Citation

2009 Cooperative Conservation Award

Lewis & Clark Regional Water System Well Field Embankment Stabilization

The collaborative partnership composed of Lewis & Clark Regional Water System, their engineers, other consultants, contractor and subcontractor, the Bureau of Reclamation, National Park Service, U. S. Army Corps of Engineers, U. S. Fish & Wildlife Service and the South Dakota Department of Game Fish and Parks, developed a plan to protect the infrastructure of Lewis & Clark while stabilizing and enhancing the bank of the Missouri River within a reach that is designated as a National Recreational River under the Wild and Scenic Rivers Act.

The air of cooperation among the members of the partnership with diverse interest and objectives was outstanding. The agreed upon concept is a well accepted bank protection plan with hydraulically rough and environmentally desirable properties. All exposed stone is covered with soil and seeded along with willow, cottonwood and dogwood plantings.

This project will have a positive effect on the recovery of the Missouri River by providing a positive alternative and guide for large-scale bank stabilization by utilizing soil over the riprap, rooted plants, and locked logs, and can be retro-fitted to many existing projects. Project monitoring will provide insight into hydraulic & environmental functions of the techniques used, and lessons learned can be used to refine future river projects.

Lewis & Clark Well Field Bank Stabilization

2009 Cooperative Conservation Award
Nomination for the
Lewis & Clark Regional Water System Well Field Embankment Stabilization

Conservation that Furthers the Mission of Interior

This partnership, assembled to ensure that the Lewis & Clark Regional Water System (Lewis & Clark) Well Field is protected from river bank erosion, exemplifies how local sponsors, state governmental entities and Federal agencies can cooperate to achieve critical conservation goals.

The Lewis & Clark Mulberry Point Well Field, which lies along the Missouri River south of Vermillion South Dakota, is the main supply feature to the Lewis & Clark Regional Water System. The collaborative partnership composed of Lewis & Clark, their engineers and other consultants, the Bureau of Reclamation (Reclamation), National Park Service, U. S. Army Corps of Engineers (Corps of Engineers), U. S. Fish & Wildlife Service (Fish & Wildlife) and the South Dakota Game Fish and Parks (Game Fish and Parks), developed a plan to protect the vital infrastructure of Lewis & Clark while stabilizing and enhancing the bank of the Missouri River within a reach that is designated as a National Recreational River under the Wild and Scenic Rivers Act.

Lewis & Clark is the largest, by volume, rural water system that has been authorized, and for which Reclamation is responsible for oversight. Formulated in 1990 and authorized by the U.S. Congress in 2000, Lewis & Clark has evolved into a 45 million gallons per day system of 20 member rural water systems withdrawing water from the sand and gravel aquifers downstream of Gavins Point Dam south of Vermillion, South Dakota with the goal of providing high quality water in a three state area. The Project has a Federal non-Federal cost share of 80 and 20 percent respectively. The current project cost is $361,108,000 Federal, $99,946,000 non-Federal for a total of $461,054,000. It is expected to be complete around 2025.

Missouri River at Well Field showing undercut banks

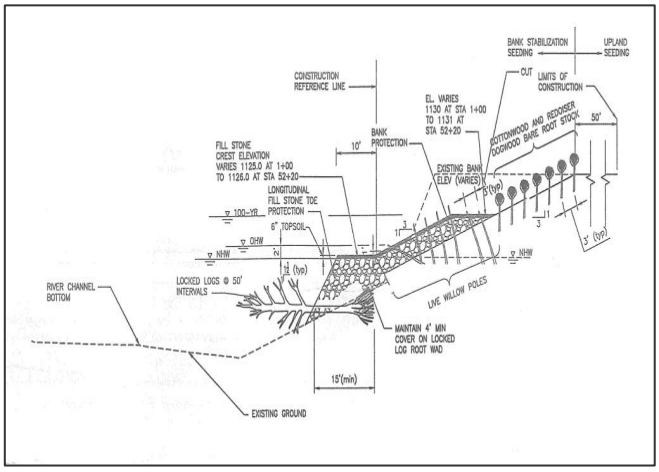
The Well Field is located within a 59-mile National Recreation reach of the Missouri River. This reach which is the first free flowing reach located below the 6 main stem dams, supports many Federal and State listed species, provides high quality outdoor recreation, and has a rich cultural history. The Park Service manages the reach for recreational, fish, wildlife, historic, and cultural values. The U.S. Army Corps of Engineers also has jurisdiction through their regulation of river flows upstream of the reach. The wells themselves are located on land owned by the Game, Fish, and Parks, who manages the land as the Frost Wilderness

Game Production Area. Because of this unique placement, cooperation and collaboration between Lewis & Clark and government agencies has been essential to planning and construction of the Mulberry Point Well Field.

