SECTION 7.0
CLEAR CREEK MONITORING AND PROJECT PLANNING

[3.2.1.6 A monitoring program to ensure the overall quality and health of Clear Creek.]

7.1 Overview

The Monitoring Program in the Clear Creek watershed is an important component in the CCSWMP. Monitoring identifies the areas of concern within the watershed as well as provides information to analyze erosion controls and related BMPs for effectiveness. The recent monitoring report, the Clear Creek Erosion Assessment Final Report, January 2003, focused on identifying and classifying the areas of erosion within the watershed. This study provides a solid description of the watershed and will support future studies. NDOT has also contracted with U.S. Geological Survey (USGS) to monitor and collect additional data to address erosion issues in the watershed. These monitoring plans assist NDOT in planning projects in the watershed to address erosion and protect Clear Creek.

7.2 Clear Creek Erosion Assessment Final Report

The Clear Creek Erosion Assessment Final Report (Final Report) identified sources and mitigation controls for erosion and sedimentation in the Clear Creek watershed. The project was funded by NDOT. The project consultant reported directly to the Clear Creek Steering Committee, comprised of representatives from NDOT, Carson Water Subconservancy District, United States Forest Service, Washoe Tribe of Nevada and California, Carson City, Douglas County and Natural Resource Conservation Service, Nevada Division of State Lands, and NDEP.

The assessment of the existing conditions in Clear Creek required data collection, hydraulic and hydrologic analysis, and environmental analysis. From the assessment and categorization of erosive activity in the watershed, mitigation alternatives were presented with associated construction costs.

The data collection process reviewed relevant studies of Clear Creek. The study by Fisher (Flume Development for a Study of Bedload and Suspended Sediment in Clear Creek Drainage, UNR DeLaMare Thesis #1246, by John Fisher, 1978) provided the most notable information with discussions of the sediment load and the geographic condition within the watershed. Fisher's study documented the potential for erosion due to steep slopes, fragile vegetation, and weathered granite and yet attributed the lack of erosion to the lack of thunderstorms and high infiltration rates. Additional information was collected through stakeholders participation in a questionnaire aimed to obtain more information and identify areas of interest to further investigate. The stakeholders who participated in the questionnaire were NDOT, Carson Water Subconservancy, Carson City, United States Forest Service, and Michael and Sharon Arnold.

The hydrologic and hydraulic analysis required collection of hydrologic data to create a Geographic Information System (GIS) database for the watershed. Rainfall records for the area were taken from the National Oceanic and Atmospheric Administration (NOAA) for the 2-year 24-hour, 25-year 24-hour, and 100-year 24-hour events. Soils were categorized by soil type and hydrological soil group, which is a classification dependent on soil type and amount of runoff expected from a given area. The land use in the area was also categorized to distinguish between different types of ground cover. The hydraulic analysis developed peak 25-year frequency flood event rates to investigate the amount of flow collected and bypassing highway US 50 drop inlets and cross culverts.

The environmental assessment required field investigation to identify areas of erosion and sedimentation. Field investigations included data collection and categorization of sedimentation, erosion, water quality, habitat, biota, and aquatic species for the main channel and channel riparian zones as well as the location of drainage structures. The environmental analysis was designed to establish a baseline condition of the riparian vegetation. The accessible areas along the main channel were visually inspected. Seven different areas were defined based on plant communities, flow regimes, and channel substrate. The seven areas were further identified by land use, riparian vegetation, stream channel substrate, turbidity, and sedimentation. The data was organized, tabulated, and mapped for concise analysis and future use.

The study of Clear Creek watershed measured the impact of erosion on a watershed basis. The source of sediment loading in the main channel was attributed to tributary streams and bank erosion within the main channel. The primary activities associated with the erosion and sedimentation are clearing or damaging existing vegetation, increasing the amount of impervious surfaces, and diverting runoff into concentrated flows thereby increasing its destructive energy and/or altering the natural drainage patterns in the watershed.

