City of Pueblo Stormwater Utility

August 4, 2008

Mr. Rick Brown
Intrastate Water Management and Development Section
COLORADO WATER CONSERVATION BOARD
1580 Logan Street, Suite 600
Denver, CO 80203

RE: Water Supply Reserve Account Grant Application
Bedload/Sediment Collection and Removal Technology – Fountain Creek

Dear Mr. Brown:

Please find attached the Water Supply Reserve Account Grant Application for the Bedload/Sediment Collection and Removal Technology – Fountain Creek.

Arkansas River Roundtable member Tom Florczak, who also serves as the City of Pueblo's Assistant City Attorney, is sponsoring the grant application.

If you have any questions or need further information, please contact me at (719) 553-2283.

Sincerely,

DENNIS MARONEY
Stormwater Utility Director

211 E. "D" Street Pueblo, Colorado 81003 (719) 553-2299 Fax (719) 553-2294

RESOLUTION NO. 11345

A RESOLUTION APPROVING A GRANT APPLICATION TO THE COLORADO WATER CONSERVATION BOARD WATER SUPPLY RESERVE FUND RELATING TO THE FOUNTAIN CREEK BEDLOAD SEDIMENT COLLECTION AND REMOVAL TECHNOLOGY PROJECT AND AUTHORIZING THE PRESIDENT OF CITY COUNCIL TO EXECUTE SAME

WHEREAS, the City Council supports the application to the Colorado Water Conservation Board Water Supply Reserve Account to assist in the cost to complete the Fountain Creek Bedload Sediment Collection and Removal Technology Project;

BE IT RESOLVED BY THE CITY COUNCIL OF PUEBLO, COLORADO, that:

The grant application to the Colorado Water Conservation Board Water Supply Reserve Fund for the Fountain Creek Bedload Sediment Collection and Removal Technology Project consisting of a demonstration project to determine the applicability of sediment removal structures to improve stream conditions on Fountain Creek, a copy of which is attached hereto, is hereby approved. The President of City Council is hereby authorized to execute the application on behalf of the City.

INTRODUCED: JULY 28, 2008

BY: Vera Ortegon
COUNCIL PERSON

APPROVED:
PRESIDENT OF CITY COUNCIL

ATTESTED BY:
CITY CLERK

COLORADO
DEPARTMENT OF NATURAL RESOURCES

COLORADO WATER CONSERVATION BOARD

WATER SUPPLY RESERVE ACCOUNT
2007-2008 GRANT APPLICATION FORM

Bedload/Sediment collection and removal technology - Fountain Creek

Name of Water Activity/Project **River Basin Location**

$225,000	X	Basin Account		Yes
		Statewide Account		No

Amount of Funds Requested | Please Check Applicable Box | Approval Letter Signed By Roundtable Chair and Description of Results of Evaluation and Approval Process

*** For the Basin Account, the Application Deadline is 60 Days Prior to the Bimonthly CWCB meeting. The CWCB meetings are posted at www.cwcb.state.co.us and are generally the third week of the month.**

*** For the Statewide Account, the Application Deadline is 60 Days Prior to the March and September CWCB Board Meetings.**

* In completing the application you may attach additional sheets if the form does not provide adequate space. If additional sheets are attached please be sure to reference the section number of the application that you are addressing (i.e., A.1. etc.).

Instructions: This application form must be submitted in electronic format (Microsoft Word or Original PDF are preferred). The application can be emailed or a disc can be mailed to the address at the end of the application form. The Water Supply Reserve Account Criteria and Guidelines can be found at http://cwcb.state.co.us/IWMD/. **The criteria and guidelines should be reviewed and followed when completing this application**. You may attach additional sheets as necessary to fully answer any question, or to provide additional information that you feel would be helpful in evaluating this application. Include with your application a cover letter summarizing your request for a grant. If you have difficulty with any part of the application, contact Rick Brown of the Intrastate Water Management and Development (Colorado Water Conservation Board) for assistance, at (303) 866-3514 or email Rick at rick.brown@state.co.us. Generally, the applicant is also the prospective owner and sponsor of the proposed water activity. If this is not the case, contact the Rick Brown before completing this application.

Water Supply Reserve Account – Grant Application Form
Form Revised May 2007

Part A. - Description of the Applicant (Project Sponsor or Owner);

1. Applicant Name(s): City of Pueblo (Stormwater Utility)

Mailing address: 1 City Hall Place
Pueblo, CO 81003

Taxpayer ID#: 84-6000615 Email address: dmaroney@pueblo.us

Phone Numbers: Business: (719) 553-2283
Home:
Fax: (719) 553-2294

2. Person to contact regarding this application if different from above:

Name: Dennis Maroney

Position/Title City of Pueblo Stormwater Utility Director

3. Provide a brief description of your organization below: see "Description of Applicant" in Part 2 of Criteria and Guidance for required information.

Type: Home Rule Municipality

Official Name: City of Pueblo, CO, 1 City Hall Place, Pueblo, CO 81003

Year Formed: Four cities were consolidated to establish the City of Pueblo - incorporated in 1885

Statutes: Organized under Article XX of the Constitution of the State of Colorado

Contact Person: Dave Galli, City Manager and for project specific questions contact Dennis Maroney, Stormwater Utility Director.

Mission Statement: **P**ride in our community, its history, work ethic, and diverse culture; **U**nited in our goals and mission for a strong and vibrant community; **E**ntrepreneurial spirit that fosters educational excellence and enhanced opportunities; **B**eautification, cleanliness, and amenities for a Proud City; **L**eadership with the utmost integrity, character, ethical standards, and honesty; **O**utstanding service toward an enhanced quality of life for our citizens.

Funding: The City of Pueblo received a total of $66,501,920 in revenues in 2007 from a variety of sources including the following: General Taxes (property and sales) $57,886,928; Licenses & Permits $570,866; Intergovernmental Receipts $1,374,032; Charges for Services $3,172,608; Fines & Forfeitures $1,682,166; Other Revenues 1,815,320

Water Related Enterprise Fund Budgets: $8,877,942 Wastewater; $3,914,123 Stormwater Utility

Staffing: The City of Pueblo has 684 employees including 65 employees who are directly related to water functions within the city through the Stormwater Utility and the Wastewater Department.

Brief History: Pueblo is situated at the confluence of the Arkansas River and Fountain Creek 103 miles south of Denver. The area is considered to be semi-arid with approximately 14 inches of precipitation annually. Pueblo is an important part of the Front Range Urban Corridor. It is considered to be the economic hub of southeastern Colorado. Pueblo is one of the largest steel-producing cities in the United States, because of this Pueblo is referred to as the "steel city". The current city of Pueblo represents the consolidation of four towns: Pueblo, South Pueblo, Central Pueblo and Bessemer. The cities legally consolidated as the City of Pueblo in 1886 and Bessemer joined Pueblo in 1894. The mean annual flow of Fountain Creek has risen from a historical average of approximately 60 cubic feet per second (cfs) to greater than 230 cfs. While flow associated with extreme flood events has not statistically changed, there are increasing trends in both low and high streamflow records. An earthen levee was constructed above SH 47 during the 1930's through a federal WPA project. The Army Corps of Engineers built a flood control system along the banks of Fountain Creek through the central portion of Pueblo in 1989. Pueblo has a history of devastating floods that date back to floods in 1921, 1935 and 1965. In 1999 high water from Fountain Creek caused major damage in El Paso County and destroyed bridges and other structures in Pueblo County. Flooding and erosion within the Fountain Creek Basin have accelerated the loss of aquatic and wetland habitats, contributed to the loss of hundreds of acres of productive farmland, and caused the foundations of roads and homes to crumble. Fountain Creek is experiencing aggradation of sediments from the confluence with the Arkansas River north approximately three miles to the Highway 50 bridge. Sediment is transported from the subwatershed uplands to the Fountain Creek mouth at a greater rate than the system can handle. In recognition of the need to improve and update the city's stormwater infrastructure, the City established a Stormwater Utility in 2004. The funds collected are placed in an enterprise fund exclusively for the construction, operation and maintenance of stormwater and water quality facilities.

4. If the Contracting Entity is different then the Applicant (Project Sponsor or Owner) please describe the Contracting Entity here.

The City of Pueblo will be contracting the manufacturing and installation of a bedload sediment collector and sediment separation system for the demonstration project. The City of Pueblo will solicit proposals from private companies based on specific specifications and design parameters for the installation and operation of equipment utilized for the project. In June 2007, the Lower Arkansas Valley Water Conservancy District sponsored a small-scale test for a one-week period of time utilizing a two foot by four foot bedload collector within Fountain Creek. The project was contracted to Streamside Systems LLC who use alternative methods of cleaning up the earth's water resources. Streamside Systems uses a passive, selective sediment extraction and stream sediment separation system to remove bedload sediments. The demonstration project will utilize the Streamside System technology or a similar equally pre-qualified system. The contact information - Streamside Systems LLC, Attn: Randall Tucker, 7449 TWP Rd 95, Findlay, OH 45840, (419) 423-1290.

Part B. - Description of the Water Activity – Please Refer to Criteria and Guidance Document for Eligibly Requirements

1. Name of water activity/project:

Fountain Creek Project – Bedload/Sediment Collection and Removal Demonstration Project

What is the purpose of this grant application?

