THIRD FIVE-YEAR REVIEW REPORT FOR

CARSON RIVER MERCURY SUPERFUND SITE

WASHOE, CARSON CITY, STOREY, LYON, AND CHURCHILL COUNTIES, NEVADA

PREPARED BY

United States Army Corps of Engineers

Seattle District

Seattle, Washington

Approved by: _____ Date: 9/27/13

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Executive Summary

This is the third Five-Year Review of the Carson River Mercury Superfund Site (CRMS) located in Washoe, Carson City, Storey, Lyon, and Churchill Counties, Nevada. The purpose of this Five-Year Review (FYR) is to review information to determine if the remedy is and will continue to be protective of human health and the environment. The triggering action for this FYR was the signing of the previous FYR on September 30, 2008.

The CRMS begins on the eastern edge of Carson City, Nevada, and includes more than 50 miles of mercury-contaminated river, reservoir, and wetland water and sediments in the middle and lower portions of the Carson River system, and soils and tailings at more than 200 mill sites where mercury was used to process gold and silver ore mined from the Comstock Lode. The CRMS also encompasses areas where mercury contamination has come to reside due to erosion from the mill sites.

This FYR is for Operable Unit 1 of the CRMS. Operable Unit 1 (OU1) consists of the upland mercury-contaminated mills, tailings, and soils, while Operable Unit 2 (OU2) contains the mercury contamination associated with the Carson River system. OU2 is still in the Remedial Investigation/ Feasibility Study (RI/FS) phase.

EPA selected the final remedy for OU1 in the 1995 Record of Decision (ROD). The remedy was surface soil removal and/or capping of four residential areas in Dayton and Silver City, where mercury exceeded site-specific cleanup levels for soil. Institutional Controls (ICs) were part of the ROD for these properties to ensure that any subsurface soils remaining with mercury which exceeded cleanup levels were not disturbed. The Dayton and Silver City remediated areas achieved construction completion in December 1999. In addition, a Long Term Sampling and Response Plan (LTSRP) was required to ensure sampling and, if needed, remediation, was performed on properties which were developed for residential use in the future.

The remedy is functioning as intended by the decision document, based on the Remedial Actions (RAs) reviewed during this FYR, to include the implemented and in-progress ICs. The exposure assumptions and remedial action objectives selected at the time of the remedy are still valid. Although cleanup levels, Applicable or Relevant and Appropriate Requirements (ARARs)/To Be Considered (TBCs), and toxicity values selected at the time of remedy have changed, these changes do not affect the protectiveness of the remedy. No other information has come to light that could call into question the protectiveness of the remedy.

The remedy at the CRMS is currently protective of human health and the environment. The contaminated surface soils at four residential areas have been removed, the draft LTSRP has been functioning to prevent exposure to contaminants at new residential subdivisions, and the 2013 ESD has improved the site definition and updated the cleanup levels. In order to be protective in the long-term, the following actions need to be taken: 1) finalize the LTSRP, and 2) finalize the Environmental Covenants (ECs) on remediated properties.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Carson River Mercury Superfund Site (CRMS)		
EPA ID: NVD980813646		
Region: 9	**State:** NV	**City/County:** Dayton and Silver City, Washoe, Carson City, Storey, Lyon, and Churchill Counties

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** No (Yes for OU1, No for OU2)

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:**
Author name (Federal or State Project Manager): Jere Johnson
Author affiliation: EPA Region 9
Review period: September 30, 2008 – September 30, 2013
Date of site inspection: November 29, 2012
Type of review: Statutory
Review number: 3
Triggering action date: September 30, 2008
Due date *(five years after triggering action date)*: September 30, 2013

Issues/Recommendations				
OU(s) without Issues/Recommendations Identified in the Five-Year Review:				
OU2 (OU2 is in the RI/FS stage and was not evaluated).				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): OU1	**Issue Category: Institutional Controls**			
	Issue: An ESD has recently been signed by EPA which better defines the site and which documents new site cleanup levels for arsenic and lead. Other IC documents, including the revised LTSRP, which addresses residential development within the CRMS, and the Environmental Covenants to control the disturbance of subsurface soils on properties remediated by EPA during the remedial action, are in the process of being formalized..			
	Recommendation: Finalize the long-term response and administrative IC documents (LTSRP and ECs on remediated properties).			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA and NDEP	NDEP and EPA	01/2014

Protectiveness Statement(s)		
Include each individual OU protectiveness determination and statement. If you need to add more protectiveness determinations and statements for additional OUs, copy and paste the table below as many times as necessary to complete for each OU evaluated in the FYR report.		
Operable Unit: **OU1**	***Protectiveness Determination:*** **Short-term Protective**	***Addendum Due Date (if applicable):***
Protectiveness Statement: The remedy at the CRMS is currently protective of human health and the environment in the short term. The contaminated surface soils at four residential areas have been removed, and institutional controls were put into place to prevent exposure to contaminants remaining on other properties. In order to be protective in the long-term, the following actions need to be taken: 1) finalize the LTSRP, and 2) finalize the ECs on remediated properties.		

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List of Abbreviations

ARAR	Applicable or Relevant and Appropriate Requirement
BCA	Bureau of Corrective Action
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRMS	Carson River Mercury Superfund Site
EC	Environmental Covenant
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
ft^2	square feet
FYR	Five-Year Review
IC	Institutional Control
IRIS	Integrated Risk Information System
IUR	Inhalation Risk Unit
LTSRP	Long-Term Sampling and Response Plan
$\mu g/m^3$	microgram per cubic meter
mg/kg	milligram per kilogram
mg/m^3	milligram per cubic meter
NAC	Nevada Administrative Code
NCP	National Contingency Plan
NDEP	Nevada Department of Environmental Protection
NPL	National Priority List
OU	Operable Unit
RA	Remedial Action

RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RfCi	Reference Concentration (inhalation)
RfDo	Reference Dose (oral)
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
SFo	Slope Factor (oral)
TBC	To Be Considered
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

Third Five-Year Review Report

for

Carson River Mercury Superfund Site

1. Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy at a Superfund site in order to determine if the remedy will continue to be protective of human health and the environment. The methods, findings, and conclusions of FYRs are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Contingency Plan (NCP). CERCLA 121 states:

> "*If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*"

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> "*If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such actions no less often than every five years after the initiation of the selected remedial action.*"

EPA Region 9 and the U.S. Army Corps of Engineers (USACE) conducted the FYR and prepared this report regarding the remedy implemented at the Carson River Mercury Superfund Site (CRMS) in Washoe, Carson City, Storey, Lyon, and Churchill Counties, Nevada. EPA is the lead agency for developing and implementing the remedy for the site. The Nevada Department of Conservation and Natural Resources Division of Environmental Protection (NDEP), as the support agency representing the State of Nevada, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the third FYR for the CRMS. The triggering action for this statutory review is the previous FYR. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site at levels above those that would allow for unlimited use and unrestricted exposure.

The CRMS consists of two Operable Units.

- Operable Unit 1 (OU1) consists of mill sites and those areas where tailings have contaminated surface soil and drainages.
- OU2 consists of the Carson River itself including water, sediments, and biota.

This FYR addresses OU1 at the CRMS. OU2 is in the Remedial Investigation/Feasibility Study (RI/FS) stage, hence there is no implemented remedy available for review for OU2.

2. Site Chronology

The following table lists the dates of important events for the Carson River Mercury Superfund Site.

