Basin Environmental Improvement Project Commission (BEIPC)
Project Grant Work Plan

Applicant: Idaho Department of Environmental Quality on Behalf of the Basin Environmental Improvement Project Commission

Contact: Terry Harwood, BEIPC Executive Director

Amount Requested: **$ 1,988,200**

Introduction

The State of Idaho Legislature established the Coeur d'Alene Basin Environmental Improvement Project Commission (BEIPC) to implement, direct, and/or coordinate environmental remediation, natural resource restoration, and related measures to address water quality and heavy metal contamination in the Coeur d'Alene Basin of Idaho in a manner that is protective of human health and the environment, consistent with local, state, federal, and tribal participation, resources, and authorities.

The 2004 conference report accompanying the congressional appropriation act for EPA included a line item in the amount of $1,988,200 for the BEIPC to carry out a pilot program for environmental response, natural resource restoration and related activities. The Idaho Department of Environmental Quality (IDEQ), on behalf of BEIPC, is requesting funding to support work projects of BEIPC. IDEQ will serve as the administrator for these funds. This may include direct contracting by IDEQ on behalf of BEIPC, or entering into subcontracts or interagency agreements to complete the work tasks as IDEQ may be directed by BEIPC. IDEQ is requesting all $1,988,200 in this application.

The major objectives of the projects proposed for this phase of funding are:

1) Complete Mica Bay nutrient reduction project study;
2) Sample nearshore sites in Coeur d'Alene Lake's southern portion to better define the extent and possible source of elevated cadmium, lead, and zinc concentrations in nearshore and pelagic locations south of Harrison and north of Chatcolet Lake;
3) Construct and study the effectiveness of a pilot cascading overland flow wetland to determine if future construction of a wastewater treatment facility discharging to a wetland is feasible in the Coeur d'Alene Basin;
4) Characterize nutrient concentrations and transport through the Plummer Creek watershed and into Chatcolet Lake; the results will serve as the basis for developing nutrient and water quality management efforts within the context of a Coeur d'Alene Lake Management Plan;
5) Develop stream channel and drainage infrastructure techniques to control and mitigate water pollution and protect property from recontamination and flood impacts;

6) Construct a demonstration project to re-establish a fully functional resident fishery and improvement of habitat to enable successful migration at a completed mine and mill site cleanup and restoration;
7) Develop an alkaline precipitation design to treat water that has the minimum possible capital and operating costs although it may not completely satisfy the goals of the ROD;
8) Identify sources of toxicity in Basin community wastewater treatment plant effluent to develop options for removal of toxicants; perform bench testing to verify removals; and develop capital and O&M cost projections;
9) Develop Phase 2 of the Simulation Model to Evaluate Coeur d'Alene Lake's Response to Watershed Remediation to provide the entities responsible for management of Coeur d'Alene Lake with a sophisticated computer modeling system to simulate the Lake's responses to a wide range of remediation strategies to be implemented under the Superfund Record of Decision and the Lake Management Plan;
10) Develop a set of tools that can be used by resource managers for evaluating proposed projects designed to minimize the transport of metal contaminated sediments in the Lower Coeur d'Alene River;
11) Assess the economics and effectiveness of alluvium sorting as a mine waste removal strategy at the project implementation level; and
12) Conduct an extensive evaluation of all activities within a 1 mile perimeter of the shore of Coeur d'Alene Lake to determine impacts and management practices with initial emphasis on development and construction activities.

The scope of these projects consists of coordination and acceleration of research, investigations, experiments, demonstrations, surveys, and studies to the causes, effects, extent, prevention, reduction, and elimination of adverse impacts to water quality in the Coeur d'Alene Basin. Results from these projects will be transferable to other areas and communities within the Basin to reduce, eliminate, or prevent impacts to water quality.

Stakeholders participating with the BEIPC and these pilot projects are already investing significant time and resources via the BEIPC Technical Leadership Group (TLG) and the Citizen Coordinating Committee (CCC). These advisory groups reviewed and provided comment on numerous projects proposed for potential funding using this Clean Water Act Grant. The projects listed below were those recommended to and approved by the BEIPC at its November 10, 2004 and February 16, 2005 meetings.

PROJECT DESCRIPTIONS

Task 1 - Mica Bay Nutrient Reduction Project Completion

Budget Requested: **$121,000**

This project was originally funded in its entirety under Clean Water Act 104(b)(3) Grant #X-970789-01, Task 11. A subsequent amendment to that grant reduced the scope of and funding for this project to only include completion of a feasibility study. The rest of the

project to initiate design, permitting, contracting and construction and monitoring of a large-scale pilot project was deferred to this new Clean Water Act Grant.

Land use changes and development pressures in the Coeur d'Alene Lake watershed have accelerated nutrient enrichment of the lake. The presence of heavy metals on the lake bottom necessitate that nutrient enrichment be minimized to prevent the formation of anoxic conditions. A strategy to control nutrient levels may insure that metals stay chemically bound to bottom sediments, protecting lake water quality.

The work is intended to be a demonstration and training project for use by wetland delta landowners. It is intended to encourage them to consider altering management of unusable lands for the purpose of providing public benefits by lowering nutrient delivery near shore areas of Coeur d'Alene Lake. Currently, these landowners have no information concerning how a project of this nature would work, how to design this type of project, and potential costs and collateral effects on their land. Potential restoration projects in wetland delta areas on the lake are more complicated because the fifty (50) square mile lake is fed by mountain streams subject to heavy runoff periods and its natural pool elevation fluctuates because of power generation. Wetland areas are periodically flooded and drained. The fluctuating water levels create many design and construction challenges. This project is intended to tackle the many difficult design aspects offered by this unique site to provide answers concerning potential project success and costs. This work will provide written documentation to be used to educate and train interested landowners in this type of wetland management and overcome obstacles to their participation.

A large source of nutrients entering the lake is nutrients attached to sediment particles. A reduction in sediment reaching the lake will reduce nutrient loading. Effects of sedimentation and nutrient enrichment such as reduced water depth, increased aquatic weed growth and loss of fish spawning habitat are apparent in the shallower bays. These effects can occur naturally over time, but are often greatly accelerated due to human activity. Since there are many sources of nutrients and sediment, an extensive array of measures must be utilized to prevent accelerated aging of a lake. This proposal, to re-activate one of nature's natural water cleansing systems, is one measure to slow down that aging process. It is a non-regulatory approach, utilizes simple construction techniques, provides for protection of strategically located wetlands, and should be easily reproducible for landowners.

Most of the nutrient and sediment loading to the lake occurs during peak flow events. Historically, extensive wetland deltas filtered stream water during out-of-bank flows, settling sediments, utilizing nutrients and recharging groundwater. Due to a variety of human caused impacts, such as the channelization of Mica Creek and subsequent channel entrenchment, floodwaters can no longer reach much of their floodplain. If this function could be restored in an economic fashion, it could be implemented at the mouth of similar lake tributaries to reduce sedimentation and help protect bays from nutrient enrichment. Due to the artificially regulated lake levels, bank stability is also a problem in channels that receive lake back-water. The project will also address necessary measures to stabilize these areas.

Project Description: This project will demonstrate for training and education purposes a means of reducing nutrient and sediment impacts to Coeur d'Alene Lake in compliance with the implementation of the Coeur d'Alene Lake Management Plan. It will also accomplish some TMDL implementation goals for the recovery of beneficial uses in Mica Creek.

The proposed project involves stabilizing the lower 900 feet of Mica Creek and restoration of the adjacent 17.6 acres, mostly wetlands. The goal is to filter out sediment laden spring flows by better utilization of adjacent wetlands and to prevent further bank sloughing caused by lake pool elevation changes and stream channelization. A conservation easement would insure that these improvements to protect lake water quality would remain in place. If successful, this technique could be used in similar tributaries with poorly functioning wetland deltas as part of an overall nutrient and sediment reduction program.