In order to facilitate communication and assure that natural resources are considered in project planning and construction, preliminary plans for construction phases of the Lewis & Clark System are reviewed by an Interagency Environmental Review Team. This team includes Reclamation, Lewis & Clark, and representatives from Federal, State, and Local agencies who have an interest in the project.

The original plan for protection of the well field utilized the installation of buried riprap or sheet piling inland from and parallel to the river bank. This protection was a continuation of buried stone revetment previously installed by the South Dakota Department of Transportation to protect the new Highway 19 and bridge. The modification of this design resulted from reviews by the Interagency Environmental Review Team. The river channel is dynamic in this location and it was anticipated that the river bank would eventually erode back to the buried riprap. This would launch the buried revetment and expose it to view from the river. If the revetment did not launch properly its erosion control protection would be reduced. Concerned that unsightly exposed riprap would impact the aesthetic values of the river reach, the Park Service recommended changing to a design that would not incorporate riprap.

After much consultation and several on site meetings, the partners agreed upon an innovative solution: a vegetative stone toe revetment recommended by Dave Derrick of the Corps of Engineers Water Ways Experiment Station in Vicksburg Mississippi. The agreed upon concept is well a accepted bank protection plan consisting of self-adjusting, and self-filtering stone toe that is well-understood, well designed, and time tested with a low degree of risk.



Bank Stabilization Detail

An approximately 5,000 foot revetment was installed and covered with soil. A layer of rock riprap was placed along the bank of the river extending above high water levels, with a thickened toe below the water level and extending up the bank at a flatter slope. To provide hydraulically rough and environmentally desirable properties 113 locked logs were placed in the rock toe plus 49,000 unrooted willow pole plantings placed within and through the riprap, and 59,300 rooted stock plants for the lower, middle, and upper bank areas. Then all exposed stone was covered (choked) with soil and seeded with native grasses and forbs. The revetment includes travel lanes to allow wildlife to access

the shoreline over rock filled key trenches which penetrate the river bank and were constructed perpendicular to the revetment to prevent erosion behind the revetment.

The project is beneficial hydraulically and environmentally. The locked logs move scour and stream channel away from eroded bank and should enhance sediment and woody debris deposition. The self-adjusting stone toe provides protection against scour and the riprap revetment provides direct armor protection while the vegetative roughness reduces flow velocities and invites deposition and plant roots to strengthen the bank and bind the soil.

This project will have a positive effect on the National Recreation reach and the Missouri River as a whole by providing a positive alternative and model for large-scale bank stabilization projects. It also furthers the mission of the Department of the Interior in multiple ways. It allows for the delivery of water in an environmentally responsible way, preserves and enhances the landscape and values for which the National Recreation River was designated, and improves habitat to promote recreational use on State land.

Completed Stabilization with locked logs, grass and young cottonwoods

Collaboration to Promote Partnerships

The Park Service initially recommended an "Engineered Log Jam" design. However, this design was not thought to be adequate to stabilize the river bank on a river this size and in this climate by Corps of Engineers. The partners discussed options and agreed upon a solution which would maintain the values of the National Recreation River while protecting vital infrastructure.

Lewis & Clark demonstrated flexibility and a willingness to adapt the stabilization design to enhance the river bank and game production area. The Park Service reviewed the design and provided design specifications that would preserve and enhance the river reach values. When Lewis & Clark questioned the feasibility of complying with a specification to water the plantings; Lewis & Clark and the Park Service decided instead to plant more shrubs, thus assuring coverage if some of the shrubs died. All partners collaborated in the 404 Permitting process.

Collaboration among partners did not cease when construction began in October 2007. At the preconstruction conference the prime contractor, his earthwork subcontractor, and the construction observer were brought into the process. Methodologies concerning the placement of riprap in the river, the planting of the willow poles in the riprap on the bank,

and the upland seeding were all discussed. The subcontractor agreed to modify his construction methods to ensure the best results as far as erosion protection and plant survival. Reclamation provided training for the contractor and their subcontractor on the recognition of undiscovered cultural resources if they were to be encountered.