Table 1. Chronology of Site Events

Event	Date
Mercury-contaminated mill tailings discharged to the environment	Mid to Late 1800s
Initial discovery of elevated mercury levels in the Carson River	Early 1970s
CRMS receives final listing on the National Priority List (NPL)	Aug 1990
Mercury-laden tailings excavated and treated in response to orders by the EPA.	Oct 1990 Aug 1992
The Human Health Risk Assessment and Remedial Investigation Report is published	Dec 1994
The OU1 Feasibility Study is completed	Dec 1994
The OU1 Record of Decision (ROD) is signed	Mar 1995
The OU1 Remedial Design begins	Apr 1995
The OU1 Remedial Design is completed	Sept 1996
The OU1 Remedial Action begins	Sept 1996

Event	Date
The OU1 Superfund State Contract is signed	Jul 1997
The OU1 Remedial Action construction period	Aug 1998 – Jan 1999 Aug – Dec 1999
The first FYR report is completed	Sept 2003
The draft Long-Term Sampling and Response Plan (LTSRP) is developed	Jan 2005
NDEP finalizes the brochure describing development permitting requirements in the Carson River area	Apr 2008
The second FYR report is completed	Sept 2008
Environmental Covenants (ECs) in-progress to address disturbance of remediated areas, and ECs resulting from LTSRP actions made available to the public	Jan 2012
EPA completes drafting a revised LTSRP to address residential development within the CRMS	Sept 2012
Archeological studies of historic mill sites are completed	2012
EPA signs the Explanation of Significant Differences (ESD) to address the CRMS boundary definition and changes in cleanup levels for arsenic and lead	September 2013

3. Background

3.1. Physical Characteristics

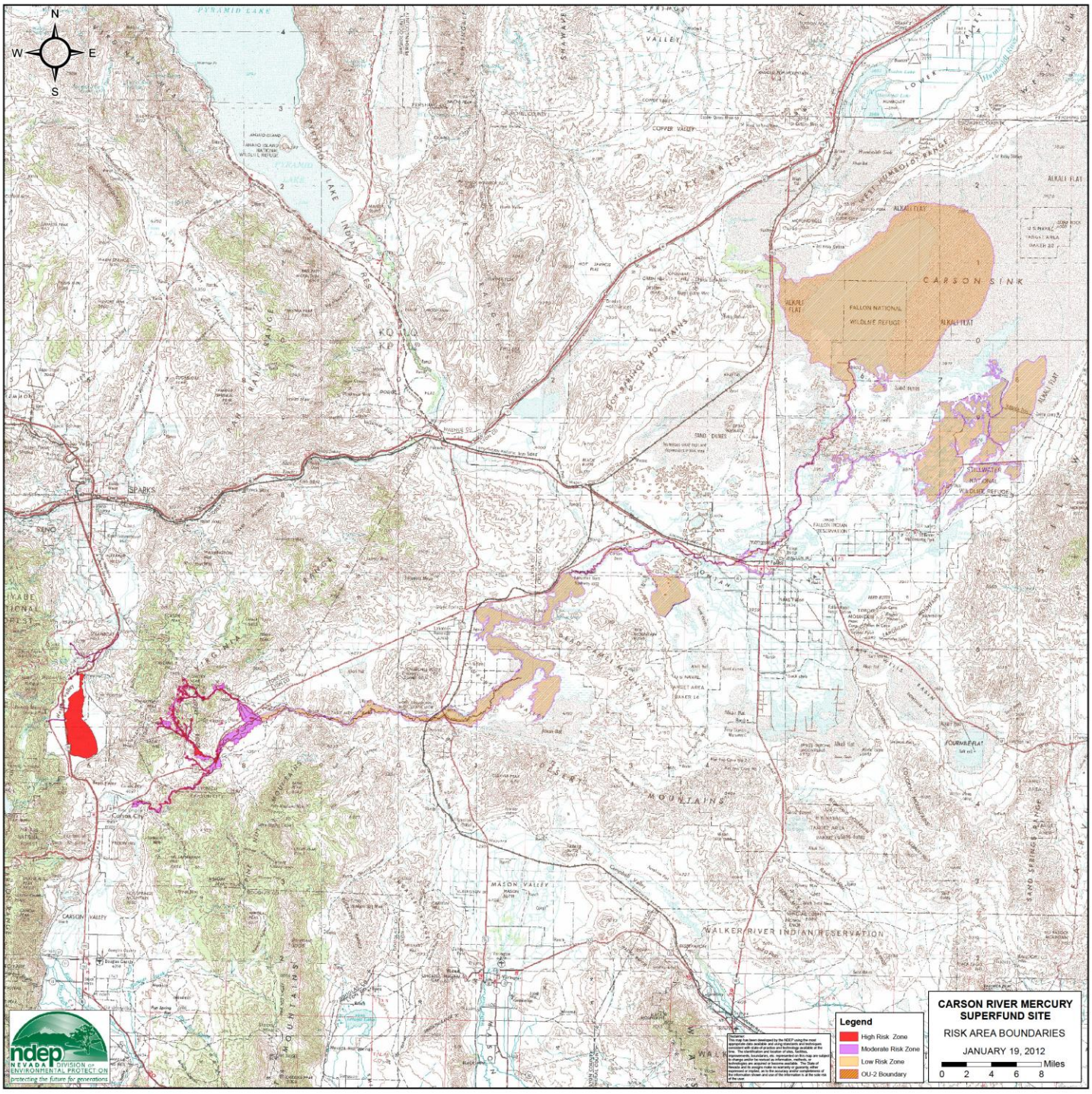
The CRMS begins on the eastern edge of Carson City, Nevada, and includes more than 50 miles of mercury-contaminated river, reservoir, and wetland water and sediments in the middle and lower portions of the Carson River system, and soils and tailings at more than 200 mill sites where mercury was used to process gold and silver ore mined from the Comstock Lode. The CRMS also encompasses areas where mercury contamination has come to reside due to erosion from the mill sites.

The vicinity of the CRMS is shown in **Error! Reference source not found.**. Detailed maps depicting he OU1 remediated areas within Dayton and Silver City are shown in Figure 2 and Figure 3 respectively.

According to the Nevada Bureau of Mines and Geology, the Virginia Mountain Range, consisting mostly of volcanic rock overlying metamorphic rock and granodiorite, erupted approximately between 18 million years ago and as recently as 1 million years ago. As the volcanic system waned during later times, hot water continued to percolate through fractures in the rock, hydrothermally altering and mineralizing the broken rock. It was believed to be these hydrothermal systems that leached original minerals from the rock and deposited the gold and silver which eventually lead to the Comstock mining era. The metallic minerals mercury, arsenic, and lead all occur naturally in ore from the Comstock Lode.

The CRMS is not considered to be located in a densely populated area of Nevada. According to 2010 US Census data, the populations of the Nevada counties comprising the CRMS are as follows: Washoe County, 421,407; Carson City County, 55,274; Storey County, 4,010; Lyon County, 51,980; and Churchill County, 24,877. The vast majority of the population of Washoe County is located in the Reno-Sparks metropolitan area, which is outside the boundaries of the CRMS. In fact, the majority of residents from each of the five listed counties do not reside within the CRMS boundaries. In 2010, the population of Dayton, Nevada, in Lyon County, where all but one of the remedial actions occurred, was 8,964.