[ ] Environmental compliance and feasibility study

[ ] Technical Assistance regarding permitting, feasibility studies, and environmental compliance

[X] Studies or analysis of structural, nonstructural, consumptive, nonconsumptive water needs, projects

Study or Analysis of:

- [X] Structural project or activity
- [ ] Nonstructural project or activity
- [ ] Consumptive project or activity
- [ ] Nonconsumptive project or activity

[ ] Structural and/ or nonstructural water project or activity

2. Describe how the water activity meets these **Threshold Criteria.**

1. The water activity meets the eligibility requirements outlined in Part 2 of the Criteria and Guidelines.

The City of Pueblo meets the eligibility requirements outlined in the Criteria and Guidelines. The City of Pueblo is defined as a Home Rule Municipality eligible to receive funding from the Colorado Water Conservation Board Water Supply Reserve Fund. The proposed bedload sediment and collection demonstration project qualifies for funding as a water activity study or

analysis of structural, nonstructural, consumptive and consumptive water needs project or activity. The water activity is consistent with Section 37-75-102 C.R.S. and Section 37-75-104 (2)(c).

Water activities are identified as Studies or analysis of structural, nonstructural consumptive, and nonconsumptive water needs, projects, or activities; and Structural and nonstructural water projects or activities.

2. The water activity is consistent with Section 37-75-102 Colorado Revised Statutes. The requirements/language from the statute is provided in Part 3 of the Criteria and Guidelines.

   The bedload sediment demonstration project will not restrict, remove, or delay the supply of water flowing within Fountain Creek. The shareholders of water rights in the Fountain Creek and Arkansas River Basins will continue to use or dispose of water rights in any manner permitted under Colorado law. The project will not diminish, impair, or cause injury to any property or contractual right created by intergovernmental agreements, contracts, stipulations among parties to water cases, terms and conditions in water decrees, or any other similar document related to the allocation or use of water. Higher peak flows and velocity during storm events are occurring as a result of urbanized development within the watershed creating more impervious areas which historically absorbed much more of the water from storm events. This ongoing urbanization is resulting in more frequent runoff events with increased storm water flow volumes and rates, erosion, and sedimentation in Fountain Creek. The water quality issues within the Lower Fountain Creek Watershed include high concentrations of E. coli and other organics, and concentrations of naturally occurring selenium that are likely impacting fish and other macroinvertebrate species. The area most impacted by high sedimentation levels is the 2½-mile segment directly upstream of the confluence with the Arkansas River. The proposed location for the sediment demonstration project is 2,100 feet north of the confluence with the Arkansas River, within this 2½-mile segment of sediment-impacted stream.

3. The water activity underwent an evaluation and approval process and was approved by the Basin Roundtable (BRT) and the application includes a description of the results of the BRTs evaluation and approval of the activity. At a minimum, the description must include the level of agreement reached by the roundtable, including any minority opinion(s) if there was not general agreement for the activity. The description must also include reasons why general agreement was not reached (if it was not), including who opposed the activity and why they opposed it. Note- If this information is included in the letter from the roundtable chair simply reference that letter.

4. The water activity meets the provisions of Section 37-75-104(2), Colorado Revised Statutes. The requirements/language from the statute is provided in Part 3 of the Criteria and Guidelines.

3. For Applications that include a request for funds from the Statewide Account, describe how the water activity meets the **Evaluation Criteria**. See Part 3 of Criteria and Guidelines.

Promoting Collaboration

This project promotes collaboration and cooperation with the Lower Arkansas Valley Water Conservancy District (LAVWCD), State of Colorado, U.S. Bureau of Reclamation, Pueblo County, USGS, Colorado State University-Pueblo (CSU), and the U.S. Army Corps of Engineers.

Portions of the matching funds for this project are being funded through a Colorado Department of Health and Environment (CDPHE), EPA 319 Water Quality grant to assist in funding demonstration projects along Fountain Creek within Pueblo County. The bedload sediment demonstration project is one of the projects included for funding from the CDPHE.

The City of Pueblo is also working in cooperation with the LAVWCD in taking a leadership role in addressing the catastrophic storm water sedimentation and riparian damage issues in Fountain Creek and their direct impact on the water quality of the Lower Arkansas River Basin. The Fountain Creek Bedload - Sediment Collection and Removal Project is being coordinated with the efforts of the USGS, Colorado Springs Utilities, Fountain Creek Watershed, Fountain Creek Vision Task Force, the U.S. Army Corps of Engineers Albuquerque District in order to share the results of the demonstration project for the purposes of modeling efforts for Fountain Creek, removal of pollutants, and streambed geomorphology changes. This project addresses current water quality and improvements that will over time transform Fountain Creek from an impaired river system to an asset for the communities within the watershed. The Fountain Creek Bedload - Sediment Collection and Removal Project is the first major demonstration project to assess the benefits of specific BMP along Fountain Creek within Reach 2 of the watershed.

Macroinvertebrate surveys will be conducted by Professor Scott Herrmann with assistance from biology students in his classes at Colorado State University-Pueblo. General limnological water quality data will be generated each field trip. Those data include parameters such as temperature; specific conductivity; dissolved oxygen; pH; total, calcium, and magnesium hardness; total alkalinity; sulfate; nitrate/nitrite nitrogen; chloride and reactive phosphate. Temperature and dissolved oxygen profiles will be generated during the month of August. A qualitative evaluation of macroinvertebrates at the project site will be conducted from 2008 into 2011. The resulting species lists should reflect conditions before and after the sediment collector demonstration project.

The following local utilities and governments in Pueblo and El Paso Counties and throughout the region as members of the Fountain Creek Vision Task Force are interested in improvements to Fountain Creek including this proposed project:

City of Fountain
City of Colorado Springs
City of Pueblo
Pikes Peak Area Council of Governments
Pueblo County
Teller County
Colorado Open Lands
Colorado Springs Utilities
Department of Defense
Pueblo Area Council of Governments
Technical Advisory Committee
Lower Arkansas Valley Water Conservation District
El Paso County
City of Pueblo residents
Pueblo Board of Water Works
Colorado Progressive Coalition

Facilitating Water Activity Implementation

The Fountain Creek Bedload/Sediment Collection and Removal Technology Project is supported by the Fountain Creek Vision Task Force, and the Fountain Creek Watershed comprised of member agencies of both the Pikes Peak and Pueblo Area Councils of Governments. The Lower Arkansas Valley Water Conservancy District and Colorado Springs Utilities are supportive of the water quality demonstration project and are coordinating their efforts in developing a long-range plan for potential projects within the Fountain Creek Watershed. The outcome of this project is expected to provide a basis for the improvement of water quality, bank stabilization, bedload reduction, habitat improvement. In addition the project will provide sediment transport modeling criteria, as well as accelerate the restoration of channel stability and reduction of flooding along Fountain Creek and throughout the Arkansas River Basin.

The City of Pueblo has an excellent track record for the development, support, implementation, and completion of major community projects in the Pueblo region. Pueblo is known statewide, as well as nationally, as a city that gets things done. The Arkansas River Corridor Legacy Project, an $8.75 million combination of river habitat and recreation projects was completed in 2005. The Historic Arkansas Riverwalk Project (HARP), a $25 million project featuring park, economic development, and water quality improvements was completed in 2002 and continues to have ongoing improvements implemented by the City of Pueblo. These project were completed in a timely and efficient manner.

4. Please provide an overview of the water project or activity to be funded including – type of activity, statement of what the activity is intended to accomplish, the need for the activity, the problems and opportunities to be addressed, expectations of the participants, why the activity is important, the service area or geographic location, and any relevant issues etc. Please include any relevant TABOR issues that may affect the Contracting Entity. Please refer to Part 2 of Criteria and Guidance document for additional detail on information to include.

Overview of Project

This is the second phase of a project that was initiated by the LAVWCD during the June 2007 on a smaller scale to evaluate the success of a Bedload Monitoring Collector system placed in Fountain Creek approximately ½-mile upstream of the confluence with the Arkansas River. The project will assess any changes in the water quality and any reductions in downstream sediment deposition, as well as the creek's ability to manage high-flow conditions (flood control). The improvements involve the placement of a pre-cast concrete sediment collector within Fountain Creek. The sediment collector will serve as a research tool to gage the transport rates of sediment captured by a large-scale collector, and to verify the system's ability to remove and classify by granule size the sediment for beneficial re-use by the City of Pueblo. This demonstration project will be conducted for a one-year period with monitoring and testing completed at specific times and at a variety of flow conditions. The City of Pueblo owns the property where the demonstration project will be operated. The project includes monitoring to assess the success of the project in relationship to establishing sediment transport modeling criteria, removal of contaminants from Fountain Creek, impacts to sediment, and potential benefits in reduction of erosion and the re-establishment of a stable creek channel.

