Hesse, Steve	Engineering Design Assoc, 134 W. Emma	Springdale, AR
88	Hooton, Teddy	City of Jonesboro, 314 W. Washington	Jonesboro, AR
89	Jefcoat, Thomas	Milholland Engineering & surveying, 205 W. Center St.	Fayetteville
90	Justus, Paul	NW AR Regional Planning Commission, 406 N. Shiloh	Springdale, AR
91	Leraris, Philip	Private Consultant, PO Box 11123	Ft. Smith, AR
92	Lonon, Bill	Washington County Environmental Affairs, 2615 Brink Drive	Fayetteville
93	McNeely, David	City of Lowell, PO Box 979, 4520 Phoneix Ave	Lowell, AR
94	Melton, Dough	Priviate Consultant	Ft. Smith, AR
95	Ottingher, Barry	Red Deer, Inc., PO Box 691	Springdale, AR
96	Ritchey, Randy	Atkins Benham, Inc., 117 Parkwood St.	Lowell, AR
97	Scott-Silkwood, Cecila	Washington County Planning Commission, 2615 Brink Drive	Fayetteville
98	Sorey, Tim	Sand Creek Engineering & Landscape, 1610 N. W. 12th	Bentonville, AR
99	Trotter, Roger	Trotter's Construction, 4700 Sp. Thompson	Springdale, AR
10 0	Vaan, Hanh	US Infrastructure, Inc., 4710 S. Thompson	Springdale, AR
10 1	Wolff, Alan	Red Deer, Inc., Po Box 691	Springdale, AR
10 2	Teague, Katie	Coop Extension, 2536 McConnell Road	Fayetteville

Little Rock, AR Workshop August 14-15, 2002

No.	Name	Address	City
10 3	Black, William	Jack Langston Excavating, Inc., 13204 Helenwood	N. Little Rock, AR
10 4	Davis, Andy	Richburg Rickett Engineers PLC, #10 Shackleford Plaza Suite #100	Little Rock, AR
10 5	Hicks, Beyron	McClelland Engineering, PO Box 34087	Little Rock, AR
10 6	Looney, Randal	Federal Highway Administration, 700 W. Capitol, Room 3130	Little Rock, AR
10	Sonders, Mark	Richburg Rickett Engineers PLC, #10 Shackleford Plaza Suite #100	Little Rock, AR

7			
10			
8	Wimberly, Susan	Federal Highway Administration, 700 W. Capitol, Room 3130	Little Rock, AR
10			
9	Graham, Thomas	Bartlett & West Engineering, 1701 Centerview, Sutie 210	Little Rock, AR

Appendix G

Webpage Files

for

Arkansas Soil and Water Control Commission
Erosion and Sediment Control Webpage

Project 700 FY01 CWA Section 319(h)

See folder on CD for Workshop Workbook

Appendix H

BMP Evaluation Data

for

Project 700 FY01 CWA Section 319(h)