Figure 1. Location Map for the Carson River Mercury Superfund Site



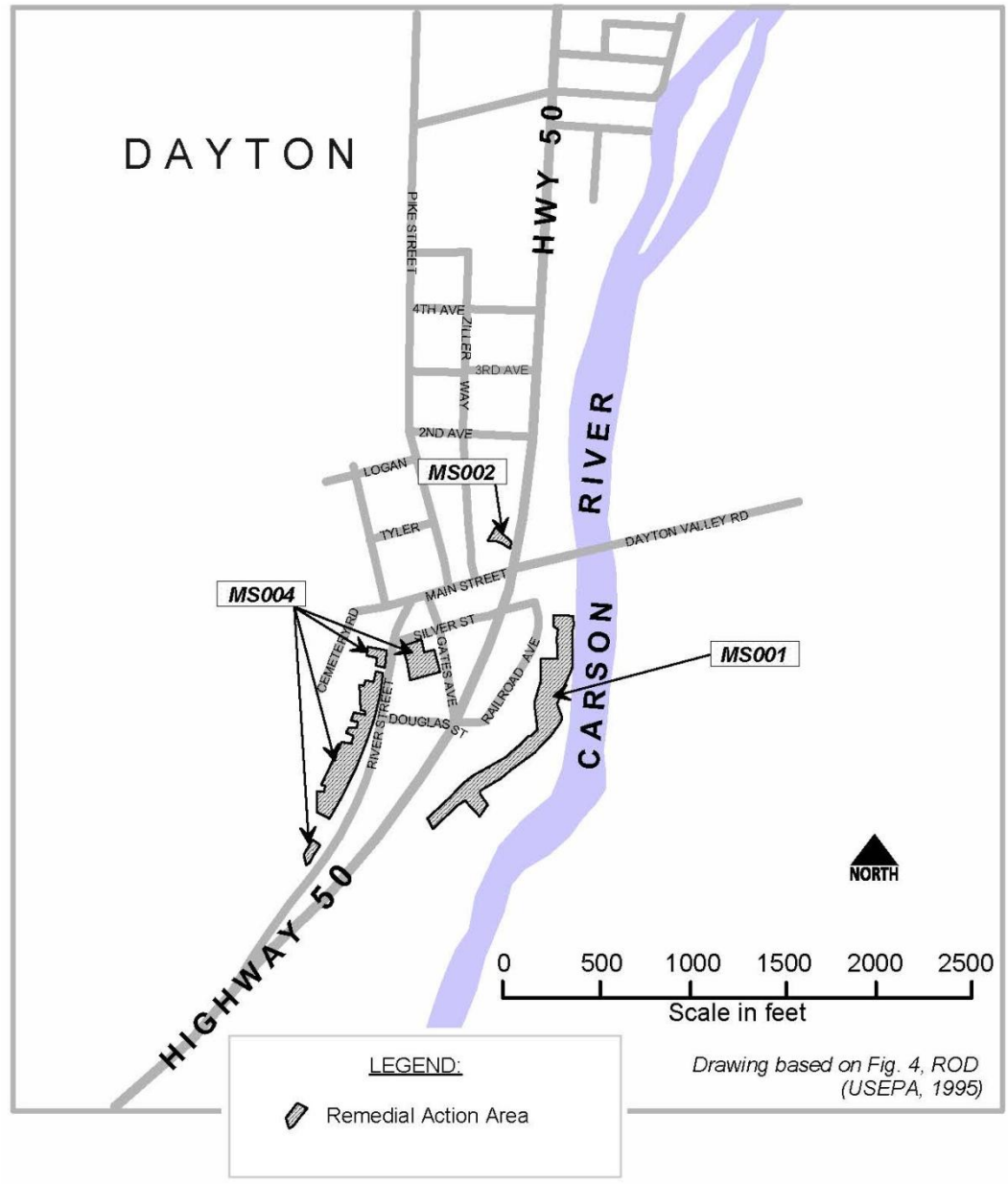


Figure 2. Carson River Mercury Superfund Site, Dayton Detail Map

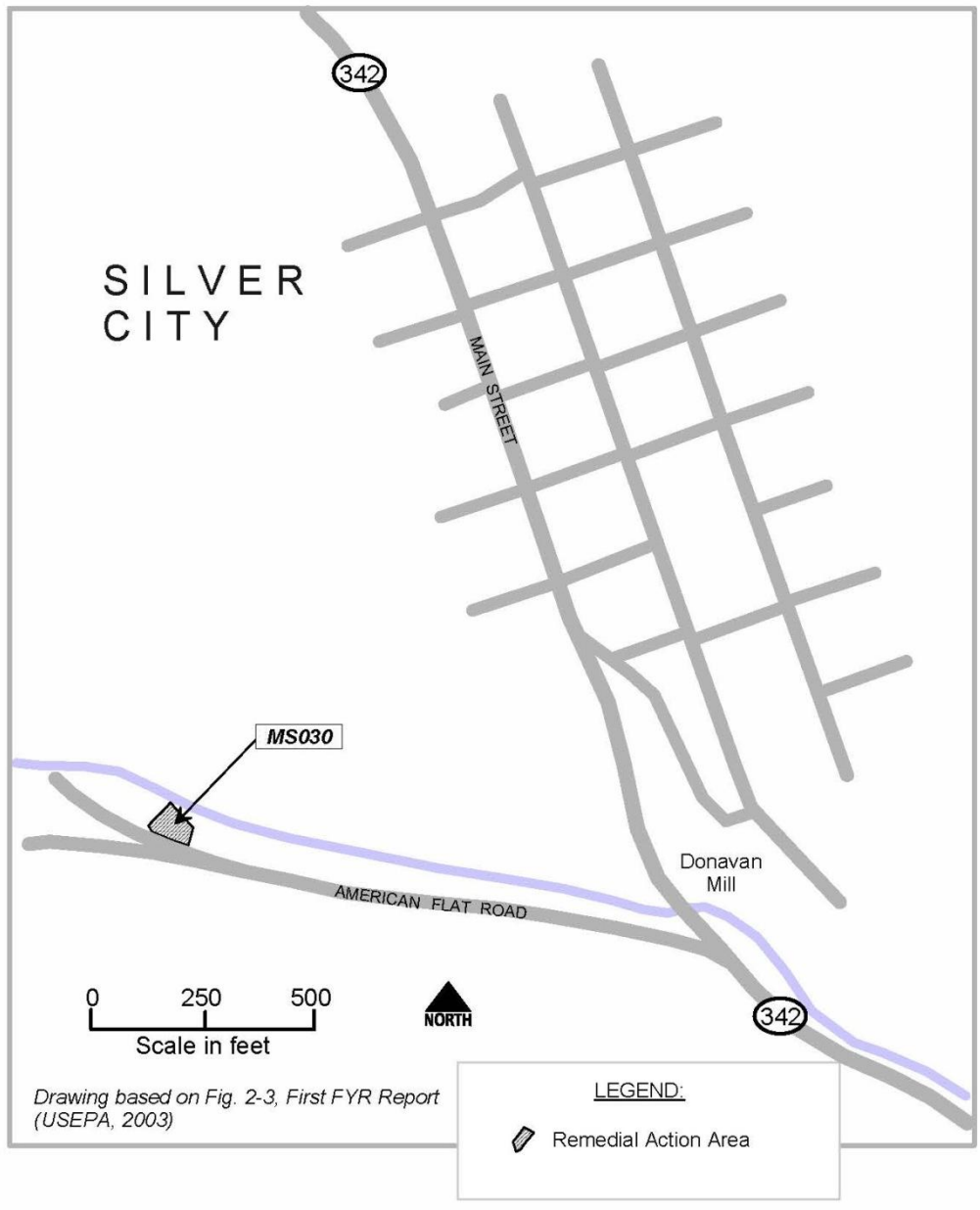


Figure 3. Carson River Mercury Superfund Site, Silver City Detail Map

3.2. Hydrology

The Carson River basin drains approximately 3,980 square miles in east-central California and west-central Nevada. The Carson River forms in the eastern Sierra Nevada Mountains south of Lake Tahoe and generally flows northeastward and eastward to the Carson Sink, a large depressional feature in the Carson Desert with no surficial fluvial outlet. The Carson River flows through a series of generally separate alluvial valleys from the headwaters area to the Carson Sink. In downstream order, the alluvial valleys passed by the River include Carson Valley, Eagle Valley, Dayton Plains, Stagecoach

Valley, Churchill Valley, and Carson Desert. Between New Empire, on the eastern edge of Carson City, and Dayton, the River flows through a narrow, high-gradient stretch along which large ore-processing mills were situated in the late 1800s. The flow of the River is interrupted west of Fallon by Lahontan Reservoir, which was constructed in 1915 as part of the Newlands Irrigation Project. Below Lahontan Dam, flow is routed through a complex network of ditches, drains, and canals of the Newlands Irrigation Project. Irrigation return flow eventually discharges to Carson Lake, the Stillwater Wildlife Refuge, and/or the Carson Sink.