Specifically, the project consists of a diversion that would be constructed to allow flood waters from Mica Creek to access adjacent wetlands. An irregularly shaped sedimentation/wildlife pond would be excavated to receive the flood waters. Runoff from the pond would sheet flow over the remaining wetland area and be returned to the creek through an existing meandered secondary channel. This secondary channel is probably the original channel before the stream was straightened. The banks of Mica Creek would be stabilized with riprap and additional woody vegetation. The bed of the creek would have grade control structures placed in it to prevent further down cutting of the channel. A minimally restrictive conservation easement would be developed to insure wetland functions are protected.

Monitoring will consist of permanently anchored marked stakes placed in the new pond at various locations so sediment accumulation can be easily recorded each year after runoff. For the first three years, marked photo points will record spring flows over critical areas of the project to insure they are functioning properly. Photos will also be taken during low flow conditions to assess the stability of the project. After the first three growing seasons, turbidity will be monitored above the diversion and at the outlet of the overflow channel just before it enters the main stem of Mica Creek. This will be repeated for three years, once per month, during spring runoff. Yearly reporting of these monitoring efforts will be conducted by the contractor or the landowner and housed at IDEQ. The final report will be used to train and educate landowners on the potential for similar projects on their property to improve water quality in Coeur d'Alene Lake.

Implementing Agency: IDEQ

Deliverables: A project design will be prepared and submitted to the BEIPC Technical Leadership Group (TLG) for review and comment. A post construction report will be provided to the BEIPC along with annual monitoring results summaries.

Task 2 – Additional Water Quality Sampling in Selected Nearshore Areas of Southern Coeur d'Alene Lake

Budget Requested: **$13,000**

A Clean Water Act 104(b)(3) Coeur d'Alene Lake Management and Water Quality Monitoring Pilot project was originally approved and funded under EPA grant #X7-970487-01, Task 1. This work is an addendum to that original task.

Recent lake water quality samples taken in the southern portion of Coeur d'Alene Lake, specifically south of Harrison and north of Chatcolet Lake, have elevated concentrations of dissolved zinc. Possible reasons for these unexpectedly high concentrations in what were generally considered to be uncontaminated areas include benthic flux of metals from the lakebed, advective transport southward by Coeur d'Alene River inflow, internal wave scouring and transport of metal-rich sediments from University Point eastward, and potential contamination associated with the former railroad bed located on the lake's eastern shore south of Harrison. A few samples of nearshore seeps in the O'Gara Bay area were taken by this project's sponsor in February 2004. The USGS analyzed these unfiltered, non-chain-of-custody samples and found a total zinc concentration of 2,900 micrograms per liter. Additional sample collection in nearshore areas of the southern lake would identify sources of potential in this supposedly uncontaminated area.

Project Description: The objective of this project addendum is to sample additional nearshore sites in the lake's southern portion to better define the extent and possible source of elevated cadmium, lead, and zinc concentrations in nearshore and pelagic locations south of Harrison and north of Chatcolet Lake. The Coeur d'Alene Tribe would collect the additional samples during water year 2005 as part of its nearshore sampling project to assess current limnological conditions and trends currently underway. The USGS would furnish sampling supplies and analyze the samples at the National Water Quality Laboratory. The proposed additional sampling locations include the following:

- South Shingle Bay
- O'Gara Bay
- Opposite Cal's Pond (see UPRR consent decree for location)
- Opposite Dean's wetland (see UPRR consent decree for location)
- North of east segment of UPRR Chatcolet causeway
- North of UPRR trestle, east of swing bridge
- North of UPRR trestle, west of swing bridge
- North of west segment of UPRR Chatcolet causeway
- Carey Bay

Samples would be collected four times during water year 2005 in conjunction with ongoing littoral/pelagic comparison sampling detailed in the USGS/Coeur d'Alene Tribe workplan. Each sample would be analyzed for total and dissolved concentrations of cadmium, lead, and zinc.

Implementing Agency: Coeur d'Alene Tribe

Deliverables: Quarterly progress reports will be prepared and presented at the Basin Information Forum. The project will provide additional spatial and temporal resolution of metal concentrations in the lake region between Harrison and Chatcolet Lake. Such data will increase our understanding of the possible source(s) and extent of these metals.

Task 3 – Plummer Wastewater Treatment Pilot

Budget Requested: **$129,900**

A number of communities in the Coeur d'Alene Basin including Plummer are faced with making a decision on wastewater treatment for the future. Plummer's current facility consists of aerated lagoons with winter discharge to Plummer Creek and summer irrigation to field crops. This project is intended to demonstrate that wetland technology can be utilized for wastewater treatment effectively by the City of Plummer and other communities with current wastewater discharges to receiving streams in the Coeur d'Alene Basin. The City is operating under a National Pollutant Discharge Elimination System (NPDES) permit for seasonal discharge into Plummer Creek and has made application for a new permit. During the period from January 1998 to May 2001, the City facility exceeded permit effluent limits. A number of alternatives have been explored to deal with the problem and this proposal has been chosen by the city to study potential solutions.

Project Description: Construct a 1/4 acre pilot cascading overland flow wetland to study if future construction of a mechanical biological treatment plant discharging to a wetland is feasible. A system of this type would combine the advantages of operating a package mechanical wastewater treatment facility with the high loading, low maintenance and year-round discharge advantages of discharging to a cascading overland flow wetland area rather than to a receiving stream. IDEQ has concerns about the effectiveness of a cascading overland flow wetland in Plummer and wants data to confirm the applicability of this technology. It was decided that building a small pilot wetland to study effectiveness rather than building a large treatment facility would be appropriate.

Location of the pilot wetland would be toward the bottom of the existing wastewater treatment system to provide the worst case area for study. Flow would be diverted through the existing sprinkler feed piping to the wetland by removing a sprinkler head for the test area. The wetland area would be diked all the way around using a bentonite clay core dike. The area would be divided into an upper and lower pond area. The dike dividing the two pond areas would also be constructed using bentonite clay at the core. In addition, flashboard controlled under-drain structure(s) would be placed on the uphill face of the dividing dike. The underdrain will be sized to permit only enough flow through to keep the upper pond area flooded. The pre-design effort would include conducting a double infiltrometer ring test, and installation of three shallow monitoring wells, one up-gradient, and the other two down-gradient from the pilot site. Once the pilot is installed and operating, it will be operated continuously for at least one year. During that year, influent flow rate and quality will be monitored, including biological,

solids, and nutrient loading rates. Effluent monitoring will include nutrient tests of the monitoring well samples.

Implementing Agency: City of Plummer

Deliverables: Influent flow rate and water quality, biochemical oxygen demand, solids, and nutrient loading rates (phosphorus, nitrate nitrogen, and potassium) will be monitored. Water quality monitoring samples will be obtained four times a month with sampling dates divided evenly among the days of the week during the pilot study to determine the success of this technology given site soil and weather conditions. Monitoring wells will also be installed up-gradient and down-gradient from the site. Monitoring will continue after the pilot period based on what IDEQ determines would be necessary to meet land application standards and any other relevant standards. Whether successful or not, data would be available to other communities to utilize for their operations.

This project will hopefully demonstrate that wetland technology can be utilized effectively by Plummer and other communities to treat wastewater in a very environmentally and fiscally responsible manner.

Task 4 – Plummer Creek Watershed Nutrient Load Assessment, Modeling and Management Plan Development

Budget Requested: **$165,700**

In 1995, the Coeur d'Alene Tribe, IDEQ and other "stakeholders" completed the Coeur d'Alene Lake Management Plan (LMP). The development of the LMP was initiated in 1991 in response to long term concerns over water quality degradation in the lake. These concerns centered on increases in water column nutrient levels and heavy metals contamination found in lakebed sediments. Subsequent to the completion of the LMP, the Tribe, State of Idaho and EPA determined that management of metals contaminated sediments could best be accomplished through effective nutrient management. This determination is supported by the 2001-EPA Basin-wide Remedial Investigation/Feasibility Study (RI/FS). The Tribe and States of Idaho and Washington concurred with the RI/FS.