Need for Project

Fountain Creek in recent years has been and currently is being analyzed and evaluated for the presence of pollutants that impact different segments of the watershed. The segments of the watershed (Segments 2-A and 2-B) within the City of Pueblo are classified as Aquatic Life Warm Water 2 and a Recreation E classification. Fountain Creek within these segments contains several

pollutants of concern including organics, metals, and pollutants attached to the high levels of sediments carried in suspension within the creek, as well as pollutants attached to sediments passed along the streambed known as "bedload sediments." In a study done by Patrick Edelmann et al. (2001) entitled Evaluation of Water Quality, Suspended Sediment, and Stream Morphology with an Emphasis on Effects of Stormflow on Fountain and Monument Creek Basins, Colorado Springs and Vicinity, Colorado, 1981 through 2001, it was concluded that suspended sediment concentrations, discharges, and yields associated with stormflow were significantly greater than during normal flow. Depending on the site and year, suspended-sediment concentrations associated with stormflow generally were 3 to 10 times greater than concentrations measured during normal flow, and suspended sediment discharges were usually more than 10 times greater during stormflow. This is important to the watershed since population growth has caused an increase in impervious surface area affecting peak quantity, frequency and velocity of flows within Fountain Creek during storm events.

Sedimentation is a major concern affecting water quality within these reaches of Fountain Creek. Most of the soils found in the Fountain Creek Watershed are easily erodable and have high to moderate runoff potential, which can contribute to the increase in erosion and sedimentation damage in the watershed. The U.S. Army Corps of Engineers Albuquerque District has identified erosion and sedimentation in Fountain Creek as an important issue. In 2008, the Corps has identified a high priority need to complete an additional Fountain Creek Study for erosion and sedimentation to further evaluate flood control, erosion, sedimentation and environmental restoration problems related to Fountain Creek. As part of the Corps study information will be collected on the bedload sediments carried in Fountain Creek especially as they related to the increases in streamflow (Stogner – USGS study, 2000) generated by increased wastewater treatment plant discharges, importation of transbasin water, and management of the Fountain Creek transbasin return flow exchange decree.

In conjunction with the coordinated efforts to study and analyze the water quality concerns of Fountain Creek there is a significant need to initiate and evaluate on-site methods to improve water quality that addresses pollutants during storm events, removal of E. coli and other organics, and sedimentation pollution. The City of Pueblo is proposing to implement a Phase 2 demonstration project within and related to Fountain Creek. The project involves the placement of a bed load sediment removal system within Fountain Creek. The projects will include monitoring to assess the success and sustainability of the projects in relationship to the removal of contaminants from Fountain Creek, impacts to sediment, and potential benefits in reduction of erosion and the re-establishment of a stable creek channel. The findings from these on-the-ground demonstration projects will be able to be incorporated into the modeling and research, as well as the recommendations provided in the ongoing studies of Fountain Creek.

Project Location

The project location is 2,100 feet north of the confluence of the Fountain Creek and the Arkansas River. The project coordinates are as follows: LATITUDE: 38.15.50 LONGITUDE: 104.35.57. Please see Map 3, 4, and 5, as well as photographs of the project location and the Streamside System collector units included as Attachment 6.

TABOR Implications

The State of Colorado and all local governments are subject to the TABOR law; however, the City of Pueblo Stormwater Utility is created and operated as an enterprise fund and is excluded from the TABOR provisions. An enterprise as defined by TABOR is "a government-owned business authorized to issue its own revenue bonds and receiving fewer than 10 percent of annual revenue in

grants from all Colorado State and local government combined."

5. Please summarize the proposed scope of work. Please refer to Part 2 of the Criteria and Guidance document for detailed requirements. On the following page there is an example format for the Scope of Work. You can use the example format or your own format, provided that comparable information is included.

The scope of work should outline by task how the water activity will be accomplished. It is important that the scope of work detail the specific steps, activities/procedures that will be followed to accomplish the water activity and the specific products/deliverables that will be accomplished. The scope of work should include but not be limited to: task description, key personnel, budget, schedule and deliverables and the final report/project documentation upon completion of the water activity.

SCOPE OF WORK

I. Goal 1: To determine if removal of bedload sediments from Fountain Creek has a positive benefit to water quality, as well as benefit to creek's thalwag stability.

Objective: reduce sedimentation pollution between the bedload sediment removal system and the confluence with the Arkansas River.

Task: Complete Design, specifications, and permitting for construction of bedload sediment removal system demonstration project area.

Products: Pre-construction bid packet with designs and specifications, and permits from the U.S. Army Corps of Engineers and the Colorado Mined Land Reclamation Board.

Cost: $20,000

Task: Installation and operation of the bedload sediment removal sediment material collection systems.

Products: Full-scale sediment removal & collection system.

Cost: $225,000

Task: Test analyze and characterize the sediments removed through the sediment removal system to determine transport rates and types and amounts of pollutants removed from Fountain Creek. Analyze any reduction in bedload sediments and habitat improvement.

Products: Sediment transport modeling criteria, sediment chemical analysis data, spreadsheets, and comparative analysis and reports of sediment content above and below sediment collector. Analysis of stream thalwag changes below sediment collector and habitat improvement.

Cost: $120,000 ($75,000 in-kind provided by City of Pueblo)

Goal 2: To provide timely progress reports, final reports, as well as accurate and complete reimbursement requests for project expenses.

Objective: The City of Pueblo and contractors shall prepare and submit timely and accurate progress reports, final reports, and reimbursement requests for project expenses.

Task: Completion of administrative reports and requirements of grant agreement including of timely and accurate progress reports, final reports and reimbursement requests.

Products: Progress reports, final reports, and reimbursement requests.

Cost: $18,000

II. Personnel

The project will likely involve contracting with Streamside Systems LLC or a company with equal or greater experience in using passive, selective sediment extraction and in-stream separation of sediment materials. Streamside Systems LLC is developing cutting-edge technologies to provide the next generation of environmentally friendly sediment removal and treatment systems.
Streamside Systems LLC, 7440 Twp Rd 95, Findlay, OH 45840; Phone: (419) 423-1290
Randall Tucker, President

HDR Engineering, Inc., 303 East 17th Avenue, Ste 700, Denver, CO 80203-1256; Phone (303) 764-1520
HDR Engineering, Inc. partners with Streamside Systems LLC to provide engineering and environmental services for the installation, operation and permitting of the bedload sediment removal and material separation operation.

Dennis Maroney, Director City of Pueblo Stormwater Utility, 211 East "D" Street, Pueblo, CO 81003; Phone: (719) 553-2283

III. Budget

See Attachment 1 showing all projected and actual expenditures

IV. Schedule

A detailed project schedule including key milestones with anticipated completion dates is included as Attachment 2.

6. Water Availability and Sustainability – this information is needed to assess the viability and effectiveness of the water project or activity. Please provide a description of each water supply source to be utilized for, or the water body to be affected by, the water activity. For water supply sources being utilized, describe its location, yield, extent of development, and water right status. For water bodies being affected, describe its location, extent of development, and the expected effect of the water activity on the water body, in either case, the analysis should take into consideration a reasonable range of hydrologic variation.

The mean annual flow of Fountain Creek has risen from a historical average of approximately 60 cubic feet per second (cfs) to greater than 230 cfs. Fountain Creek Watershed consists of 927 square miles covering three counties: El Paso, Teller, and Pueblo. Fountain Creek drains to the Arkansas

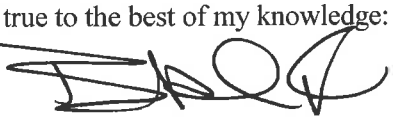
River in Pueblo, Colorado to the south. The availability and sustainability of water for this project will be provided through the return flows from Colorado Springs Utilities and any other water flowing to the confluence within the Arkansas River within the Fountain Creek Drainage Basin. Implementation of this project will access the ability to remove bedload sediments from Fountain Creek and determine if stream capacity is improved, as well as vegetative habitat and stream hydraulics are improved between the bedload removal system and the confluence with the Arkansas River. The majority of the water flowing within Fountain Creek will pass over sediment collector and continue downstream. Any water that is collected with the sediment will be returned to Fountain Creek immediately downstream of the sediment collector.

7. Please provide a brief narrative of any related or relevant previous studies.

The Lower Arkansas Valley Water Conservancy District sponsored a Phase 1 demonstration of a the bedload/sidement collection and removal technology from Streamside Systems on June 11th through June 16th, 2007. The five (5) day demonstrations occurred adjacent to the 11th Street bicycle path east of Erie Street along Fountain Creek within the levee section in the City of Pueblo. The demonstration project included the installation and operation of a 2' by 4' bedload gage and collection system. This first phase was a near term demonstration of two small, man-portable bedload monitoring collectors to provide an opportunity to observe the collector technology first hand. The demonstration also allowed for the verification of the similar results and visual validation of the of the Colorado State University, Engineering Research Centers, Hydraulics Laboratory's controlled flume test facility results. Please see the Description of Installation for the Phase 1 demonstration included as Attachment 7 and the Sediment Collector System description included as Attachment 8.

8. Additional Information – If you feel you would like to add any additional pertinent information please feel free to do so here.

The above statements are true to the best of my knowledge:

Signature of Applicant: 

Print Applicant's Name: Barbara Vidmar, President of the City Council

Project Title: Fountain Creek Bedload Sediment Collection and Removal Technology Project

Return this application to:

Mr. Rick Brown
Intrastate Water Management and Development Section
COLORADO WATER CONSERVATION BOARD
1580 Logan Street, Suite 600
Denver, CO 80203

To submit applications by Email, send to: rick.brown@state.co.us

River in Pueblo, Colorado to the south. The availability and sustainability of water for this project will be provided through the return flows from Colorado Springs Utilities and any other water flowing to the confluence within the Arkansas River within the Fountain Creek Drainage Basin. Implementation of this project will access the ability to remove bedload sediments from Fountain Creek and determine if stream capacity is improved, as well as vegetative habitat and stream hydraulics are improved between the bedload removal system and the confluence with the Arkansas River. The majority of the water flowing within Fountain Creek will pass over sediment collector and continue downstream. Any water that is collected with the sediment will be returned to Fountain Creek immediately downstream of the sediment collector.