Stream flow in the Carson River above Lahontan Reservoir is highly seasonal. The major source of water for the Carson River is the winter snow pack in the Sierra Nevada Mountains. Base flow is reached in late summer (August, September, and October) and flow then increases slightly through the fall and winter (November through March), until the snow melt season starts in early spring. Maximum annual flow typically occurs in April, May, and June.

The areal extent of water bodies and wetlands in the Carson Basin is highly variable, both seasonally and from year-to-year. This is especially true in the Carson Desert. For example, between July 1984 and February 1985, following three unusually wet years, the water surface area of the Carson Sink was approximately 200,000 acres; yet by April 1988, during a second consecutive drought year, the Sink was dry.

Surface soils within the area encompassed by the CRMS vary widely. Native soils may vary from fine silts and clays to coarse sands and gravels. Anthropogenic fill may consist of any combination of native materials. Mine tailings piles, where present, usually consist of finer-grained material that has been repeatedly crushed to extract the desired ore mineral. Surface waters related to OU2 are relevant only to the extent that washes have been responsible for the transport of mercury down-slope from mine and mill sites. Washes are areas where intermittent channelized flow tends to accumulate. They are typically dry but contained milling process water during historical operations. Some washes may contain minor surface water during the spring snowmelt season or subsequent to rare heavy rainfall events. Groundwater is not a medium of concern for this CERCLA site; therefore, detailed hydrostratigraphic information is not included in this report.

3.3. Land and Resource Use

Historical land use in the Carson River basin was mostly agriculture and mining in the 1840s and 1850s. The mining industry and population in the basin fell rapidly in the 1880s; however, railroad access helped promote ranching and farming. Another change in land use was an increase in irrigated acreage in the Carson Desert, prompted by the impoundment of Lahontan Reservoir in 1915 and the creation of the Newlands Irrigation Project. Alfalfa was the principal irrigated crop, in terms of acreage and revenue, in the Newlands Irrigation Project. From 1980 to 1987, the estimated irrigated acreage ranged from 61,000 to 67,000 acres for the Newlands Project. Dayton and Churchill Valleys, which have the smallest populations in the Nevada portion of the Carson basin, are primarily rangeland, with agricultural areas along the Carson River. Land use and population remained relatively unchanged in the Carson River basin from 1890 to 1950, until the advent of suburban development.

Since 1950, Carson City and Fallon have grown considerably, with most of the urban and suburban development occurring on land previously used for agriculture. Presently, the local economy and urban land uses are dominated by the retail trade and service sectors, primarily casinos and adjunct businesses such as hotels, motels and restaurants. Areas surrounding the CRMS are expected to continue to experience a high rate of residential growth over the next several decades. Projected land use for CRMS-impacted areas is likely to include commercial and residential land development, which is addressed by the ICs of the CRMS. Most new residential housing is developed as subdivisions. Incidental ingestion of CRMS-impacted surface soils by residents is considered the most significant potential exposure route under OU1; hence this pathway poses the greatest risk to potential receptors, as discussed later in the report. Groundwater usage within the boundaries of the CRMS has not been researched for this report because groundwater is not a medium of concern for the site.

Recently, the Comstock Mining Company started operations to conduct gold and silver exploration, mining, and processing within the CRMS in Storey and Lyon counties.

3.4. History of Contamination

Mining in the Carson River drainage basin commenced in 1850 when placer deposits were discovered near Dayton at the mouth of Gold Canyon. Throughout the 1850s, mining consisted of working placer deposits for the gold in Gold Canyon and Six Mile Canyon. Subsequent exploration of the surrounding mountains identified significant metal-bearing veins and rock that became known as the Comstock Lode. The initial ore discovered was extremely rich in gold and silver; gold was more abundant in Gold Canyon while silver was more abundant in Six Mile Canyon. The general milling process employed before 1900 involved pulverizing ore with stamp mills, creating a slurry, and adding mercury to the mixture. The mercury formed an amalgam with the precious metals which was then separated from the solution and retorted. During the mining era, an estimated 14,000,000 pounds of mercury was discharged into the Carson River drainage, primarily in the form of mercury-contaminated tailings.

A U.S. Geological Survey (USGS) study first documented elevated levels of mercury in sediment and surface water in the Carson River system in the early 1970s. Subsequent studies further delineated the extent of mercury contamination at historical mill sites, in river and lake sediment, in the adjacent floodplain, and in fish and wildlife. The CRMS was added to the National Priorities List (NPL) on August 30, 1990. The extent of mercury contamination has not been fully delineated at this time. Nevada State Health Division advisories recommend limited or no consumption of fish and waterfowl at the site due to high levels of mercury.

In 1994, EPA Region 9 released the Carson River Human Health Risk Assessment and Remedial Investigation Report. Data gathered in support of the Remedial Investigation included over 1,000 soil samples collected at 131 historic mill sites, and samples of sediment, air, groundwater, surface water, and biota. The report identified mercury, arsenic, and lead as contaminants of concern for the CRMS. All three metals occur naturally in ore from the Comstock Lode, but arsenic and lead were concentrated in the milling process, and the addition of mercury as an amalgam greatly exceeded the levels naturally present in the ore. Based on the risk assessment, EPA established a site-specific

cleanup level of 80 milligrams per kilogram (mg/kg) of mercury in residential soils. The level was designed to be protective of a child, age 1 to 6, who would come into contact with mercury contaminated soils, and was based on the oral reference dose for inorganic mercury. The level takes into account the species of mercury found in the soils at the CRMS and the bioavailability of those species.

On March 30, 1995, EPA Region 9 signed a ROD selecting a cleanup remedy for OU1. The objective of the remedial action was to "reduce human health risks by reducing direct exposure to surface soils containing mercury at concentrations equal to or greater than 80 mg/kg in residential areas." The ROD also determined that the cleanup level for arsenic that was specified in the Nevada Contaminated Soil and Groundwater Remediation Policy was pertinent and would be followed. In 1995, the Nevada standard for arsenic was 80 mg/kg. A lead cleanup level was not established since neither EPA nor the Nevada Policy established a reference dose for lead.

3.5. Initial Response

In October 1990, prior to the signing of the ROD, mercury laden tailings located on a 6.5 acre property five miles east of Dayton were excavated and treated in response to an Administrative Order issued by EPA to private property owners. Mercury contamination in soil on this property was found in concentrations as high as 1,500 mg/kg. The Order issued for this site recognized a new residential subdivision in close proximity to the site, unrestricted access to the site, and tire marks from off-road vehicles evident on the contaminated soils as some of the reasons for the action. The tailings were taken to the Flowery Mine heap leaching facility for treatment by cyanidation.

In August 1992, mercury laden tailings located in Dayton were excavated and treated in response to an Administrative Order issued by EPA to private property owners and the Nevada Department of Transportation. Soil with mercury concentrations greater than 25 mg/kg was excavated from an area bounded by U.S. Highway 50 to the east, Douglas Street to the north, and River Road to the west, and taken to the Flowery Mine heap leaching facility for treatment by cyanidation. The remaining excavation was backfilled with clean soil. As stated in the Order, a closed public park and playground as well as unrestricted access to much of the site necessitated prompt action.

As part of the RI/FS, EPA conducted historical research to determine the locations of Comstock mills, and to develop general information regarding their operations. The findings of this research identified 131 historic mill sites.