The LMP contains lists of proposed general management actions complied by several advisory workgroups. The South Lake Workgroup, in particular, produced a list which focuses attention to sediment and nutrient loading from tributary streams and rivers. Both sediments and nutrients are generated from many watershed areas in the Coeur d'Alene Basin, especially runoff from agricultural, timbering and grazing activities.

Project Description: This proposed project will characterize nutrient concentrations and transport through the Plummer Creek watershed and into Chatcolet Lake. The results will serve as the basis for developing nutrient and water quality management efforts within the context of a LMP, as well as other Tribal, State, and Federal water quality regulatory actions. The proposed project has been designed to update the current

understanding of nutrient loading sources within the Plummer Creek watershed and to delineate appropriate nutrient loading controls in the form of a Watershed Nutrient Management Plan.

Plummer Creek is a 4th-order tributary of Chatcolet Lake (and thus Coeur d'Alene Lake) that enters the lake at the southwest corner. In almost ten (10) miles of length, the Plummer Creek watershed covers 43.3 square miles with a basin relief of 2,017 feet. Land cover in the watershed is approximately 63% forest, 30% agricultural, 1.5% urban/industrial and 5.5% in the NRCS Conservation Reserve Program set-aside. Much of the lower basin, including some old-growth forest and the wetland area at the Plummer Creek delta, is protected from development within Heyburn State Park.

The EPA sampled Coeur d'Alene Lake and several of its tributaries, including Plummer Creek, as part of the National Eutrophication Survey in 1975. From this study, the southern end of Coeur d'Alene was identified as being over-enriched with nutrients and the annual phosphorus load from Plummer Creek was calculated to be 435 kg. The Idaho Department of Health and Welfare – Division of Environmental Quality (IDHWDEQ, now IDEQ) conducted a study in 1975 to obtain water quality data for establishing effluent limits for the City of Plummer's wastewater treatment facility (WWTF). The results of this sampling effort demonstrated significant nutrient increases between upstream and downstream monitoring sites. This study identified sediment, nutrients and bacteria as pollutants to be controlled to adequately protect the beneficial uses of Plummer Creek and Chatcolet Lake. From 12/88 to 9/89 the IDHW-DEQ performed monitoring of Plummer Creek and Chatcolet Lake with the purpose of providing information on reaches of the creek that were being impacted by agricultural runoff and evaluating the impact of sediment and nutrient loads on Chatcolet Lake. This work found that the agricultural land uses were the primary sources of suspended sediment, but that non-point source stormwater runoff from the City of Plummer and the industrial areas was a significant contributor to the annual sediment load.

Phosphorus "impacts" from non-point sources were observed at all stream sampling sites in this study. This study is of particular importance for its insight into the causes and behavior of water quality problems in Chatcolet Lake. In this regard, in-lake concentrations of total phosphorus and suspended sediment were found to be at a maximum and water transparency was at a minimum shortly after peak runoff. The St. Joe River did not appear to have a major impact on suspended sediment and total phosphorus since it exhibited concentration peaks after the peaks seen in Chatcolet. This led to the conclusion that algae was not the cause of high suspended sediment and other trophic state index values in Chatcolet, rather these were a consequence of agricultural runoff in Plummer Creek.

In 1990, a fish habitat ranking study performed on 19 streams by the Coeur d'Alene Tribe found that Plummer Creek, and its primary tributary Little Plummer Creek, had sufficient fish habitat potential to warrant further study. This was based on road access, fish passage barriers, gradient and potential for enhancement. However, the follow-up study, performed during 1991, did not find that Plummer Creek was a fish habitat priority watershed. The water quality data collected in 1991, while limited, did indicate that high

levels of nitrate and phosphate (dissolved "ortho" phosphorus) were present during the spring period.

Most recently, in 1997 the Tribe performed a watershed assessment focusing on fish habitat quality. This effort followed methods outlined by the Washington Forest Practices Board (WFPB) in developing a sediment budget, performing a hydrological analysis and a stream bank habitat condition survey. A summary was also compiled of existing water quality data. Based on comparisons of peak nutrient values, and degrees of exceedance of water quality standards between the EPA's and IDHW-DEQ's data sets, the water quality of Plummer Creek declined from 1975 to 1989.

Excess nutrients were consistently recorded at the mouth, so Plummer Creek contributes to the eutrophication of Chatcolet and Coeur d'Alene Lakes. Assuming consistency in data gathering techniques, total annual phosphorus load to Chatcolet appears to have increased from 0.48 tons per year to 9.9 tons per year, and total nitrogen load appears to have increased from13.5 tons to 99 tons per year. Construction of the Plummer WWTF in 1979 has undoubtedly reduced total nitrogen loads below what they would have been, but this appears to have been overwhelmed by contributions from other sources.

Implementing Agency: Coeur d'Alene Tribe

Deliverables: The purpose of the proposed project is to develop a Watershed Nutrient Management Plan that will include appropriate and specific point nutrient source control efforts for the Plummer Creek watershed. To accomplish the project purpose, the specific objectives of the proposed project are:

- To characterize nutrient (nitrogen and phosphorus) and sediment concentrations and transport throughout the Plummer Creek watershed and into Chatcolet Lake through a two-year monitoring effort.
- To use the Generalized Watershed Loading Function (GWLF) or similar model to establish nutrient loadings from sources and land uses throughout the watershed.
- To review previously developed nutrient control project options and develop an updated set of recommended projects.
- To prepare a Watershed Nutrient Management Plan for use by the Tribe, the City of Plummer, Benewah County and other environmental resource agencies.

Field water quality and constituent concentration data will be collected at key "nodes" and potential pollutant sources in the Plummer Creek watershed. A hydrology-driven approach will be employed, with approximately 15 – 18 samples collected annually from each node for two full water years (Oct. 1 – Sept. 30). Sample collection will occur most frequently during spring runoff, and less frequently in summer, autumn and winter. Continuous stream stage recorders may be deployed near the mouths of Little Plummer and Plummer Creeks. This data will be used for input to an appropriate hydrologically-based constituent concentration and transport model that will be useful for developing Total Maximum Daily Loads (TMDLs) for key constituents, and for evaluating wastewater treatment and other pollution abatement technologies in the Plummer Creek watershed. Modeling and a final Management Plan report will be completed by the end of the project's third year.

The GWLF will be used to simulate watershed nutrient loadings. The model will be configured based on watershed data (e.g., land use, soils, weather, crop, point source, etc.) for a number of sub-watersheds. After configuration, the model will be tested or calibrated to available flow and water quality data. The calibrated model will be applied to establish the "existing conditions" in the watershed. The model results will be used to characterize the current nutrient loading conditions in the watershed, including identifying the location and magnitude of watershed sources.

The modeling results will support development of the management plan through characterizing existing nutrient source loads and evaluating management alternatives. Once the watershed loading is characterized with the model, the results can be presented to the stakeholder group to identify areas and opportunities for future management options. The "ideas" from the stakeholders will be prioritized to identify several (5-8) management scenarios that will be evaluated using the calibrated GWLF model. The analysis will evaluate the results/impacts of implementing the different management alternatives. The modeling will support the stakeholder driven process for identify management options and evaluating their potential effectiveness.