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8. Additional Information – If you feel you would like to add any additional pertinent information please feel free to do so here.

The above statements are true to the best of my knowledge:

Signature of Applicant:

Print Applicant's Name:

Project Title:

Return this application to:

Mr. Rick Brown
Intrastate Water Management and Development Section
COLORADO WATER CONSERVATION BOARD
1580 Logan Street, Suite 600
Denver, CO 80203

To submit applications by Email, send to: rick.brown@state.co.us

ATTACHMENT 1

FOUNTAIN CREEK BEDLOAD SEDIMENT REMOVAL DEMONSTRATION PROJECT

Project Budget	08-'09	09-'10	10'-'11	TOTAL COSTS	Cash Match & In-Kind	CWCB Funds
OBJECTIVE 1: Bedload sediment system						
Installation of Sediment Collector & Site Restor.	$ 131,000	$ 25,000	$ 4,000	$ 160,000	$ 32,000	$128,000
Installation of Discharge Collector & Flow Indicator	$ 55,000			$ 55,000	$ 11,000	$44,000
Design & Specifications	$ 20,000			$ 20,000	$ 4,000	$16,000
Construction Management	$ 9,000	$ 1,000		$ 10,000	$ 2,000	$8,000
Subtotals	$ 215,000	$ 26,000	$ 4,000	$ 245,000	$ 49,000	$196,000
OBJECTIVE 3: Monitoring Water Quality & Sediments						
Water Sample Collection & Analysis (in-kind)	$ 15,000	$ 30,000	$ 30,000	$ 75,000	$ 75,000**	$0
Macroinvertebrate Analysis	$ 5,000	$ 7,500	$ 7,500	$ 20,000	$ 11,000	$9,000
Sediment System Collection & Analysis	$ 25,000			$ 25,000	$ 13,000	$12,000
Subtotals	$ 45,000	$ 37,500	$ 37,500	$ 120,000	$ 99,000	$21,000
OBJECTIVE 4: ADMINISTRATIVE						
Progress Reports	$ 5,600	$ 5,400	$ 3,400	$ 14,400	$ 6,400	$8,000
Reimbursement Requests	$ 400	$ 600	$ 600	$ 1,600	$ 1,600	$0
Final Report/Grant Close-out			$ 2,000	$ 2,000	$ 2,000	$0
Subtotals	$ 6,000	$ 6,000	$ 6,000	$ 18,000	$ 10,000	$8,000
TOTAL PROJECT BUDGET	$ 266,000	$ 69,500	$ 47,500	$ 383,000	$ 158,000	$ 225,000

**** In-Kind Contribution**

ATTACHMENT 2

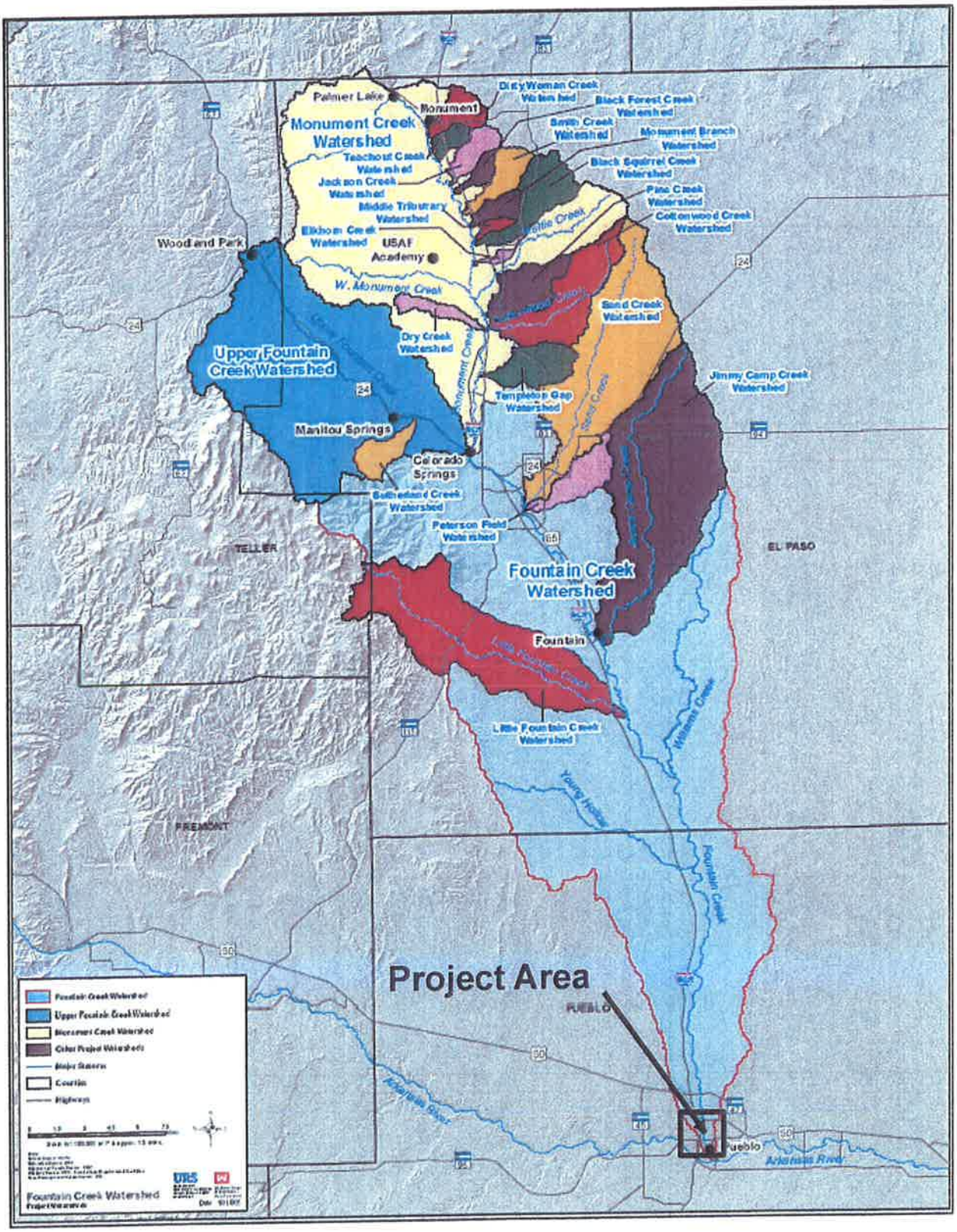
MILESTONES TABLE FOR FOUNTAIN CREEK BEDLOAD SEDIMENT DEMONSTRATION PROJECT

TASK/RESPONSIBLE ORGANIZATIONS	OUTPUT	QTY	YEAR 1	YEAR 2	YEAR 3
			08/08 7/09	08/09 7/10	08/10 7/11
Task 1 – ($20,000) Complete Design, specifications, and permitting for construction of bedload sediment removal system demonstration project area /City of Pueblo hired contractor	Construction design and specifications	1 1			
Task 2 – ($225,000) Installation of the bedload sediment system and sediment material collection system/City of Pueblo and hired contractor(s)	Full-scale sediment removal & collection system	1			
Task 3 - ($25,000) Monitor and test water quality and sediments/ City of Pueblo Stormwater and Wastewater departments & CSU Pueblo	Water quality and sediment monitoring				
OBJECTIVE 3 **Task 1 – ($18,000) Complete grant reports**	Administrative, grant progress and final report	12			