3.6. Basis for Taking Action

The contaminants of concern for the CRMS are mercury, arsenic, and lead. Mercury occurs naturally in Comstock ore, but at low levels. The mercury added for gold and silver amalgamation greatly exceeds the natural levels. Arsenic and lead are naturally occurring metals but were concentrated in the milling waste stream. The presence of these contaminants in soil provided the basis for taking action under CERCLA. The primary threat to human health was posed by ingestion of soil in a residential setting by young children, and ingestion of contaminated fish and waterfowl.

4. Remedial Actions

4.1. Remedy Selection

The remedial action objective for OU1 as described in the 1995 ROD was to reduce human health risks by reducing direct exposure to mercury equal to or greater than 80 mg/kg in surface soils in residential areas.

The selected remedy as described in the 1995 ROD is:

- Excavation of approximately 5,000 cubic yards of contaminated soils, disposal at a Resource Conservation and Recovery Act (RCRA) municipal and/or hazardous waste landfill, and restoration of properties. In the event that there is residual contamination in the subsurface soil and it is not addressed, then this alternative may also include ICs; and

- Implementation of ICs to ensure that any residential development in present open land use areas known or suspected to be impacted by mercury includes characterizing mercury levels in surface soils and, if necessary, addressing impacted soils. These ICs will be referred to as the Long-Term Sampling and Response Plan (LTSRP).

4.2 Remedy Implementation

The four areas of concern within OU1 where remediation occurred subsequent to the 1995 ROD are residential properties designated MS001, MS002, MS004, and MS030. These four areas were remediated between August 1998 and December 1999. The remediation involved excavation of the uppermost 2 feet of the surface soil that was determined by sampling to be above the cleanup threshold for mercury. Excavation was followed by capping with an equivalent volume of clean fill. Most areas were reseeded and landscaped similarly to what was removed during the remedial action. The locations of the four remediated areas, shown in Figure 2 for MS001, MS002 and MS004, and Figure 3 for MS030, are as follows:

- MS001: The 92,344 ft^2 remediated area, located in Dayton, is bound by Main Street/Dayton Valley Road to the north, Railroad Avenue to the west, the Carson River to the east and Pradere Road to the south.

- MS002: The 988 ft^2 remediated area, located in Dayton, is within a mobile home park[1] on the west side of Highway 50, east of Ziller Way.

- MS004: The 36,603 ft^2 remediated area, located in Dayton, lies along River Street between Silver Street to the north and the Highway 50/River Street junction to the south.

[1] The mobile home park no longer exists. The closest current development is commercial – a credit union to the north and the Dayton Post Office to the south.

- MS030: The 4,416 ft^2 remediated area is located in Silver City west of Highway 342 along American Flat Road.

Over 9,087 cubic yards of mercury contaminated soil was removed, nearly double the ROD estimated quantity of 5,000 cubic yards. Discovery of a historic mill building foundation and greater amounts of impacted soil at one of the areas required a larger excavation than anticipated. Following excavation, this more highly contaminated material was transported to treatment and disposal facilities in Pennsylvania.

The OU1 ICs called for in the ROD included a review process, followed by a sampling and analysis process, if warranted, for future residential developments within the boundaries of the CRMS. This process is described in the LTSRP. For developments of more than five units or greater than one acre, construction stormwater permit applications need to be approved by the NDEP Bureau of Water Pollution Control.[2] When the Bureau of Water Pollution Control receives the permit application, it sends a letter to the developer requiring them to coordinate with the NDEP Bureau of Corrective Actions on soil sampling for mercury associated with the CRMS. If and when the NDEP Bureau of Corrective Actions determines that the proposed development is within the limits of the CRMS, it requires the developer to perform sampling and, if necessary, remediation consistent with the LTSRP. The Bureau of Corrective Actions maintains a database on the developments and the sampling and remediation results. This review process has been updated and revised within the past five years, as detailed in Section 5.2.

Although the ROD provided for the LTSRP to apply to developments of less than five units or five acres (now one acre), the mechanism to notify the Bureau of Corrective Actions of those developments was never operational. The ROD envisioned that County building departments would notify the Bureau of Corrective Actions when someone applied for a building permit, but the process was never established.

4.3 Operation and Maintenance (O&M)

No active, ongoing remedial system was required in the 1995 ROD after the excavation and fill component of the remedial action was completed. The extent of current O&M activities includes the inspection of the areas which underwent remedial action in 1998-1999 every five years as part of the FYR site inspection to ensure no disturbance has occurred which could affect the remedy's protectiveness.

[2] Due to changes in the National Pollution Discharge Elimination System (NPDES) requirements for Construction General Permits (CGP) under the Phase II Storm Water Rule that was promulgated on December 8, 1999, the NDEP BWPC CGP now applies to projects disturbing at least one acre instead of five acres, or that will disturb less than one (1) acre but are part of a larger common plan for development or sale that will ultimately disturb one (1) or more acres.

5. Progress Since the Last Five-Year Review

5.1. Previous Five-Year Review Protectiveness Statement and Issues

The protectiveness statement from the 2008 FYR for the CRMS stated the following:

> *The remedy at the Carson River Mercury Site OU1 is not protective of human health and the environment because the ICs for the four properties remediated under the ROD are not in place and information on the recorded ICs for properties covered under the LTSRP is not readily accessible. In addition, a category of properties (developments smaller than five residential properties or five acres) does not have an ICs trigger mechanism. The soil removal and replacement element of the ROD was implemented as planned and the sampling and remediation aspects of the LTSRP are operating as intended for developments five or greater residential properties or five or greater acres.*

The 2008 FYR included two issues and recommendations, one stand-alone and one with four sub-components. Each recommendation and the current status are discussed below.

Table 2. Status of Recommendations from the 2008 FYR

Issues from previous FYR	Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
1a. Site boundaries not well defined	1a. Improve CRMS boundary maps to better define areas of concern	NDEP/EPA	Sept 2010	An updated CRMS boundary map was developed	Dec 2010 & Ongoing
1b. LTSRP does not address small residential developments	1b. Revise LTSRP to address developments less than five residential units or less than five acres (now one acre)	NDEP	Dec 2009	Counties were contacted to establish notification mechanism and LTSRP was updated to address small residential developments	On-going. Final LTSRP pending.
1c. LTSRP is still a draft document	1d. Adopt a final LTSRP	NDEP	Dec 2009	The LTSRP is currently a draft document. A final LTSRP is nearing signature	Pending

Issues from previous FYR	Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
1d. Information on ICs for properties not readily accessible	1d. Work with Lyon County to assure that ICs information is accessible to current and future property owners, users and developers	NDEP/EPA	Dec 2009	NDEP created a searchable public database of environmental covenants (ECs), updated as ECs become finalized	Jan 2012
2. No ICs for remediated areas, and no inspection program	2. Work with NDEP and Lyon County to develop and implement appropriate ICs and inspection program	EPA	Sept 2009	Draft ECs in progress; Inspection to remain non-intrusive during FYR	Jan 2012 & Ongoing

Recommendation 1a (Improve CRMS boundary maps to better define areas of concern)

In December 2010, NDEP updated the CRMS boundary map using the latest sampling data and NDEP's GIS site database. Note that the exact boundary of the OU1 Site, which includes former mill sites and those areas where tailings have contaminated surface oil and drainages, may change as new sampling results become available. As such, the site boundaries are expected to be updated over time as EPA/NDEP and LTSRP-related sampling actions occur. Full resolution of Issue 1a from the 2008 Second FYR required a modification to the ROD and was addressed by the 2013 ESD.

Recommendation 1b (Revise LTSRP to address developments less than five residential units or less than five acres)

NDEP is now working with Lyon, Storey, Churchill, and Washoe Counties to establish procedures for notification to NDEP when someone applies for a construction or grading permit within the boundaries of the CRMS. These procedures are intended to eliminate the loophole in application of the LTSRP to residential development less than five units or five acres (now one acre). NDEP and the counties will develop mechanisms to assure that notification takes place in a timely manner with minimal effort required by the local offices. When a construction or grading permit is requested for a property shown on the NDEP map to be within the CRMS boundary, the county will notify NDEP, and NDEP will contact the permittee. Provisions of the LTSRP will then apply to the disturbance.