Task 5 – Pinehurst Flood Impact Study

Budget Requested: **$330,000**

Pinehurst, along with other communities in the Coeur d'Alene Basin, is subject to flooding. Pinehurst has three aspects to its flooding impacts. First, Pine Creek passes along its western edge bisecting some of the western neighborhoods. Historic flooding has resulted in significant distribution of contaminated materials, increased water pollution, and property damage to the city and Interstate 90. An emergency dike was constructed after the 1974 flood and repair work by the US Army Corps of Engineers and Shoshone County have, over time, improved portions of the dike to a more stable structure. The level of protection and the integrity of the dike system are uncertain. Second, Little Pine Creek passes through the eastern half of the community and has impacted residential property and the golf course with contaminated sediments. Little Pine Creek originates south of Pinehurst passing by at least two mine sites. Man-made channels, culverts, and other restrictions exacerbate flooding problems and decrease water quality. Third, local drainage within the city has little control. Division Street has the only storm collection system, which is undersized. Remaining runoff either is directed to dry wells or low areas until water infiltrates or evaporates. Dry wells have consistently under-performed in handling runoff. Runoff contaminated with heavy metal bearing sediments degrades water quality in Little Pine Creek and Pine Creek. Flooding impacts consist of two components: 1) distribution of contaminated sediments; and 2) property damage, including impacts to protective barriers. As experienced at Milo Creek in Kellogg, flood waters can scour, convey, and distribute tailings, contaminated soils, and contaminated stream bed/bank sediments, impacting both human health and the environment. Total Maximum Daily Load (TMDL) restrictions of heavy metals in stormwater discharges are a concern to communities as well. In addition, right-of-way and road shoulder sampling in Smelterville suggests recontamination from fugitive dust

and tracked soils/sediments from vehicle traffic may be occurring. Therefore, right-of-way contamination may also be a problem in Pinehurst. Contaminated or damaged barriers become the responsibility of the property owner, exposing local citizens to tremendous liabilities. Because Milo Creek was a Presidential Declared Disaster, the Federal Emergency Management Agency (FEMA) became involved and spent over $500,000 in re-establishing protective barriers at twenty (20) properties contaminated from this flooding event. Lesser events, especially on Little Pine Creek or local drainage flooding, would likely not be eligible for emergency funding.

Project Description: The project consists of two phases and seeks to develop stream channel and drainage infrastructure techniques to control and mitigate water pollution and protect property from recontamination and flood impacts. City operations, water quality improvements, and technique performance will be assessed and will provide a basis for other Silver Valley communities pursuing water pollution mitigation. Phase 1 is a preliminary investigation and assessment to characterize water pollution sources and interaction of these sources with Little Pine Creek and local drainage. This work will provide guidance for flood control and drainage system design to address recontamination, flood conveyance, and contaminated sediment control and management. The assessment will consider contaminant sources within the city, upper watershed and along Little Pine Creek, and Pine Creek dike. Sediment management alternatives will be developed to coordinate with flood control alternatives. Phase 2 will be pilot projects on Little Pine Creek and Division Street. The Little Pine Creek project will look at reducing water pollution loading from sources and improving channel hydraulic performance to reduce scour, erosion, and contaminate disturbance through bioengineering and culvert replacement. The Division Street project will utilize engineering controls to manage water pollution constituents, i.e. sediment catchments, and oil/water separators. The Division Street drainage pipe will be enlarged and configured to address the loading and types of water pollution impacts identified in Phase 1. Catchments, swales, and other features will be added to the pipe to reduce contaminate loads. City operations and implementation of this type of water pollution control system will be monitored for cost and effort. It is recognized that Phase 1 may modify the Phase 2 project components or approaches. It is assumed that approval of this proposal would allow flexibility to adjust Phase 2 based on the assessments. The Phase 1 document will include project recommendations for Phase 2, including the next level of budgeting and project scopes. This proposal is anticipating the level of effort based on experience with Milo Creek, Smelterville, Pinehurst, and development of the Bunker Hill Communities Infrastructure and Revitalization Plan.

This pilot project will build upon existing documents produced by the State of Idaho and the City of Pinehurst. The *Preliminary Engineering Report – Storm Water Conveyance System Improvement Study* (TerraGraphics 2003) analyzed flooding impacts and the existing Pinehurst drainage system. This document provided initial system improvement recommendations and listed further studies needed to complete the comprehensive planning required for Pinehurst to address water quality improvements and flood control.

Implementing Agency: IDEQ

Deliverables: Phase 1 – Components of the project will involve: conducting investigation of identifiable contaminated sediment and soil sources exposed to flood impacts; coordination with flood control planning currently underway in Pinehurst to assess risk from these sources; identifying engineering, management, and other mechanisms to mitigate and/or address flood impacts, water pollution, and property damage; and mapping sediment characteristics and flooding and drainage impact areas. Sediment lead (Pb) levels, flood impact areas, remediated property, and the existing drainage system will be expressed on GIS maps. A water pollution/flood risk evaluation based on these maps will be performed. The assessment will then scope and detail the two demonstration projects to research and develop cost-effective techniques for addressing water pollution control, sediment control, and flood impact mitigation.

The project will result in the development of innovative approaches for stream channel and drainage infrastructure construction and management to control and mitigate water pollution and protect property from recontamination and flood impacts. The engineering aspects would also include consideration of the following elements: key technical and political considerations; coordination with on-going drainage control designs; Little Pine Creek upper watershed and channel stabilization; hydraulic issues; sediment transport issues; pilot project order of magnitude cost estimates; and Institutional Control Program (ICP) issues. The Contractor will develop a Phase 1 Water Pollution Source Assessment and Control Report summarizing findings and recommendations.

Phase 2 – The main component of Phase 2 will be the development of two (2) engineering plans, specifications, and cost estimate packages for project implementation at Little Pine Creek and Division Street. After approval by appropriate reviewing agencies and the City of Pinehurst, a bid package will be prepared and advertised for award. Post-construction monitoring will occur during significant storm events in the first year of operation. A monitoring plan will be developed to support near-term and long-term project performance assessment. In addition, city expenditure on pilot project elements will be recorded. An annual monitoring summary presenting the monitoring and assessment results will be produced.

Construction can be divided into schedules that would allow distinct project items to be constructed at different times. If funding needs to be spread over a couple of years, the project can respond with phased construction and still meet project goals and objectives.

Monitoring: Sampling at several locations around and within Pinehurst will occur. Sampling locations will include: 1) mine dumps along upper Little Pine Creek drainage; 2) Little Pine Creek channel; 3) catch basins along Division Street; 4) dry wells; 5) road shoulders; and 6) obvious low lying areas where water ponds. Samples will be collected and their location surveyed using survey-grade GPS. Lead levels will be determined using X-Ray Fluorescence (XRF). Photographs and a map delineation of the apparent area of contamination or water pollution source of each sample location will be created. Sample locations, Pb level, and area of contamination will be placed on GIS layers. A monitoring plan will be developed during Phase 2. Monitoring post-construction pilot

project performance will occur for one year and then be transferred to the City of Pinehurst for long-term implementation. Channel erosion, vegetation, and water quality changes during high water events will be recorded. In addition, City costs and efforts will be documented. Issues such as material management, disposal, ICP, repair, sampling, and reporting will be discussed. The monitoring program will last for three years.

A final Phase 1 project report will be prepared and shared with the City of Pinehurst, Shoshone County and the Basin Commission through the Technical Leadership Group (TLG). Phase 2 design packages will be developed in coordination with the City of Pinehurst and the assigned TLG members. The monitoring plan will be developed and approved by the TLG. This project will provide recommendations for reducing risk of future water pollution, flood damage, and recontamination of remediated residential properties. This project will be transferable, in part, to other cities and Basin activities in assessing their risk of recontamination and flood impact management.

The pilot project will coordinate with Pinehurst's on-going flood control program and coordinate with future Basin programs (5-year review). Technique monitoring and assessment will help to focus on-going and future water pollution and flood control projects. Finally, input from the TLG during Phase 1 and Phase 2 will allow for project development to identify any issues or concerns that may arise, enabling them to seek guidance before specific demonstration projects are approved.