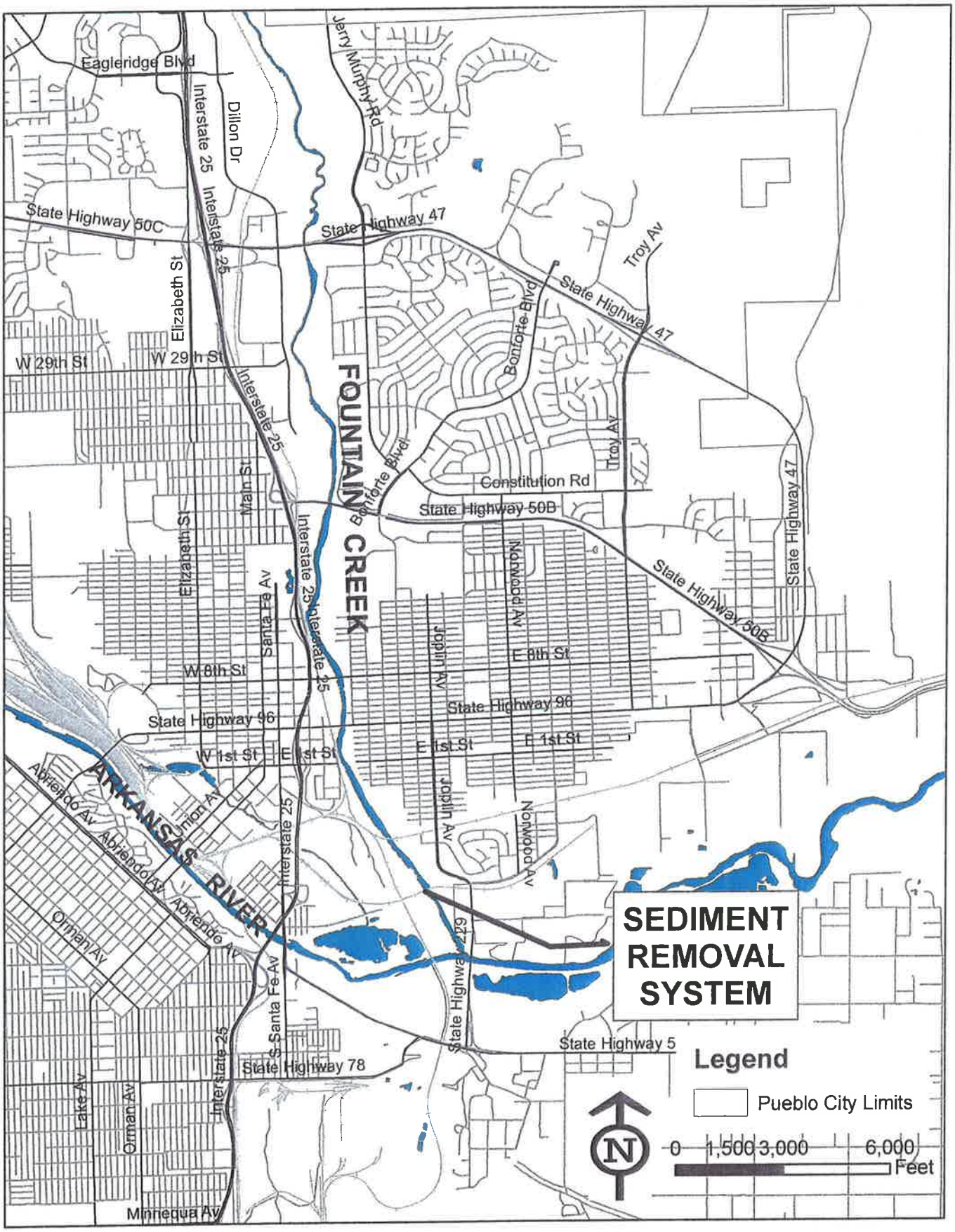
PROJECT MILESTONES

The project milestones include the completion of the design and specifications, construction of the project, ongoing water quality and sediment monitoring during the project, and completion of the grant progress reports, reimbursement requests and final grant closeout. The water and sediment monitoring will be completed on an ongoing basis over an eighteen month period with an annual report comparing the results of the testing. The administration of the grant and submittal of reports will be completed throughout the project with progress reports submitted quarterly, reimbursement requests submitted per the terms of the grant agreement, and a final report submitted at the completion of the project.

ATTACHMENT 3
VICINITY MAP
CITY OF PUEBLO
FOUNTAIN CREEK BEDLOAD SEDIMENT
DEMONSTRATION PROJECT



ATTACHMENT 4
FOUNTAIN CREEK BEDLOAD SEDIMENT DEMONSTRATION PROJECT
CITY OF PUEBLO MAP



ATTACHMENT 5
FOUNTAIN CREEK BEDLOAD SEDIMENT DEMONSTRATION PROJECT
PROJECT LOCATION

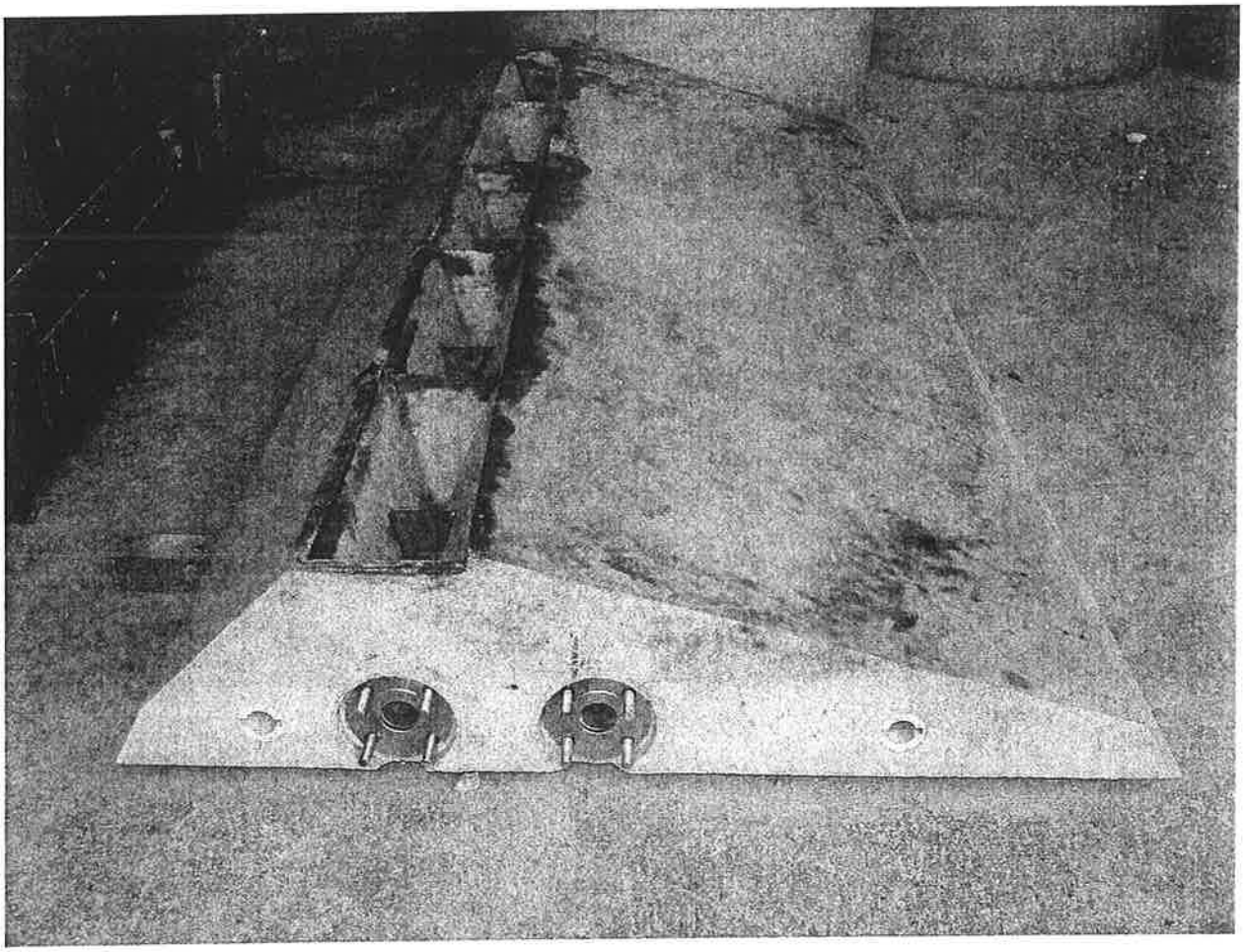
ATTACHMENT 6

BEDLOAD SEDIMENT REMOVAL
PROJECT AREA PHOTOS

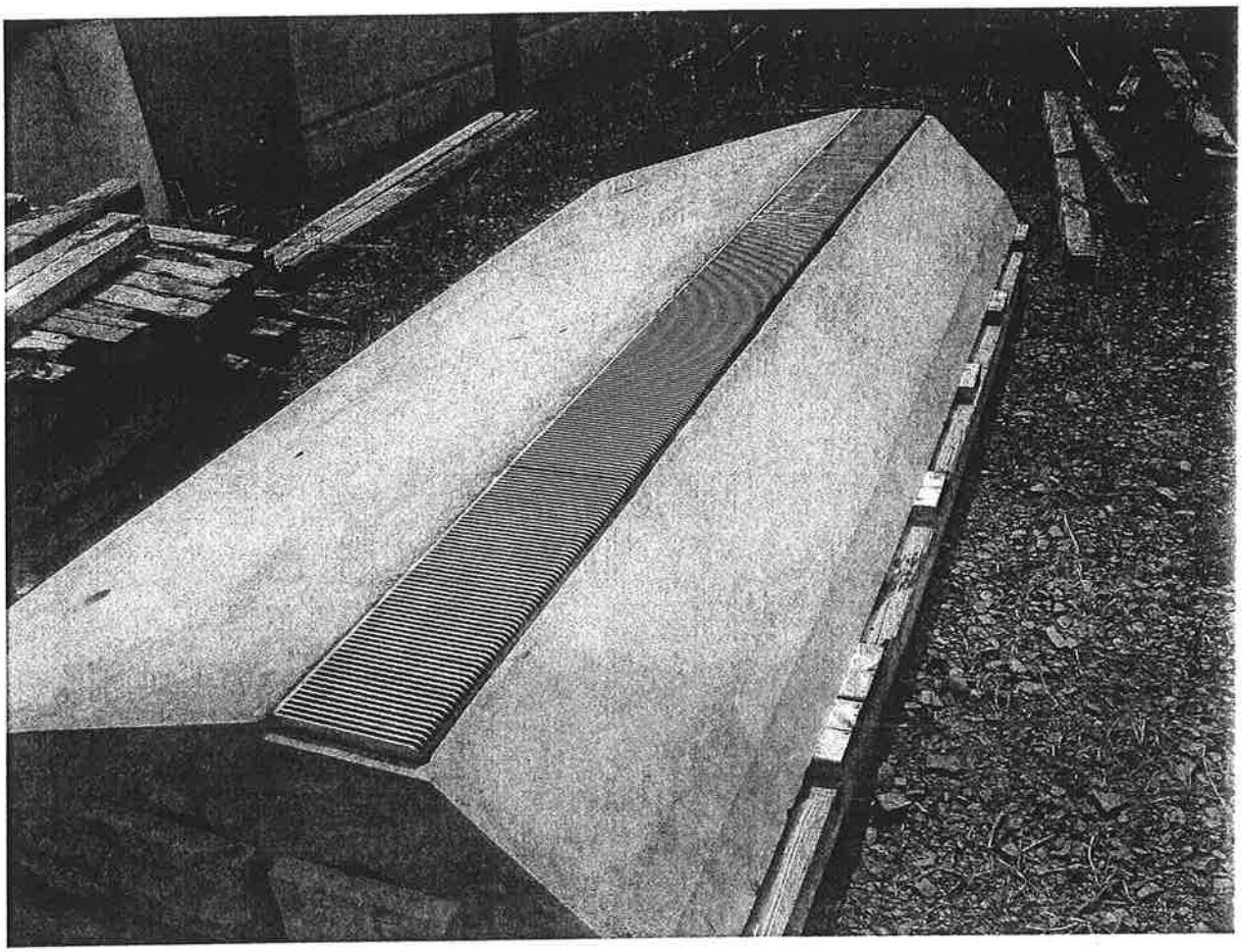
Looking southwest toward the Joplin St. Railroad Bridge Sediment removal project site on Fountain Creek. Sediment capture project would be likely located between the second and third piers of the railroad bridge.