It has been a concern of NDEP and EPA that the application of the LTSRP to a smaller developments and construction projects not put an undue burden on individual homeowners. Therefore, on a trial

basis, if a permit is issued for construction, grading, or other work associated with an individual home that would make the work subject to the LTSRP, NDEP will provide sampling services required by the LTSRP at no cost to the homeowner. The NDEP sampling effort will be included in the statement of work for the NDEP Superfund Support Agency Cooperative Agreement and EPA will provide the funding for the services. The services will be offered initially on a trial basis for one year to determine the level of need and the funding required. If the NDEP sampling identifies surface soil contamination that requires cleanup, then EPA may look to access Superfund monies to fund the activity. The services are intended to assist individual homeowners, and do not apply to commercial development or residences built for speculation.

Recommendation 1c (Adopt a final LTSRP)

EPA and NDEP are in agreement on the content of the LTSRP, and the revisions have been approved by legal counsel for EPA and are under review by counsel for the State of Nevada. The LTSRP is consistent with the ROD and the 2013 ESD and also includes provisions to assure compliance with the requirements of the National Historic Preservation Act and the Programmatic Agreement that is being developed among EPA, NDEP, and the Nevada State Historic Preservation Office. Although a final LTSRP has not been enacted, updates to the draft LTSRP have improved this IC since the last FYR. Progress is being made toward finalization.

Recommendation 1d (Work with Lyon County to assure that ICs information is accessible to current and future property owners, users and developers)

NDEP has begun and will maintain a searchable public database on their website, organized by parcel number, of all CRMS durable notification mechanisms. Pursuant to the adopted LTSRP, the durable notification mechanism for CRMS will be an environmental covenant (EC).[3] The Environmental Covenants Uniform Act was passed by the Nevada legislature in 2005 and sets forth the procedure for executing and recording a covenant to provide notice to the public of activity and use limitations with respect to real property that is the subject of an environmental response project. An EC runs with the property in perpetuity, and establishment of an EC is voluntary on the part of the property owner. The NDEP database will provide the public with accurate and accessible information about mercury contamination on individual properties and any precautions that must be taken to assure that remedial actions remain protective. Presently, the Riverpark subdivision in Lyon County has 218 lots and the Onda Verde subdivision in Churchill County has 36 lots with ECs that are viewable on the NDEP website in conjunction with the soil investigation reports and individual parcel soil data.

Recommendation 2 (Work with NDEP and Lyon County to develop and implement appropriate ICs and inspection program for remediated areas)

NDEP and the Nevada Attorney General's Office drafted ECs for the properties remediated in 1998-1999 that had mercury contamination left in place below the 2-foot cleanup depth. These ICs are in draft form and have not yet been implemented. See Section 6.7 for additional details of the draft ECs.

[3] Nevada Revised Statues (NRS) Chapter 445D, *Environmental Covenants (Uniform Act)*.

5.2. Work Completed at the Site during this Five-Year Review Period

In 2012, an extensive archaeological survey was conducted at the CRMS to locate and screen almost 250 former mill sites that were active during the Comstock era (the original site investigation identified 131 historical mill sites.) The inventory included development of an accurate description of each mill and its ore processing history, recording of each mill's precise geographic location, and documentation of any physical remains of the mill. This field effort helped contribute to a more accurate definition of the CRMS boundary. Future soil sampling for CRMS contaminants of concern at the surveyed former mill sites is planned to further refine Site boundaries and contaminant nature and extent.

All other work completed on the CRMS was administrative in nature and included progress in closing the loophole in application of the draft LTSRP to residential developments of five acres or less and/or five units or less, work toward finalizing the LTSRP, advancement of formal ICs, making ICs information more readily accessible to the public, and drafting and signing the 2013 ESD to address the CRMS boundary definition and changes in cleanup levels for two of the three contaminants of concern (arsenic and lead) since the ROD was signed.

Figure 4 shows the latest available updated OU1 site boundary map and the mercury risk areas.

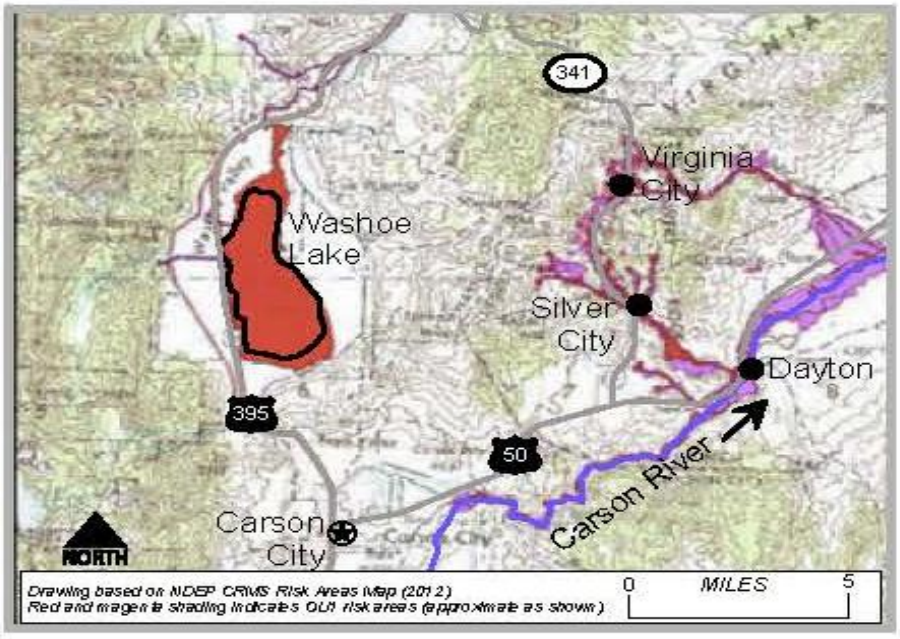


Figure 4. CRMS Risk Area Boundaries for OU1

6. Five-Year Review Process

6.1. Administrative Components

EPA Region 9 initiated the FYR in August 2012 and scheduled its completion for September 2013. The EPA Region 9 review team was led by Jere Johnson of EPA, Remedial Project Manager (RPM) for OU1 of the CRMS, and included USACE Seattle District personnel Marlowe Laubach (chemical engineer) and Jeff Powers (hydrogeologist). In August 2012, EPA held a scoping call with the review team to discuss the site and items of interest as they related to the protectiveness of the remedy currently in place. A review schedule was established that consisted of the following:

- Community notification
- Document review
- Data collection and review
- Site inspection
- Local interviews
- FYR Report development and review

6.2. Community Involvement

On February 15, 2013, a public notice was published in the *Comstock Chronicle* announcing the commencement of the FYR process for the CRMS. The notice invited community participation and provided contact information for Jere Johnson and Leana Rosetti, the EPA Community Involvement Coordinator. The press notice is available in Appendix B.

The FYR report will be made available to the public once it is finalized. Copies of this document will be placed in the designated public repositories: Dayton Valley Library in Dayton, Nevada, Churchill County Library in Fallon, Nevada; Nevada State Library in Carson City, Nevada; and the EPA Superfund Records Center in San Francisco, California. Upon completion of the FYR, a public notice will be published in the *Comstock Chronicle* to announce the availability of the final FYR report in CRMS document repositories.

6.3. Document Review

This FYR included a review of relevant, site-related documents including the ROD, remedial action reports, the official NDEP CRMS website, and unpublished draft versions of the LTSRP and the ESD. A complete list of the documents reviewed can be found in Appendix A.