Partners discuss construction methods

Monthly construction coordination meetings were held with the contractor and his subcontractors along with representatives from Reclamation, the Park Service, Game Fish and Parks, Corps of Engineers, and Fish & Wildlife. Throughout construction the design was continually adapted to ensure that the end product would be functional and blend in as much as possible to the natural river bank. Such adaptations included spacing and configuration of the willow poles, spacing and species of the upland seedlings, reconfiguration and location of wildlife ramps, and the disposition of excess soil resulting from the river bank eroding 25-30 feet between final design and construction. Game, Fish, and Parks made recommendations on utilizing this soil to create berms to enhance the Game Production Area, and recommended native species.

The cooperation of the earthwork subcontractor was so evident that a National Park Service representative made the statement "that he had never seen a contractor like him before" after the subcontractor offered up a suggestion or solution to a problem. Even with several changes there were only two additive changes to the contract: one for additional willow poles and the other for additional excavation both due to the higher bank resulting from the river bank erosion.

There are nesting locations of the federally endangered least tern and the federally threatened piping plover located on islands adjacent to the stabilization. The area also provides habitat for the bald eagle, which was listed as federally threatened when the project began. Reclamation, the Fish &Wildlife and the other partners coordinated carefully to assure that there were no impacts to these species from construction.

Cooperation and communication were evident at every stage of the project and made it possible to bring an innovative design to reality.

List of Collaborators (Partners)

Lewis & Clark Regional Water System
Lennis (Red) Arndt, Chairman of the Board of Directors, 507-920-9771
Troy Larson, Executive Director, 605-336-8688
Jim Auen, Water Treatment Plant Superintendant, 605-336-8688
Dan Zulkosky, Construction Administrator, 605-336-8688

HDR Engineering Inc.
Charles "Chip" Haas, Project Manager, 402-399-1333
John Engle, Project Engineer, 402-926-7110
Teresa C. Konda, Design Engineer, 402-926-7063
Terry Stoltenow, Construction Observer, 605-988-4253
Meagan Hall, Environmental Specialist, 402-399-4983
Daniel Graber, Project Manger, 605 -977-7740
William W. Brinker, Senior Vice President 605-977-7740

Banner Associates
Timothy R. Conner, Senior Project Manager, 605-692-6342
Matthew Q. Rippentrop, Construction Observer, 605-690-4355
Ron Bergen, Survey Coordinator, 605-692-6342
David C. Odens, Senior Project Manager, 605-692-6342

National Park Service
Wayne Werkmeister, Chief - Resource Management, 402-336-3970 (Relocated)
Tyler Cole, Hydrologist, 402-336-3970 (Resigned)

U. S. Army Corps of Engineers
David L. Derrick, Research Hydraulic Engineer, Costal and Hydraulics Laboratory, 601-218-7717
John Remus, Chief - Hydrologic Engineering Branch, 402-995-2349
Luke Wallace, Environmental, Economics, and Cultural Resources, 402-995-2692
Daniel Pridal, Chief - Sedimentation and Channel Stabilization Section, 402-995-2336
Jerome Tworek, Sedimentation and Channel Stabilization Section, 402-995-2357
Thomas Lowin, Environmental Resource Specialist, 605-224-8531

South Dakota Game, Fish and Parks
Steve VanderBeek, Regional Habitat Manager, 605-362-2700
John Kirk, Program Administrator, 605-773-4501 (Retired)
David J. Ode, Botanist, 605-773-4227

South Dakota Department of Environment and Resources
David Ryan, Natural Resource Engineer, 695-773-4216 (Passed away, January 15, 2009)

U. S. Fish & Wildlife Service
Scott Larson, Fish & Wildlife Biologist, 605-224-8693
Charlene Bessken, Fish & Wildlife Biologist, 605-224-8693

Welfl Construction Corporation
Kevin Schulz, Owner, 605-665-3258
Jakob Brouwer, Superintendent, 605-665-3258

Lake Regional Contracting, Inc. *
Thomas Powell, Owner, 320-894-0491

TRC Environmental Corporation
Jan Hart, Senior Project Manager/Biologist, 307-742-3843
Bruce R. McClelland, Archeologist, 307-742-3843
Edward Schneider, Cultural Resources Program Manager 307-742-3843

South Dakota State University
Gary Larson, Professor, 605- 688-4121

U. S. Bureau of Reclamation
Theodore L. Hall, Civil Engineer, 605-945-2980 Ext. 3003
Faye Streier, Natural Resource Specialist, 605-394-5797 Ext. 3005
James Kangas, Archeologist, 605-394-5797 Ext. 3012
Scott A. Jacobson, Civil Engineer, 701-221-1215
Jame L. Todd, Chief - Engineering & Construction Services - 701-221-1201 (Resigned)
Joseph E. Hall, Chief - Recreation and Land Management - 702-221-1280