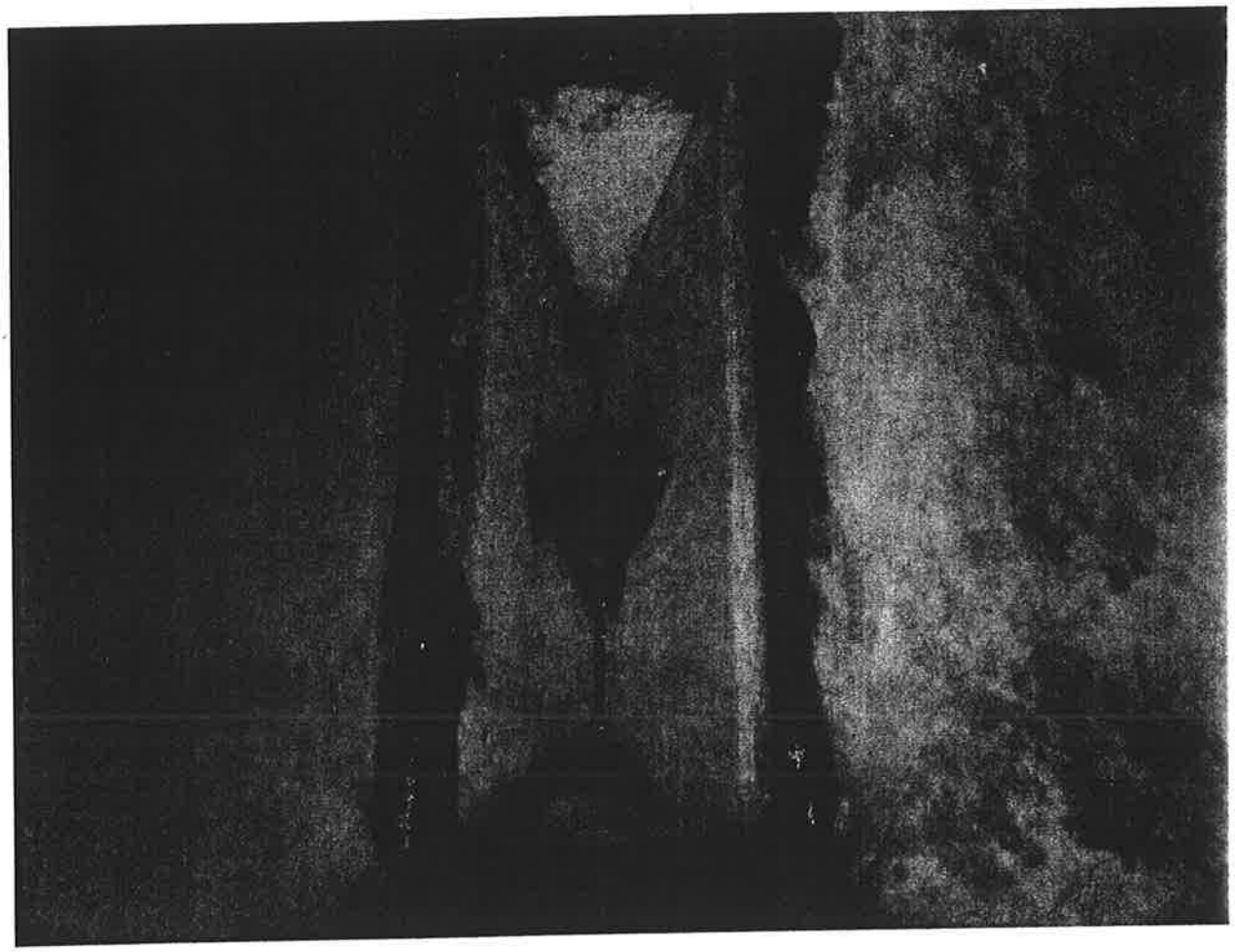
Looking northwest from the Joplin St. Railroad Bridge at the up-stream portion of Fountain Creek showing current sediment deposition within the channel.

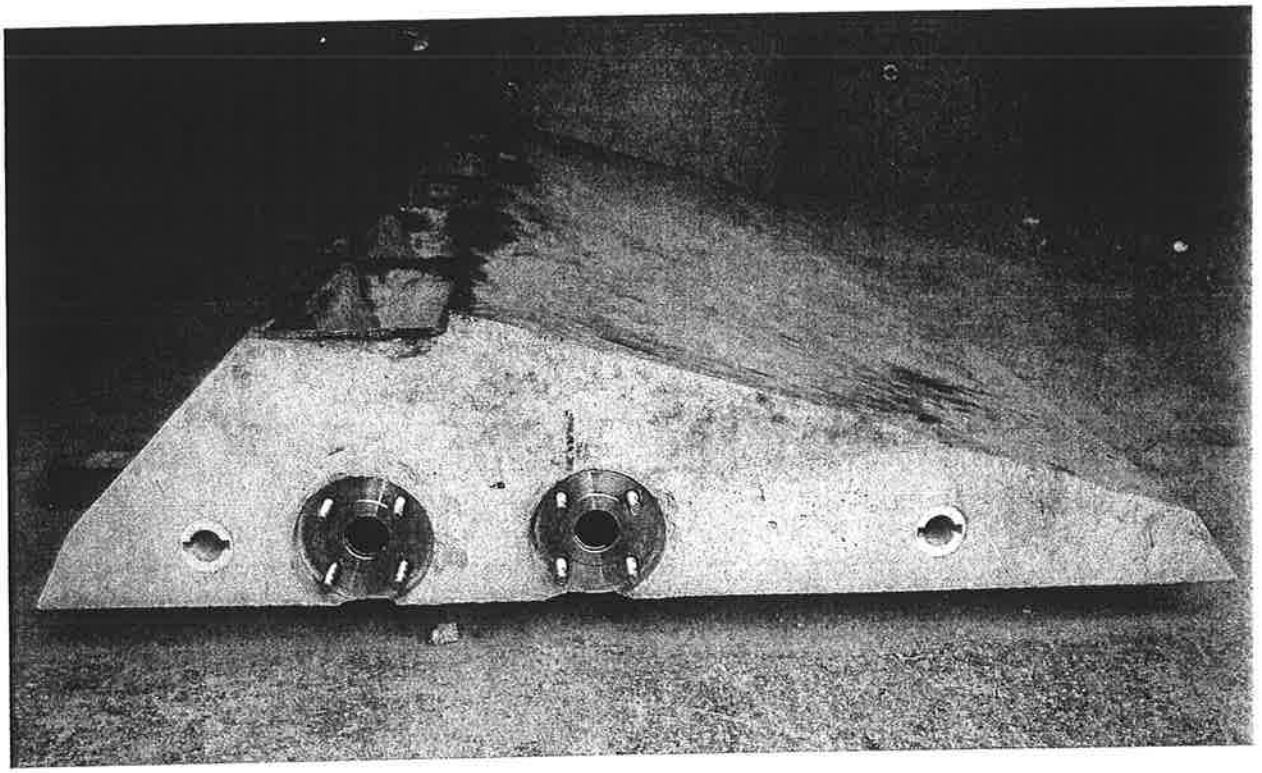
Phase II, Bed Load Gage and Collector Photographs