ARARs/TBCs Review

Section 121(d) of CERCLA requires that remedial actions selected for Superfund sites comply with "legally applicable or relevant and appropriate standard[s], requirement[s], criteria, or limitation[s]." The highest tier of cleanup standards are those promulgated under Federal or, with certain conditions,

State law that are "applicable or relevant and appropriate" (ARAR) to a particular site, contaminant, or remedial action. As such, ARARs can be chemical-specific, location-specific, and/or action-specific requirements.

At the time the 1995 ROD was signed, there were no federal or state laws concerning mercury, arsenic and lead cleanup levels that were considered to be ARARs for the cleanup of OU1. However, there were standards from the next tier of requirements, termed "To Be Considered" (TBC) standards, which were determined to be germane to the CRMS cleanup. The Nevada Contaminated Soil and Groundwater Remediation Policy was determined to be appropriate for the arsenic standard and that cleanup level was selected in the ROD. For mercury, the section of the Policy that states that site specific cleanup levels may be used at a site if they were developed using a scientifically valid risk assessment was used to adopt the mercury cleanup level determined by EPA based on the HHRA. No standards for lead were presented in the ROD.

As described in Table 4 below, the Nevada Contaminated Soil and Groundwater Remediation Policy cited in the ROD is no longer in effect. Cleanup levels for soil in Nevada are now governed by Nevada Administrative Code (NAC) 445A.2272, which was amended in 2009. The 2013 ESD and the updated 2011 draft LTSRP presents the cleanup levels for site contaminants of concern based on the EPA risk assessment from the ROD for mercury, the 95th percentile of the normal probability distribution of 397 sample locations throughout the Carson River Basin for arsenic, and the most recent EPA Regional Screening Levels (RSLs) for lead, consistent with NAC 445A.2272. The cleanup standards for arsenic and lead in the ESD and draft LTSRP are more stringent standards than the cleanup levels presented in the ROD.

Table 3. Summary of Soil ARAR/TBC Changes

Contaminants of Concern	1995 ROD ARARs/TBCs[1] (mg/kg)	Current (mg/kg)	ARARs /TBCs Changed?[2]
Mercury	80	80 (residential)[2]	No change (residential);
Arsenic	80	32 (residential)[2]	More stringent
Lead	--	400 (residential)[2]	More stringent
1 – The ROD only identified cleanup levels for residential land use. 2 – From the 2013 ESD.			

Federal and State laws and regulations other than the ARARs/TBCs that have been promulgated or changed over the past five years are described in Table 4. ARARs identified in the 1995 ROD that are no longer pertinent, due to the phase the remedy is in, are not included in the table. There have been no revisions to laws and regulations that affect the protectiveness of the remedy.

Table 4. Applicable or Relevant and Appropriate Requirements/To Be Considered Evaluation

Requirement	Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
Nevada Contaminated Soil and Ground Water Remediation Policy	Nevada Contaminated Soil and Ground Water Remediation Policy, June 25, 1992.	1995 ROD	This policy contains soil cleanup standards for mercury and arsenic.	This policy is no longer in effect. Cleanup levels for soils in Nevada are now governed by the Nevada Administrative Code (NAC 445A.2272). The NAC states that soil action levels must be established at background concentration or volume and is based on the protection of waters of the State, public health and safety for all identified routes of exposure and the environment. The NAC is protective.	Included in the NAC is the adoption of EPA's Integrated Risk Information System (IRIS) which is the basis for the EPA Region 9 Regional Screening Levels (RSLs) used by Nevada to determine appropriate cleanup levels.	1996; 2009.
Alternative Use of Mine Waste Solids Disposal Outside of Containment	Nevada Bureau of Mining Regulation and Reclamation Guidance Document for Alternate Use of Mine Waste Solids-Disposal Outside of Containment, May 3 1994.	1995 ROD	This guidance document describes the types of analytical tests and the respective criteria which should be used to determine if mine waste solids are acceptable for alternate uses.	This document is still used by the Nevada Bureau of Mining Regulation and Reclamation. This is still protective.	An active mine is currently operating within the CRMS.	1996

Requirement	Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
Fugitive Dust Emissions	NAC 445.734	1995 ROD	Requires that handling, transportation or storing any material be performed in a manner which does not allow controllable particulate matter to become airborne.	NAC 445B.22037, the replacement citation, is still protective.	No active remediation is currently occurring. An active mine is currently operating within the CRMS.	Replaced by NAC 445B.365 which was replace by 445B.22037. An amendment date could not be found.
100-year flood plain requirement	Executive Order no. 11988; 40 CFR 6.302(b); 40 CFR Part (Appendix A)	1995 ROD	These requirements provide that within areas subject to a one percent or greater chance of flooding in any given year, actions shall be taken to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values of flood plains.	These laws remain unchanged and do not affect protectiveness.	The remedy includes areas within the 100-year floodplain.	N/A

Requirement	Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
Executive Order on Protection of Wetlands	Executive Order 11990, 7(c), 40 CFR Part 6, App A, 4(j)	1995 ROD	Requires Federal agencies to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands, as defined	These laws remain unchanged and do not affect protectiveness.	Past remedial actions occurred in areas adjacent to the Carson River. These requirements are still applicable for future remedial actions.	N/A
Wetland Protection	Clean Water Act 404; 40 CFR Part 203; 33 CFR Part 320-330	1995 ROD	These requirements protect wetlands by prohibiting the discharge of dredged or fill material without a permit and taking actions to avoid adverse effect, minimize potential harm, and preserve and enhance wetlands to the extent possible.	33 CFR 323.2 was revised to clarify the definition of fill material. This change does not affect protectiveness.	These requirements were applicable to certain areas where remedial action occurred adjacent to the Carson River. These requirements would still be applicable for future remedial actions.	33 CFR 323.2 Amended May 9, 2002.
Archeological and Historical Preservation Act	16 USC 469, 40 CFR 6.307 (b) and (c).	1995 ROD	Establishes procedures to preserve historical and archeological data which might be destroyed through alteration of terrain as a result of Federal activity.	These laws remain unchanged and do not affect protectiveness.	A recent archeological survey identified additional mill sites. A Programmatic Agreement for NHPA compliance is in development.	N/A

Human Health Risk Assessment Review

A human health risk assessment was completed for the CRMS in 1994 and summarized in the 1995 ROD. The risk assessment initially identified the potential exposure pathways at the CRMS as soil ingestion, dust and/or vapor inhalation, consumption of domestic produce for individuals living on or adjacent to impacted areas; soil ingestion, dust and/or vapor inhalation for recreational land use in and around impacted areas; and the consumption of fish and waterfowl.

The risk assessment initially evaluated soil ingestion, sediment ingestion, surface water ingestion, groundwater ingestion, fish and waterfowl consumption and air inhalation. The ingestion of groundwater, surface water and sediment were screened out of the exposure assessment because the chemicals of potential concern were detected at relatively low levels in these media. The risk assessment identified the exposure pathways and associated risks shown in Table 5.