Task 6 – Silver Crescent Complex Habitat Restoration

Budget Requested - **$318,700**

Typically, abandoned mine and mill site cleanup actions in the Coeur d'Alene Basin deal with remediation of heavy metal contamination of surface areas and ground and surface water bodies. These actions are met to deal with human health concerns and environmental impacts. Although, after cleanup actions, contaminants at these sites are controlled and the disturbed area is relatively stable, the channel and floodplain areas usually are still in need of restoration work in order to achieve a viable reproducing fishery with pre-mining habitat quantity and quality. At site cleanup locations and downstream from those sites, there is a need to determine the best approaches to fisheries, wildlife, and terrestrial habitat restoration that are unique to the narrow and severely mine impacted conditions located in the sub-watersheds of the Basin.

The East Fork of Moon Creek boasts potential for a demonstration project to study various methods of stream channel restoration, revegetation and overall wildlife habitat restoration. The Silver Crescent cleanup work is complete and monitoring results from groundwater and surface water sampling strongly indicate an increase in water quality due to a reduction in heavy metal contaminants. The entire site is winter range for big game and the East Fork of Moon Creek provides valuable spawning and rearing habitat for Westslope Cutthroat trout in the South Fork of the Coeur d'Alene River drainage.

Project Description – This project is a demonstration project to study the feasibility and economics of watershed restoration in areas where the original stream type has been

severely altered by mining and environmental cleanup activities. Innovative high gradient stream restoration techniques will be further adapted for the unique circumstances in the East Fork Moon Creek. Work to be implemented and studied includes actions converting stream types from unstable to more stable types while accounting for site features such as a large repository located in the floodplain. Various revegetation approaches on and adjacent to waste repositories as well as the reestablishment of wildlife and fish habitat through the use of constructed or installed structures will also be applied.

Because the cleanup work is completed in the East Fork of Moon Creek sub-watershed, this project should also demonstrate the potential for the restoration of pre-mining functionality for wildlife and fisheries habitat in other sub-watersheds in the Basin. The project will be valuable in determining the probability of reestablishment of fisheries in sub-watershed to the Coeur d'Alene River where full restoration in the main river is unattainable.

Additional aspects of this project that will be demonstrative to future work in the Basin include location, use, and maintenance of a repository facility built in a narrow valley floodplain immediately adjacent to a fish bearing stream. The on-site repository constricts over 75% of the adjacent floodplain and is located in the middle portion of the site with wider, more natural floodplain areas both above and below. The existence of the repository adds many unique hydrological considerations when adapting stream restoration methods for the site. The stream reach next to the repository will be further enhanced to not only protect the repository from erosion, but also provide for fish passage and habitat opportunities. In addition, the repository itself will be planted with native shallow rooted brush species to further prevent erosion, reduce future maintenance, and reduce the success of deeper rooted tree regeneration penetrating the engineered repository cap while at the same time providing beneficial wildlife habitat.

Currently the FS, Bureau of Land Management, Coeur d'Alene Tribe, and US Fish and Wildlife Service have committed a combined $70,000 of natural resource restoration settlement funds towards the project to cover planning, design, administration, and oversight. The CWA funds being requested will be used for the on the ground construction and revegetation work as well as monitoring costs.

Implementing Agency: USDA Forest Service

Deliverables: A post construction report will outline the various watershed and habitat restoration taken and any changes that were made during the work to accommodate unforeseen site or environmental conditions. This report will include an evaluation of successes and a section dedicated to "lessons learned". The current level of surface water and groundwater monitoring will continue and the following components will be added to evaluate and quantify project accomplishments:

- Fish Tissue surveys (includes upstream and downstream areas)
- Electrofishing transects for fish density monitoring
- Fish habitat surveys to monitor the quality of fish habitat

- Songbird blood lead level surveys (includes upstream and downstream areas)
- Use of permanent benchmarks set up during contract preparation for cross section/longitudinal profile monitoring
- Use of stationary photo points for vegetative and riparian habitat monitoring

At the end of the monitoring period, the results will be combined and presented in a 5 year post project report.

Task 7 – Canyon Creek Treatability Study

Budget Requested: **$100,000**

Mining related impacts have adversely affected water quality in the Coeur d'Alene River Basin. The largest source of dissolved metals to the South Fork above Superfund Operable Units 1&2 (OU1 & 2) is Canyon Creek. Most of the load contributed by Canyon Creek enters the stream with contaminated groundwater in the Woodland Park area. There have been a number of studies characterizing the area and the impacts of dissolved metals on stream water quality.

The Coeur d'Alene Basin OU3 Record of Decision (ROD) calls for treating up to 60 cubic feet per second of Canyon Creek surface water flow through a passive water treatment system. The goal of the system is to reduce the dissolved zinc load in Canyon Creek by 322 pounds per day on a yearly average basis. The estimated capital cost for the system is $15 million and the present value for thirty (30) years of operating and maintenance (O&M) is $18 million. The ROD recognized that more work was needed to develop the details of a water treatment system and calls for a treatability study to develop the necessary information.

Project Description: This proposal is to develop a conceptual design for construction of an alkaline precipitation treatment pilot plant study. The conceptual design will include a literature search into the technology; an evaluation of implementation and effectiveness issues associated with this technology; and a design for a pilot scale test facility and program. It will include conceptual sizing and operational requirements of the entire full scale treatment system including land requirements, access, treatment ponds, process equipment, piping, power and electrical requirements, water collection, pumping, and waste disposal systems. It will also include an assessment of operations and maintenance activities and costs and a discussion of the pros and cons of utilization of this treatment technology. Inherent in that discussion will be the requirements of the ROD and the applicable water quality discharge limitations.

Implementing Agency: IDEQ

Deliverables: The Draft Report will be presented to the TLG. The presentation will be in sufficient detail to allow TLG members to understand and comment upon the study, design, process, and cost estimates. The results of the presentation and TLG comments will be addressed in subsequent design phases.

The final results of the entire work effort will be presented to the TLG and the BEIPC.

Task 8 – South Fork Sewer District Toxicity Reduction

Budget Request**: $115,900**

Meeting the proposed South Fork Coeur d'Alene River TMDL discharge standards will be difficult for most dischargers and will place a financial burden on the municipal ratepayers. The Page wastewater treatment plant (WWTP) metals and phosphorus removal pilot study grant (X-970789-01, Task 4) bolstered the available database by more accurately defining the effluent metals and phosphorus levels at the WWTP. That study was also critical in identifying what effluent metals levels are attainable with innovative treatment technologies and at what cost. This project will expand on the previously gathered information to determine which metal or combination of metals is toxic and how to focus the limited available resources. In particular, this work will determine whether the metals are toxic at the levels proposed by the TMDL. The project site is the Page wastewater treatment plant located one mile west of Smelterville.

Project Description: This is demonstration project to identify sources of toxicity in Basin community wastewater treatment plant effluent; develop options for removal of toxicants; perform bench testing to verify removals; and develop capital and O&M cost projections.

Implementing Agency**:** South Fork Sewer District.

Deliverables**:** The work will include a comprehensive review of current performance of the Page wastewater treatment plant, a treatability analysis, and bench scale performance testing. All whole effluent toxicity (WET) and toxicity identification evaluations will be performed by third party laboratories under contract. Monitoring will be performed three times annually when WET tests are taken and subsequently to review performance during bench scale testing. Monitoring will include measurement of influent/effluent metals, ammonia, dissolved oxygen, chlorine, and other potential toxicants. Final results will be delivered in the form of a final report. Testing could begin within one (1) month of award of the contract and would be conducted over three (3) consecutive quarters. The final report would be issued twelve (12) months after the initial grant award.

Task 9 – Simulation Model to Evaluate Coeur d'Alene Lake's Response to Watershed Remediation - Phase 2.