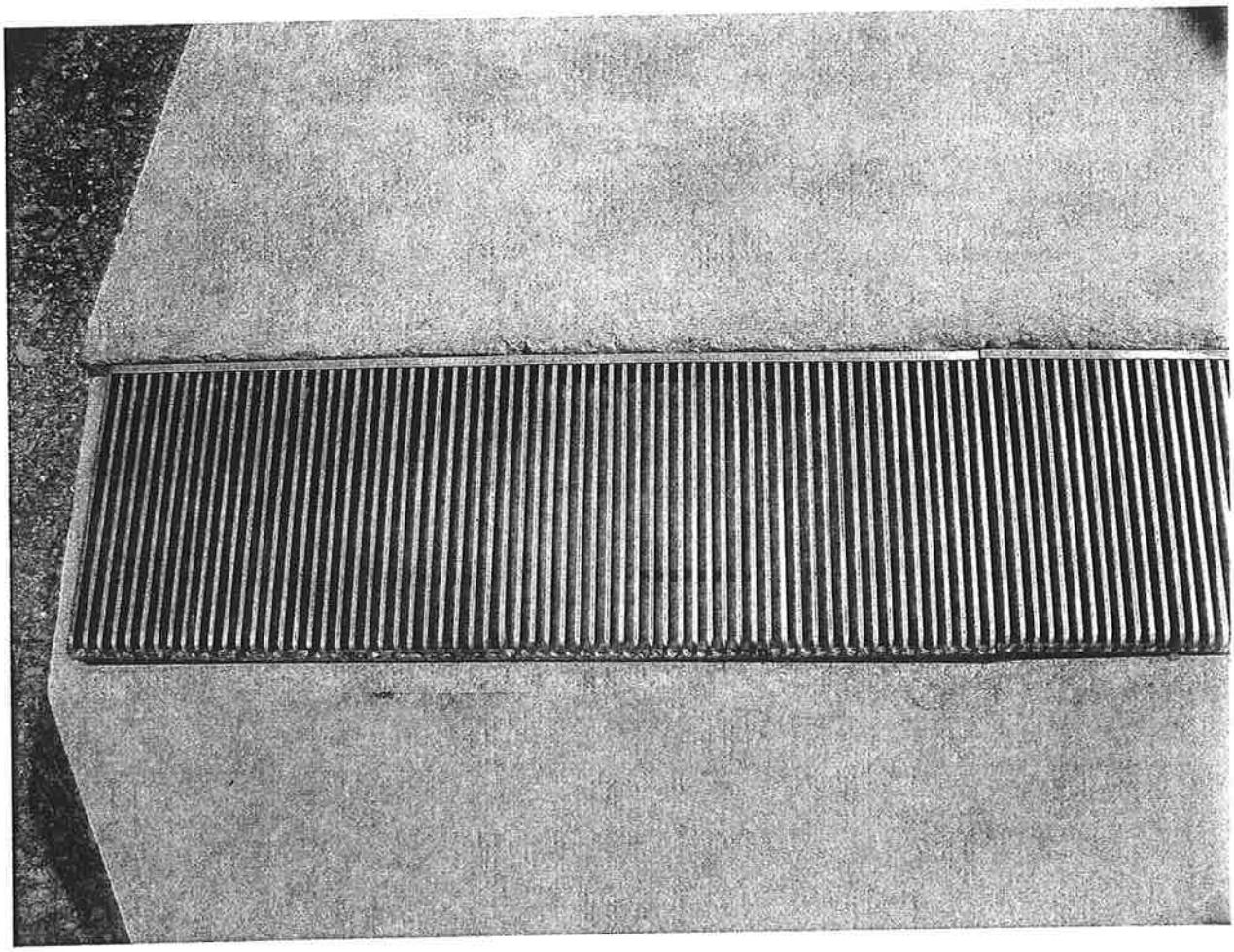


Proposal CO0001S
Streamside Systems, LLC.









Classified (by grain size) Sediment from Streamside's system.

	grams	
132 OPN	100	10.94%
46 OPN	215	23.52%
400 OPN	180	19.69%
26 OPN	100	10.94%
20 OPN	94	10.28%
15 OPN	204.5	22.37%
9 OPN	20.5	2.24%
	914	100.00%

Grain size distribution from Fountain Creek proposed test site.

Description of Installation

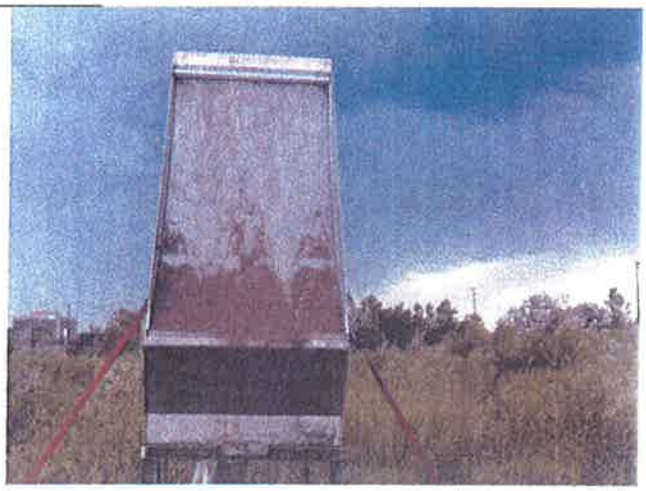
Streamside Systems Equipment for Demonstration

Bedload Collector

Streamside Systems 24" wide bedload collector was used for the demonstration (Phase 1). This small collector permitted rapid assessment of different placements in elevation, to allow the best performance. Placing the collector (i.e., the top of the hopper) slightly above the river bottom produced the best results.

Dropbox Filter

Streamside Systems 24" Dropbox filter was used for the demonstration (Phase 1). Although this method of separation produced great results, it is not practical for large installations such as 150-ft cross-sections.



Functional Differences between Phase 1 and Phases 2 & 3

The Phase 1 Demo unit pumped the sediments captured and removed from the Collector hopper to the dropbox filter for dewatering, and the water was then returned to the river. The full-size Collectors for Phases 2 and 3 will differ from Phase 1 in using a closed-loop water cycle. After dewatering the sediments, the water will return to the Collector hopper, thereby eliminating any withdrawal from or return of water to the river. Additional advantages of the closed-loop water cycle include the avoidance of entraining any suspended fish or eggs or invertebrates, as well as the elimination of any impingement velocity through the Collector screen that could otherwise tend to clog the screen with leaves or debris.

Attachment F
Stream Side

A NEW SERIES OF SEDIMENT COLLECTORS FOR MONITORING TRUE BEDLOAD

David A. Braatz[1] and Randall L. Tucker[2]

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Keywords: fluvial sediment, monitoring, bedload, sediment sampling, restoration

ABSTRACT

Streamside Systems LLC offers a bedload monitoring collector with variable mesh screening to collect targeted sizes of bedload sediment. Prototypes have been tested for continuous operation (3 to 5-month periods) for sand to medium gravel moving as bedload. The Streamside collectors sample true bedload, and avoid the collection of suspended sediment and organic matter. Bedload net samplers such as the Helley-Smith, which block a partial cross-section of the water column, can become blocked by the inclusion of organic matter, and are biased by including suspended sediments (from near the bottom of the stream, where suspended sediment concentrations are highest). In low-gradient streams, the Streamside collectors are pumped out, and can easily be back flushed or "zeroed". A siphon removal system will work continuously with a localized drop adequate to pull 20 to 25 gpm through the collector with a 2-inch hose. The outlet hose allows samples to be collected safely from the shoreline, even under high flow conditions, and for any desired sample period (seconds to months).

INTRODUCTION

Sedimentation is generally identified as the leading water quality problem in the United States. Streamside Systems LLC (Findlay, Ohio) was formed to research, design, and market equipment to aid in the prevention of sediment impacts to surface waters, and to restore sediment-impacted aquatic habitats. One series of products was designed to remove targeted sizes of sediments (generally sand and finer) as they move downstream as bedload. These collectors are passive, noninvasive, and scalable to any size stream or river. . As a new, best available technology (BAT) alternative to dredging, the

collectors can **avoid** the common adverse impacts of dredging, such as:

- Habitat damage via unselective removal of gravel and cobble
- Biological damage via removal of fish eggs, invertebrates, and organic matter
- Resuspension of sediment-associated contaminants
- Reduced water quality and increased turbidity due to substrate disruption, and
- Morphological damage that can lead to headcutting

A wide variety of applications exist for this new type of passive bedload sediment collector, including:

- Habitat improvement for fish spawning or for endangered mussels, through selective removal of harmful fine sediments, an increase in the substrate median particle size (D50), and reduced embeddedness
- Reduction in pond and reservoir sedimentation, by removal of bedload at the mouths of tributary streams
- Solution to "hungry waters" below dams, by collecting the bedload in tributary streams, bypassing the reservoir, and reintroducing the sediment below the dam
- Selective removal of a clean-washed commercial product (sand), with no increase in turbidity over ambient, while improving habitat
- Reduction in water treatment costs for industrial, municipal, and agricultural water users
- Prevention of downstream sediment impacts below dam-removal projects, below logging operations, and at stream crossings for roads and utilities
- Maintenance of navigation channel depth in major rivers, and sediment bypass systems for coastal inlets
- Supplying clean, sorted sand for beach nourishment programs
- Restoration of aggrading channels or individual pools by installing collectors as grade control structures that remove excess sediments, and
- Collecting bedload data to develop watershed sediment budgets; to develop sediment TMDL's; to measure nonpoint source sediment impacts throughout a watershed; and to collect bedload data to document damages, identify sources, and assess liability for sediment impacts.