Suspended Solids Data

BMP	Bottle Label	Test	Tare Weight (mg)	Sample Volume (mL)	Gross Weight (mg)	TSS (mg/L)	Avg TSS (mg/L)	Effective-ness (%)
ECB	SSA1	1	1384.5	50	1468.9	1688.0		
		2	1404.3	50	1482.7	1568.0		
	SSA2	1	1385.7	50	1438.6	1058.0		
		2	1384.4	50	1443.1	1174.0		
	SSA3	1	1381.7	50	1438.9	1144.0		
		2	1391.0	50	1449.5	1170.0		
	SSA4	1	1378.2	50	1686.8	6172.0		
		2	1383.3	50	1679.1	5916.0		
	SSA5	1	1399.9	50	1556.1	3124.0		
		2	1383.1	50	1526.8	2874.0	2589	77
Silt Fence	SSB1	1	1382.7	60	2076.6	11565.0		
		2	1393.8	60	1900.2	8440.0		
	SSB2	1	1382.5	60	1712.9	5506.7		
		2	1387.8	60	1728.7	5681.7		
	SSB3	1	1386.0	60	2101.4	11923.3		
		2	1375.9	60	2171.6	13261.7		
	SSB4	1	1375.2	60	1872.9	8295.0		
		2	1389.7	60	1862.3	7876.7	9069	19
Bare Earth	SSC1	1	1387.2	40	1804.2	10425.0		
		2	1387.5	40	1832.9	11135.0		
	SSC2	1	1395.0	40	1632.9	5947.5		
		2	1383.0	40	1611.1	5702.5		
	SSC3	1	1384.1	40	1852.8	11717.5		
		2	1385.6	40	1937	13785.0		
	SSC4	1	1393.3	40	1858.4	11627.5		
		2	1376.8	40	1874.3	12437.5		
	SSC5	1	1392.1	50	2085.4	13866.0		
		2	1387.2	50	2163.7	15530.0	11217	0.0
Straw Wattle	SSD1	1	1392.6	40	1655.8	6580.0		
		2	1382.1	40	1632.2	6252.5		
	SSD2	1	1396.6	40	1615.3	5467.5		
		2	1384.6	40	1627.3	6067.5		
	SSD3	1	1384.2	40	1698	7845.0		
		2	1391.9	40	1639	6177.5		
	SSD4	1	1397.9	40	1957.2	13982.5		
		2	1394.3	40	1927.2	13322.5	8212	27
Straw Mulch	SSE1	1	1377.2	50	1423.9	934.0		
		2	1390.6	50	1436.5	918.0		
	SSE2	1	1386.2	50	1442.1	1118.0		
		2	1391.3	50	1445.1	1076.0		
	SSE3	1	1385.0	50	1398.5	270.0		
		2	1388.0	50	1403.1	302.0		
	SSE4	1	1395.1	50	1408.9	276.0		
		2	1396.4	50	1406.6	204.0	637	94

Chemcical Oxygen Demand (COD) Data

BMP	Bottle Label	Test	COD (mg/L)	Avg COD (mg/L)	Effective-ness (%)
ECB	CODA1	1	108.1		
	CODA2	1	121.3		
	CODA3	1	114.7		
	CODA4	1	136.2		
	CODA5	1	134.6	123	70
Silt Fence	CODB1	1	113.7		
	CODB2	1	89.07		
	CODB3	1	656.4		
	CODB4	1	303.2	291	29
Bare Earth	CODC1	1	725.2		
	CODC2	1	153.5		
	CODC3	1	363.8		
	CODC4	1	316.3		
	CODC5	1	483.2	408	0.0
Straw Wattle	CODD1	1	237.0		
	CODD2	1	245.1		
	CODD3	1	262.3		
	CODD4	1	341.7	272	34
Straw Mulch	CODE1	1	224.6		
	CODE2	1	244.2		
	CODE3	1	139.6		
	CODE4	1	108.5	179	56

Copper Data

BMP	Bottle Label	Test	Copper Conc. (mg/L)	Avg Cu Conc. (mg/L)	Effective-ness (%)
ECB	CuA1	1	0.01		
	CuA2	1	0.01		
	CuA3	1	0.00		
	CuA4	1	0.00		
	CuA5	1	0.00	0.003	-71
Silt Fence	CuB1	1	0.00		
	CuB2	1	0.00		
	CuB3	1	0.00		
	CuB4	1	0.00	0.001	29
Bare Earth	CuC1	1	0.00		
	CuC2	1	0.00		
	CuC3	1	0.00		
	CuC4	1	0.00		
	CuC5	1	0.00	0.002	0.0
Straw Wattle	CuD1	1	0.00		
	CuD2	1	0.00		
	CuD3	1	0.00		
	CuD4	1	0.01	0.004	-118
Straw Mulch	CuE1	1	0.01		
	CuE2	1	0.01		
	CuE3	1	0.00		
	CuE4	1	0.00	0.005	-214