Budget Request: **$221,800 ($11,800 for Peer Review)**

This project is Phase 2 of and an addendum to CWA 104(b)(3) Grant #X-970789-01, Task 9.

Eutrophication and metal contamination issues in Coeur d'Alene Lake have been the impetus for numerous investigations of the lake and its watershed. Several of the more significant investigations were conducted under Superfund related to the Remedial

Investigation/Feasibility Studies (RI/FS), Natural Resources Damage Assessments (NRDA) and the Clean Water Act (CWA) related to lake restoration, total maximum daily loads, and non-point source pollution. The Coeur d'Alene Basin RI/FS resulted in a Record of Decision (ROD) that implements a long-term remediation of metal contamination within Coeur d'Alene Lake's watershed. A concurrent Lake Management Plan (LMP) is to be implemented by a consortium of state, tribal, federal and local governments in order to control watershed-derived nutrient inputs to the lake.

Predicting the limnological response of Coeur d'Alene Lake to reduced nutrient and metal inputs is complicated by the interaction of eutrophication and metal contamination within the lake's water column and lakebed sediments. Zinc concentrations are known to inhibit phytoplankton growth in the lake; therefore zinc's suppressive effects will be reduced as watershed remediation reduces zinc inputs to the lake. As such, it may be necessary to reduce nutrient inputs to the lake in order to avoid extensive phytoplankton blooms that could then consume oxygen and lead to anoxic conditions in the hypolimnion with release of zinc and nutrients from lakebed sediments. The nutrient and metal supply to the lake have their origin in the watershed and fluxes from its lakebed sediments. The in-lake water quality and ecological effects from these two sources of nutrients and metals result from a complex interaction of highly variable watershed inputs; lake hydrodynamics; and geochemical processes among nutrients, metals, ligands, and redox conditions.

Project Description: This proposal is Phase 2 of a project to provide the entities responsible for management of Coeur d'Alene Lake with a sophisticated computer modeling system with which to simulate the lake's responses to a wide range of remediation strategies to be implemented under the ROD and the LMP. The project objective is to utilize existing, or to develop as needed, physical, chemical, and biological data in an existing suite of well-proven one, two, and three-dimensional lake models capable of simulating the limnological complexity of the Lake.

The project was designed to be conducted in two phases, the first of which was funded in 2003. Phase 1 of this project included tasks 1 and 2 (described below). Phase 2 includes tasks 3 and 4 (described below). The project will benefit from several studies previously conducted or ongoing in the Coeur d'Alene River Basin. Knowledge developed from these studies will be useful for the development of the model's database, boundary conditions, and simulation scenarios.

This project is relevant to several areas identified in the 5-year plan. The limnological data generated by the ongoing Coeur d'Alene Lake Study can be used to develop a powerful predictive tool for adaptive management of the lake. The ongoing Basin Environmental Monitoring Program will generate hydrologic, nutrient, metal, and sediment input data that can be used to develop highly accurate simulations of lake conditions under various loading conditions (low, average, and high flow events). The ability to simulate sediment movement and environmental impacts on the lake lend additional credence to development of a hydrologic/sediment-transport model for the lower Coeur d'Alene River. Task 4 of the project also makes extensive use of the probabilistic model developed as part of the RI/FS.

This project also includes a peer review of Phase 1 and Phase 2 by Scott Wells, PhD, PE of Portland State University who has been identified by IDEQ as an expert in the field of modeling. The peer review will weigh in at specific milestones. A conceptual plan is shown below.

- Establish milestones to discuss intermediate model "results" such as after each of these tasks are completed:
    - Model bathymetry and model boundary conditions
    - Model calibration
    - Model application

  This could be a review of technical memos and/or presentations of model results by the modeling team. The peer-reviewer would generate a memo after each step with suggestions, if any.
- At the end of the modeling study, the peer-reviewer would provide a technical memorandum on the entire model development.

Implementing Agency: USGS

Deliverables: The project will develop a powerful predictive tool for adaptive management of the lake for use under both the ROD and LMP. Potential uses of model output include monitoring program design, pre-project evaluation of the in-lake effects of various remedial actions, and long-term simulations assessing the interaction of remediation processes with different timescales of implementation and effect. Phase 1 of the project was approved for implementation in the February 2004. Task 1, data synthesis, was begun in April 2004. Funds have been distributed to the investigators responsible for phytoplankton bioassays and benthic flux algorithm development. Funds have also been distributed to the University of Western Australia for data synthesis and initial model development. Task 2, the intensive field experiment, was to occur in May 2004; however, the unusually early snowmelt runoff in the Basin caused postponement of that work to May 2005.

If Phase 2 is approved and funded, Tasks 3 and 4, the modeling study and the investigation of management scenarios, would commence in 2005. Both phases of the project would be completed by September 2006. Quarterly progress reports will be prepared and presented at the Basin Information Forum. Annual technical presentations will also be made to acquaint potential model users with progress on model development, calibration, verification, and simulations. A model application manual will be prepared so interested parties may design and implement their own remediation scenarios.

Task 10 – Lower River Sediment Transport Model and Bed Evolution – Phase 2

Budget Request**: $128,000**

This project is Phase 2 of and an addendum to CWA 104(b)(3) Grant #X-970789-01, Task 8.

Over one hundred years of mining in the Coeur d'Alene Basin has resulted in large quantities of metal-enriched sediments being transported to and deposited within the lower Coeur d'Alene River and its floodplain. Remedial Investigation/Feasibility Studies (RI/FS) conducted in the basin under the Superfund resulted in a Record of Decision (ROD) that requires the implementation of a long-term remediation of metal contamination within the Coeur d'Alene Basin. Since much of the contaminated sediments have been shown to be deposited in the bed, banks, and floodplain of the Coeur d'Alene River between Cataldo and Harrison, this river reach is the focus of several mitigative efforts aimed at preventing these sediments from being remobilized and carried downstream.

Project Description: The goal of this project is to develop a set of tools that can be used by resource managers for evaluating proposed projects designed to minimize the transport of metal contaminated sediments in the Lower Coeur d'Alene River. Objectives include the utilization of existing data and collection of additional data to develop and calibrate computer models of the river between Cataldo and Coeur d'Alene Lake. These models would be capable of simulating the hydraulic and sediment transport characteristics of the river over a wide range of streamflow and lake elevation conditions. The models would be used to test proposed projects prior to implementation with the goal of improving their design and avoiding unanticipated and costly mistakes. The project was designed to be conducted in two phases, the first of which was funded in 2004. Phase 1 of this project includes tasks 1 and 2 (described below). Phase 2 includes task 3 (described below).

The project will benefit from several ongoing or previously conducted studies in the Coeur d'Alene Basin. Data and knowledge resulting from these studies will provide useful information required for model input and calibration. Data from the Basin monitoring network will provide information over an increasingly wide range of hydrologic conditions. This information is needed to develop sediment models capable of simulating any combination of streamflow and lake elevation conditions that might feasibly occur. Data from previous hydraulic modeling studies of the Lower Coeur d'Alene River will be compiled and used as a starting point for development of the sediment transport models. Data collected as part of a proposed study to model the hydrodynamic and limnological processes in Coeur d'Alene Lake will be useful in verifying the results of sediment models developed for the Lower Coeur d'Alene River.

A 1-dimensional (1-D) sediment transport model developed by the USGS will be constructed to simulate sediment transport and bed evolution over the approximately twenty five (25) mile main channel river reach between Cataldo and the inlet to Coeur d'Alene Lake. This model simulates the transport of sediment including silt, sand, gravel, and cobble and quantifies average erosion and deposition rates in the bed throughout the reach. Upon successful calibration of the 1-D sediment transport model, a multi-dimensional hydraulic and bed shear stress model will be constructed and calibrated to a short reach where future bank protection projects will be implemented. The multi-dimensional model will be nested within the 1-D model thus providing a useful exchange of information between the two models. Both models were developed by researchers from the USGS National Research Program in Denver, Colorado and have

been applied for evaluating sediment transport issues in rivers throughout the U.S. Currently, both models in the same nested scheme as proposed here, are being used to evaluate sediment transport issues in the Kootenai River in North Idaho, Montana, and British Columbia. The system being modeled is very similar to the Coeur d'Alene River system.