INSTALLATION AND OPERATION

Bedload sampling is the specific application of Streamside collectors to be addressed here. The portable collector is of stainless steel construction and is dug into the streambed and anchored. As bedload sediments move downstream over the collector, they drop through the screen into a hopper and are continuously removed by siphon suction or by pump-out. A computerized controller can be added to electric systems, to pump on a timed cycle or with respect to stream stage or

discharge. Maximum particle sizes sampled depend on the width of screen slotting used, the size of the collector, the hopper capacity, and the output hose diameter. Prototype collectors that have been used for three to five month periods of continuous operation had screen slots of 5mm, 0.5 inch, or 1.0 inch, with a two-inch outlet hose. Another Streamside bedload sampler design uses three separate collection chambers, with screening slots of 2mm, 8mm, and 64mm.

The collectors are scalable to any size stream, and multiple units (e.g., 10-ton pre-cast concrete collectors, with large capacity urethane hopper assemblies) can be linked together to completely cross major rivers. The collectors can be constructed with or without sidewalls. For small streams, a two-foot wide sidewall collector can use supplemental wing walls to channel and collect 100% bedload (of the screen-selected sizes) from a four to six-foot wide channel. Collectors without sidewalls can be emplaced adjacent to each other, or small units can be installed at various locations on a cross-section.

Streamside collectors measure the sediments that move along the stream bottom and fall into the hopper. Leaf litter, invertebrates, eggs, and other organic matter all pass over the collector unaffected. When a collector without sidewalls is dug into the streambed, it is virtually snag-free, and passively removes the targeted sediments on a continuous basis. Sediment samples can be collected in a large bin or truck bed or sediment basin while the equipment is unattended, and manual samples can be safely taken over any time interval (from seconds to months) or any hydrograph category (rising, falling, or flat). Small, portable collectors can be used as bedload subsampling devices, or collectors can be sized to target the entire stream width. Streamside Systems offers 10 and 20-ton pre-cast concrete collectors to commercial sand mining operations, that can target 100% of bedload sand transport in large rivers; this can offer invaluable data on continuous bedload transport rates that have never before been available for major rivers. The flexibility of allowing extremely long-term and large volume samples, greatly reduces the variability and subsampling error inherent in bedload sampling with alternative methods.

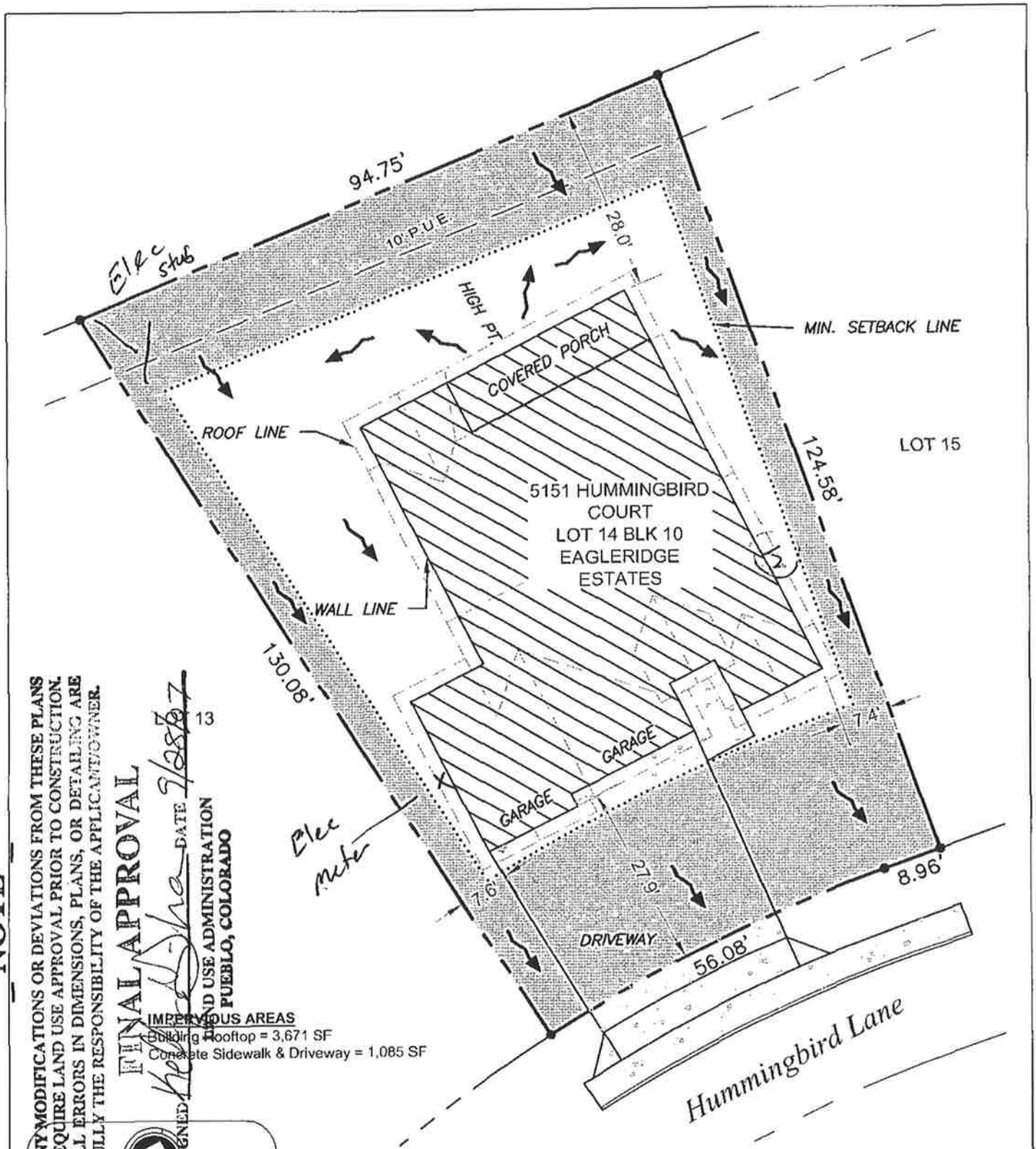
DISCUSSION

The numerous potential applications for Streamside Systems collectors are mentioned in this paper because they define the various interest groups that may fund and operate the sediment removal installations, thereby providing bedload data on a wide range of stream types and stream sizes, as a side benefit and at no cost to the "bedload community". Adoption of Streamside Systems collectors as a Best Available Technology (BAT) alternative to dredging for instream sand mining operations, would give the aggregate industry a better product at a lower cost, while eliminating significant environmental impacts and positively improving instream habitat, and also providing some of the best available bedload transport data for sand-bed streams. Many

sites hold the potential to "turn the pollutant into a commercial product", while restoring sediment-impacted streams, and providing a funding source for riparian restoration, for conservation easements, and for monitoring programs. Clearly, cooperation and cofunding needs to be encouraged among the community of "sediment stakeholders" in a watershed.

Accuracy is a major issue yet to be addressed. We have conducted simple measurements above and below Streamside collectors, with a Helley-Smith sampler. Results showed that Streamside collectors were 94% efficient. Since our collectors capture sediments that are moving along the stream bottom (i.e., bedload) and drop into the hopper, and since the Helley-Smith uses a net that sieves a cross-section of the water column at the bottom of the stream (where suspended sediment concentrations are highest), it is perhaps more logical to say that Streamside collectors capture 100% of the "true bedload", and can be used to estimate the degree of over sampling bias from water column nets that capture suspended sediment plus bedload. We find it difficult to consider a net clogged with loads of organic matter to be a "bedload sample". Perhaps a new working definition of "bedload" is in order.

Streamside Systems collectors appear to hold great promise, particularly for measuring sand and fine gravel transport. We have not yet built or tested the collectors for coarse gravel or cobble, although they should be scalable to any desired particle sizes. Several studies are currently underway regarding trout habitat improvement, morphological impacts, and macroinvertebrate recolonization studies, but much research remains to be done.



NOTE

ANY MODIFICATIONS OR DEVIATIONS FROM THESE PLANS REQUIRE LAND USE APPROVAL PRIOR TO CONSTRUCTION. ALL ERRORS IN DIMENSIONS, PLANS, OR DETAILING ARE FULLY THE RESPONSIBILITY OF THE APPLICANT/OWNER.

FINAL APPROVAL
SIGNED _____ DATE 1/28/07
13
LAND USE ADMINISTRATION
PUEBLO, COLORADO

IMPERVIOUS AREAS
Building Rooftop = 3,671 SF
Concrete Sidewalk & Driveway = 1,085 SF

N
0 20
SCALE: 1"=20'
PROPOSED STORMWATER FLOW DIRECTION

NOTE: Building setback dimensions are from property line to wall line.

Gagliano Engineering, Inc. ph. 719.547.7073
MAIL P.O. Box 2520 Pueblo, CO 81004
OFFICE 359 E. Enterprise Dr. Unit #8 Pueblo West, CO 81007

PLOT PLAN FOR RESIDENCE AT
5151 Hummingbird Court, Pueblo, CO 81008
Lot 14 Block 10 Eagleridge Estates Sub.

DRAWN BY: jvg	DATE: 09/26/07	SCALE: as shown