The goal of the study was to develop mitigation alternatives and measure their associated construction costs. The Final Report recommends increased attention to construction site practices to prevent further erosion in the watershed. The specific construction site BMPs recommended included protecting the natural vegetation, preventing soil loss, reusing surface soils, installing silt fences, attending to heavy use areas, and formulating a spill prevention program. Additionally, controls should have the capacity to slow runoff velocities before entering the conveyance system promoting the settling of pollutants and preventing scouring at the outlet. The five types of erosion sources identified in Clear Creek are culvert outlets, channels, slopes, Clear Creek main channel banks, and headcuts. The BMPs recommended to address these issues are namely culvert extensions with sufficient sections of rip rap at the outlet, pipe extensions, geotextile warps, fiber logs, hydroseed and native plantings, erosion control blankets, mulching, root wads, coir rolls and sediment basins. The Final Report recommends BMP maintenance is scheduled after major flood events as well as annual inspections of culvert outlets and sediment basins. The results of this study may be used in the selection of BMPs and design of future monitoring programs in the Clear Creek watershed.

The Final Report for Clear Creek watershed is a reference for NDOT from which to make future decisions for the management of NDOT facilities to insure the protection of the Clear Creek watershed to the maximum extent practicable.

7.3 NDOT and USGS Clear Creek Monitoring

NDOT has partnered with USGS to monitor Clear Creek to address erosion issues within the watershed. The goal of the monitoring project is to establish a comprehensive dataset of water quality and sediment characteristics. It is important to establish the current physical and chemical characteristics of the basin to enable evaluation of control or mitigation efforts in the future. The project will collect suspended and bedload sediment and water quality samples between four sites in the Clear Creek watershed over a two-year period (2004-2005).

The project approach will use the existing USGS gaging station in the middle reach of Clear Creek near Carson City and three additional sites, two along the mainstream and one on a tributary. The three additional sites will be sampled for suspended and bedload sediments and water quality. The selection of the three additional sites was driven by dividing Clear Creek into sections with one above construction erosion structures, one at the mid-elevation point in the meadow section, and one downstream US 395 to allow monitoring alongside the highway. The data collection consists of routine field measurements, routine sediment samples, and analysis of nutrients, major constituents and trace constituents in water samples. At the gaging station in Clear Creek, a Data Collection Platform (DCP) will be installed to monitor runoff events and snowmelt. All data will be stored in the USGS National Water Information Database and published in the USGS Annual Report.

This monitoring project will advance the understanding of hydrologic processes in Clear Creek watershed and provide assistance for water resource information planning and operation procedures. The collection of data will increase the understanding of sediment transport and ultimately allow the erosion control structures to be analyzed for usefulness. NDOT, as a participant in this study, will be able to access the data and analytically assess the effectiveness of the erosion control measures applied to NDOT facilities. Following completion of this study, the Monitoring Program in this CCSWMP will be revised to provide ongoing monitoring that builds on the results and conclusions of the NDOT/USGS study.

In additional to the joint NDOT and USGS monitoring project in the Clear Creek watershed, NDOT will not exclude the watershed from the Monitoring Program to be developed in the statewide SWMP.

7.4 NDOT's Current and Future Projects in the Clear Creek Watershed

The Clear Creek watershed monitoring projects have enabled NDOT to develop project plans to address water quality within the watershed. NDOT has identified strategies to protect Clear Creek. Projects in Clear Creek have been identified by NDOT to address slope stability, erosion control, and structural deficiencies of existing drainage facilities. Currently, NDOT has contracted with the Carson Valley Conservation District (CVCD) with input from the Clear Creek Watershed Council and the Clear Creek steering committee to construct erosion control projects. Alternatively, NDOT is researching the feasibility of installing a storm drain pipe within the US 50 corridor to protect the watershed. The storm drain will convey storm water from the roadway along the highway corridor to a detention basin for treatment and will be discharged back into Clear Creek. NDOT will evaluate this alternative within the first year of the Permit life and report NDOT's strategy for Clear Creek projects in the statewide SWMP's Annual Report.