Phase 1: Task 1 – Data Acquisition and Compilation (already funded)
Data is being compiled from all known sources including work done on the previously mentioned studies. These data include bathymetry, topography, suspended and bedload sediment, bed material, streamflow, stage, and velocity data. Additional bathymetric, topographic, and stream velocity data will be collected as required. Additional sediment data will be collected using standard USGS sediment sampling equipment and methods.

Phase 1: Task 2 – 1-D Model Development, Calibration, and Validation (already funded)
The 1-D sediment transport model will be constructed beginning on the North Fork Coeur d'Alene River near Enaville and the South Fork near Pinehurst, and continuing down the main stem Coeur d'Alene River from Cataldo to the gaging station near where the river flows into Coeur d'Alene Lake. Suspended sediment transport curves will be developed from existing sediment and streamflow data. Bedload transport curves will be developed from a combination of existing data and through analysis of bed material samples using appropriate bedload transport equations.

Phase 2: Task 3 – Multi-dimensional Model Development, Calibration, and Validation (funding being requested) The multi-dimensional (multi-D) modeling system consists of 2 and quasi-3 dimensional modules that can be used to simulate velocities and hence shear stresses near the bed. These models would be used initially to simulate velocity and shear stresses for a 500 m reach near Rose Lake where bank stabilization projects have been proposed for implementation. The multi-D model would facilitate the evaluation of these projects and their potential cross-channel effects on the riverbed. Multi-D models require considerably more detailed input data than do 1-D models, therefore in this reach, additional bathymetric surveys and bed material samples will be required. Stage and slope information from the 1-D model, coupled with detailed three dimensional velocity data would be used to calibrate and validate the multi-D model.

The project is relevant to the 5-year plan in that the resulting model will facilitate the identification of erosion-prone reaches of the Coeur d'Alene River. This knowledge will aid in design and monitoring of stream bank remediation projects.

Implementing Agency: USGS

Deliverables: The project will result in the development of predictive tools capable of evaluating proposed projects that are designed to minimize the transport of metal contaminated sediments in the Lower Coeur d'Alene River. These models would be capable of simulating the hydraulic and sediment transport characteristics of the river over a wide range of streamflow and lake elevation conditions. The models would be used to test proposed projects prior to implementation with the goal of improving their design and avoiding unanticipated and costly mistakes. Quarterly progress reports will

be prepared and presented at the Basin Information Forum. Annual technical presentations will also be made to acquaint potential model users with progress on model development, calibration, verification, and simulations. A formal USGS series report will be published that will describe all aspects of the study including the development, calibration, and verification of the hydraulic and sediment models. Publication of a final project report will occur in December 2005.

Task 11 – Assessment of the Economics and Effectiveness of Alluvium Sorting as a Mine Waste Removal Strategy at the Project Implementation Level

Budget Requested**: $207,000**

Mine wastes were deposited next to streams by necessity in the narrow valleys of the Coeur d'Alene Mining District. The erosive action of precipitation, runoff, and the streams has carried a significant portion of the tailings into the streams and mixed these with native alluvium. "Jig" tailings that were a product of the earlier gravity separation system are of a more coarse size (large sand). Jig tailings are rich in metals compared to later silt size tailings produced in the floatation process. Typically, mill sites where jig tailings predominate are prominent sources of metals contamination to streams. A deposit of jig tailings is typically accompanied by a down stream tail of tailings-streambed alluvium mixture. In the streams of the Upper Coeur d'Alene Basin, jig-tailing contaminants are pervasive below all historic mining activities even where the source piles associated with run of the stream tailings impoundments have been removed. At some point downstream the concentration of jig tailings is sufficiently diffuse to be difficult to visually discern. In theory removal of a jig-tailings deposit and its associated tailings-alluvium mix should improve the water and alluvium quality downstream. This contention has been difficult to assess in the South Fork Coeur d'Alene watershed. A long period of wholesale discharge of tailings to the stream system occurred and metals contaminated ground water sources.

At one other location in the basin, remnant jig-tailings are a concern in alluvial materials. The location is in the large depositional area below Kingston on the Coeur d'Alene River. At this location in the river system, the gradient is sufficiently low and stream power sufficiently reduced such that particles larger than sand are deposited into the stream-bed-flood plain alluvium. The increased erosion throughout the upper river basin (North Fork and South Fork) has resulted in the large depositional feature near Kingston. The sand-gravel-cobble deposit has a mixture of coarse fragment jig-tailings that although in relatively low concentration, continue to contribute metal loading to the river. The low percentage of contaminated material in this depositional feature will make it difficult to address this source unless sorting approaches are employed to minimize the necessary repository volume.

Mixed bed load sediment-jig tailings deposits pose a removal challenge for metals cleanup projects in the upper basin of the Superfund Operable Unit 3. All the material might be removed from the floodplain and stream channel and placed in a repository. However, this approach introduces gross inefficiencies. A considerable volume of material with no metals contamination is transferred to waste repositories. Waste

repository space is sufficiently limited that the placement of such "clean" alluvium is a waste of repository resource. In addition the heterogeneous particle size of bulk removals reduces the desired compaction that can be attained in the repository. Lower compaction potentially compromises repository function in isolating the tailings from groundwater. In some cases wholesale removal locally at least temporally depletes the stream alluvium, the primary component of the stream channel.

Bench scales and small pilot studies completed by Paulson under contract with EPA demonstrated that the metals bearing material in a tailings-alluvium mix is in the three-quarter inch minus fraction. Screening methods used routinely in gravel sorting are available to separate three-quarter inch material from larger alluvium. However, the economics of a sorting approach, its savings in haulage costs, repository space and more efficient compaction balanced against the cost of additional handling have not been investigated at a project scale level. The recontamination of cleaned alluvium has also not been addressed sufficiently. Contaminant removal efficiency can be established after screening is complete. The quality of treated alluvium can be assessed. In addition, methods exist to assess the recontamination of alluvium from which the contaminated fraction has been removed over time.

Project Description**:** One objective of this project is to establish the costs of screening of excavated contaminated alluvium on a full mine waste cleanup project scale study. The balancing cost savings in haulage, efficient compaction, and repository space utilization will be measured to assess the comprehensive economics of the approach. The second objective is to assess the beneficial value of the sorting strategy by assessing the change in the metals content of the three-quarter inch minus fraction of the bed load sediment downstream of the cleanup project.

The demonstration project would remove contaminated stream bed and flood plain sediments from an area below two mills where significant quantities of jig tailings have thoroughly mixed with native alluvium. The material will be screened to segregate three-quarter inch minus material from larger alluvium. Alluvium excavation will be completed to acceptable human health and ecological levels of risk, based on metals concentration. The final level of metals contamination will be assessed with an XRF unit. The three-quarter inch minus material will be removed to a repository, while the larger fraction will be redistributed to establish a stable stream channel. Careful records will be kept of the costs of screening for comparison with costs of conventional removal on those portions of the site where jig tailings predominate. Careful records will be kept of volumes placed in the repository and the waste compaction attainable with sorted material compared to bulk material. After the removal actions are completed gravel quality will be measured by screening to identify the level of residual metals bearing material untreated. Gravel quality monitoring will assess post project re-infiltration of contaminated material of less than three-quarter inch. A detailed monitoring approach is included in the full project proposal.

The requested $207,000 funding for the alluvium sorting demonstration is part of the funding of a larger mine waste cleanup project. The requested funds will be used to sort, haul and properly dispose of the metals contaminated fraction in a repository. Funds will

be used to measure volumes and levels of compaction and the post project concentration of contaminated sediments in streambed alluvium. Separate funding sources will be used to cleanup concentrated jig tailings deposits, protect water quality during all actions and provide additional repository space. The sorting demonstration project must be implemented as part of a larger cleanup project in order to make valid comparisons of the economics of bulk removal and sorting strategies.

The work will be conducted in a stream far less contaminated than those of the South Fork Coeur d'Alene watershed where a substantial history of wholesale tailings discharge to the streams occurred and metals contaminated groundwater sources are significant. This difference should permit resolution of the beneficial affect of jig-tailings/contaminated fraction removal from the alluvium-tailings mix associated with mill sites through gravel quality monitoring.

The project is located at the Monarch Mill site along Prichard Creek and the Beartop Mill site in nearby Bear Gulch. The Beartop site has no upstream tailings sources, while sources upstream of the Monarch are few with the single major source removed. Removals are planned for both locations in the 2005 construction season. In both locations IDEQ will be removing jig tailings deposits located at mill sites with other funds. Downstream of these deposits, considerable mixing of jig tailings with bed load alluvium has occurred. Finer grain flotation materials are not present at these sites to confound post removal assessment of gravel quality. The added expense of sorting out the three-quarter inch minus fraction will be measured. Contaminated materials will be removed to the Eagle Creek Repository. The balancing savings in haul cost will be measured. The relatively gentle terrain of the repository will assist measurements of volume saved and penetrometer based compactions attainable at specific levels of effort. These costs will be quantified and compared to cost of handling unsorted materials to assess savings that may balance the cost of alluvium sorting. Post removal gravel infiltration monitoring on the two very different streams should bracket the responses that can be expected after jig tailings and sorting removal actions upon project completion. Post project alluvium quality monitoring will be pursued through two water-years. During that period a channel forming discharge should occur to permit fair assessment of the effectiveness. A detailed monitoring approach is included in the full project proposal. IDEQ will partner with the University of Idaho Analytical Sciences Laboratory to complete the stream and floodplain alluvium assessment. The laboratory personnel have the expertise and the equipment to process the alluvium samples and complete the required metals analysis.

The result of the demonstration project will be the cleanup of the last two significant mill sites yielding metals contamination to Prichard Creek. An assessment of the economic feasibility, repository space utilization benefits, and compaction benefits of an alluvium screening approach will be developed at the project scale level. The project will also assess the benefit of such removals by providing data on the affect on stream bed gravel and the change in their quality in terms of metals contamination for a two year post removal period.

Implementing Agency: IDEQ

Deliverables**:** A post-project closure report will document the demonstration project including assessment of alluvium sorting and post project assessment of bed load quality and re-contamination. A separate report addressing specifically these two issues will be developed for the Technical Leadership Group (TLG), the Citizen Coordinating Council (CCC) and EPA to document the project and its results. All summary documents will be made available on the IDEQ web site to inform a broader public. The bed load quality work may develop novel scientific insights of interest to a broader public. Should this occur, IDEQ will work with the University of Idaho personnel to publish these results. If requested, the results can be developed into presentations to the TLG and CCC. Should others working in the Coeur d'Alene Basin or elsewhere request assistance for projects using the approaches investigated, this will be provided to the inquiring party. All databases will be available on request. The data documenting economic and project effectiveness will be appended to the final report on the project.

Task 12 – Coeur d'Alene Lake Management Plan Implementation

Budget Requested**: $137,200**

This project will study the effectiveness of the existing 1996 Lake Management Plan (LMP) and transition into an updated LMP by developing a series of audits for various watershed activities. Once the program is established it could become a periodic, once every five years, standardized process for review and evaluation of LMP effectiveness.

Previous water quality studies have demonstrated the lake being affected by increased nutrient loading and heavy metal contributions from over 100 years of mining activity in the Coeur d'Alene Basin. These studies have also discussed the potential relationship between accelerated nutrient loading, the eutrophication process and releases of heavy metals contained in lakebed sediments to the overlying water column in the Lake. They have served as the basis for future design of additional lake water quality studies as well as LMP strategies to improve and maintain water quality.

An extensive water quality study was initiated in 1991 by the Idaho Department of Environmental Quality (IDEQ), Coeur d'Alene Tribe (Tribe), and the United States Geological Survey (USGS) in response to long-term concerns over water quality degradation in the Lake. These concerns centered on observed increases in nutrients which had resulted in increased plant growth, decreases in water clarity, and heavy metals contamination found in lakebed sediments. The study had three objectives:

1. Determine the lake's ability to receive and process nutrients (phosphorous and nitrogen) in order to devise measures that will prevent water quality degradation;
2. Determine the potential for releases of heavy metals from lakebed sediments into the overlying lake water; and
3. Develop information to support a lake management plan that will identify actions needed to meet water quality goals.

Upon completion of the 1991-92 water quality study, a LMP was developed by the Clean Lakes Coordinating Council, IDEQ, and the Tribe to address water quality issues identified in the study. The LMP was completed in 1995 and adopted in 1996. The main focus of the lake management strategy described in this plan was to minimize the release of metals to the water column from lakebed sediments through effective nutrient management and upstream metals load reductions.

In September 2002, EPA issued the ROD for the OU3 detailing strategies for cleanup throughout the rest of the Coeur d'Alene and Spokane River Basins. Although the OU3-ROD for the Selected Remedy did not include remedial actions for the Lake, it did recognize the 1996 LMP and the fact that state, tribal, federal, and local governments were in the process of reviewing and revising, as needed, the LMP outside the Superfund process. Per Memoranda of Agreement, IDEQ is currently working with Benewah, Kootenai, and Shoshone Counties and the Tribe to complete a joint updated LMP for the entire lake.

Project Description**:** Since the 1996 LMP was adopted, new information has become available, legal and regulatory decisions have been made, basin-wide remedial actions have been taken, and some implementation has occurred, all of which have impacted the appropriateness and effectiveness of the 1996 LMP and proposed management actions. One of the conclusions of the review and update of the 1996 LMP was that the need exists for a process to routinely evaluate the effectiveness of management actions taken. Some of the biggest threats to lake water quality come from man caused activities adjacent to the nearshore areas surrounding the lake including stormwater runoff from construction and lakeshore development related activities. While the scope of this project proposal is to conduct an extensive evaluation of all activities within a 1 mile perimeter of the lake shore, initial emphasis will be place on development and construction activities.

A survey is proposed which would: a) evaluate what best management practices (BMPs) are in place to protect water quality; b) determine the effectiveness of those being used; c) evaluate areas and activities where BMPs are required under various regulations, but are not being applied or are being applied improperly; and d) establish specific BMP audit procedures where needed for the following, but not limited to these activities: road construction and maintenance; building and facility construction; installation of septic and other wastewater treatment systems; operation and maintenance of marinas and docks; construction, operation and maintenance of golf courses; recreational use of the Coeur d'Alene and St. Joe Rivers and agricultural operations.

Implementing Agency: IDEQ, CDA Tribe

Deliverables: IDEQ is proposing to use requested funds to provide coordination in conjunction with the BEIPC and the Tribe to implement the project. Results of the survey will be incorporated into a report which will serve as the basis for establishment of a standardized audit process which can be repeated as needed to evaluate the effectiveness of LMP actions. Public outreach efforts will be made to develop and sustain the public support in helping to implement the LMP.

From inception, IDEQ will seek guidance and direction from the BEIPC through the Technical Leadership Group and the Citizen Coordinating Committee including scoping of final project design; periodic review of progress and results; and involvement in periodic review of the progress toward full LMP implementation. The project will be completed in one year after the grant award is made.