Table 5. Risk Assessment Summary

Exposure Scenario & Pathway	Risk Driver(s)	Risk Estimate[1]
Living On or Adjacent to Impacted areas		
Soil ingestion by child/adult Resident[2]	Mercury, arsenic	**NonCancer[4] (mercury): 2.80** **NonCancer (arsenic): 1.23** Cancer[5] (arsenic): 4E-5
Dust and/or vapor inhalation[3] by child/adult Resident[2]	Mercury, arsenic	NonCancer (mercury): 0.38 NonCancer (arsenic): 0.007 Cancer (arsenic): 4E-6
Domestic produce consumption by Child resident[2]		NonCancer: 0.80
Recreational Land Use in and Around Impacted Areas		
Soil ingestion by school age child	Mercury, arsenic	NonCancer (mercury): 0.24 NonCancer (arsenic): 0.10 Cancer (arsenic):1E-5
Dust and/or vapor inhalation by school age child	Mercury, arsenic	NonCancer (mercury): 0.016 NonCancer (arsenic): 0.0003 Cancer (arsenic): 2E-7
Fish and waterfowl consumption		
White Bass/Carson River above Lahontan (adult)	Mercury	**NonCancer: 6.5**
Walleye/Lahontan Reservoir (adult)	Mercury	**NonCancer: 4.9**
White Bass/Carson River below Lahontan (adult)	Mercury	**NonCancer: 2.1**
White Bass/Indian Lakes (adult)	Mercury	**NonCancer: 4.1**
White Bass/Washoe Lake (adult)	Mercury	**NonCancer:1.2**
Shovelers/Carson Lake (adult)	Mercury	**NonCancer: 2.0**
Shovelers/Stillwater (adult)	Mercury	NonCancer: 0.8
Mallards/Carson Lake (adult)	Mercury	NonCancer: 0.6
Mallards/Stillwater (adult)	Mercury	NonCancer: 0.05

1. The ROD presented typical and high end estimated risks. Risk estimates presented in the table are the high-end estimates from the ROD

2. For the living on or adjacent to impacted area scenarios, high-end non-cancer risk estimates were calculated for a young child (under 6 years old). Cancer risk estimates were calculated for adult residents.

3. Risks were calculated using combined air inhalation rates for indoor and outdoor activities in the residential setting.

4. NonCancer Hazard Index values greater than 1 indicate that the exposure has the potential to result in adverse noncarcinogenic health effects and additional evaluation may be necessary. NonCancer risks greater than a Hazard Index of 1 are shown in **bold**.

5. Cancer risks are compared to the EPA Superfund program acceptable risk range for exposure to a carcinogen of 10^{-4} (1 in 10,000) to 10^{-6} (1 in 1,000,000) excess lifetime cancer risk. Exposures which are estimated to cause more than 1 in 10,000 excess cancers are considered by EPA to be of concern and may require action to reduce the exposure and resulting risk.

The risk assessment was reviewed as part of this Five Year Review to identify any changes in exposure or toxicity that would impact protectiveness. Lead risk was not calculated in the risk assessment but it was determined that lead blood levels provided the best index for evaluating lead exposure. There have been no changes in the exposure scenarios or pathways presented in the original risk assessment. No additional pathways have been identified.

Toxicity values

EPA's Integrated Risk Information System (IRIS) has a program to update toxicity values used by the Agency in risk assessment when newer scientific information becomes available. Since the ROD, there have been changes to the toxicity values for contaminants of concern at the CRMS. Revisions to the toxicity values for arsenic indicate a slightly lower cancer risk from oral exposure and a slightly higher cancer risk from inhalation exposure than previously considered.

Table 6. Revisions to toxicity values since the last FYR

Contaminant of Concern	**Toxicity Values**[2]				**Change**
	Cancer		Non-Cancer		
	IUR	SFo	RfCi	RfDo	
Mercury[1]	N/A	N/A	OLD: 0.3 g/m3 NEW: 0.3 g/m3	OLD: 0.3 g/kg-day NEW: 0.3 g/kg-day	No change
Arsenic	OLD: 4.2E-03 g/m3 NEW: 4.3E-03 g/m3	OLD: 1.75 mg/kg-day NEW: 1.5 mg/kg-day	OLD: N/A NEW: 1.5E-05 mg/m3	OLD: 0.3 g/kg-day NEW: 0.3 g/kg-day	Cancer: slightly less stringent (oral) slightly more stringent (inhalation) Non-cancer: No change (oral) NEW (inhalation)

1 – The risk assessment concluded based on soil samples that mercury species found at the site were approximately 90% elemental mercury and 10% mercuric chloride.

2 - The risk assessment did not assess lead risks. No toxicity factors are provided for lead in IRIS.

N/A: Not available; IUR – Inhalation Unit Risk; SFo – Oral Slope Factor; RfCi – Inhalation Reference Concentration; RfDo – Oral Reference Dose.

Ecological Review

At the time of the ROD, an ecological assessment for the CRMS was ongoing and results would be presented in the remedial investigation report for OU2. The outcome of the ecological assessment would present an understanding of how severely wildlife is impacted or threatened by the present levels of mercury in the Carson River system as well as an understanding of what factors regulate mercury cycling in the Carson River system. This information would provide the basis for evaluating methods to reduce mercury concentrations in fish, waterfowl, and other biota. These studies are currently on-going. The ROD specifies that the Remedial Action Objective (RAO) for OU1 is to reduce direct human exposure to mercury contaminated surface soil. Ecological risks will be addressed in OU2.

6.4. Data Review

Since there is no active, on-going RA at the CRMS, very limited new analytical data exists. Soil data is collected and analyzed as part of the LTSRP IC only when new residential development within the boundaries of the CRMS goes through the permitting process. Due to a downturn in the real estate market in the late 2000s and early 2010s, residential development has greatly declined and only two large-scale residential developments within the boundaries of the CRMS began the construction permitting process since the last FYR. The residential developments are Riverpark and Onda Verde. The Riverpark development is located approximately 5.5 miles northeast of Dayton, just south of Highway 50, and north of the Carson River. The Onda Verde subdivision is located in Fallon, NV just north of US Highway 50 along the Carson River with portions of the site mapped in the FEMA 100-year flood plain. It is significant to note that this subdivision is located some 66 river miles from the CRMS source area. NDEP also reviewed one pre-construction investigation conducted at the Santa Maria Ranch Phase II subdivision in Dayton.

Riverpark and Onda Verde opted to perform surface soil sampling programs only, which is defined to a depth of 2 feet below ground surface to assure adequate protection in accordance with the ROD. Because of the limited depth of sampling, environmental covenants on each parcel were necessary regardless of the soil investigation findings. The sampling and analysis plans (SAP) were reviewed and approved by NDEP prior to their implementation in accordance with provisions in the LTSRP.

Final grade sampling and ECs were completed on approximately 218 lots of Riverpark Subdivision Units 11, 12, 13, and 15. The approved SAP included approximately 454 samples collected for analysis, taken from the front and back yards of each subdivision lot. Samples were composited from either 0 to 1 feet below ground surface or 1 to 2 feet below ground surface with the depth intervals alternated between the front yard and back yard. At Riverpark, no surface soil samples with concentrations above the cleanup level of 80 mg/kg were detected for mercury. Also of note from the Riverpark sampling, only two sample locations contained arsenic at levels above the background level of 32 mg/kg where mercury also exceeded its background concentration of 1 mg/kg.

The Onda Verde surface soil sampling investigation followed a more rigorous sampling program as defined in the updated draft LTSRP that incorporates the NDEP-identified risk zones into the determination of sample density and depth. A minimum of five points per decision unit of approximate quarter (1/4) acre size are required under this risk zone sampling program. The approved SAP for Onda Verde consisted of existing grade sampling completed on approximately 185 lots and the submittal of 564 samples for analyses (not including QA/QC samples).

Lots in the subdivision identified as being in the low risk zone were sampled at a total of ten locations (five points in the front yard and five points in the backyard) to a depth of 6-inches below ground surface. The five point samples were composited and two samples from each lot (front yard and back yard) were submitted for analyses. Lots identified as being located in the moderate risk zone were sampled at ten locations (five points in the front yard and five points in the backyard) to a depth of 24 inches below ground surface. The five point samples were composited by depth intervals from 0 to 6 inches, 6 to 12

inches, 12 to 18 inches and 18 to 24 inches below ground surface and eight samples were then submitted from each lot for laboratory analyses.

The Onda Verde surface soil investigation found no analytical results above the action levels for the three site contaminants of concern. The reported maximum concentrations found were 52.8 mg/kg mercury, 28.5 mg/kg arsenic and 20 mg/kg lead; however, the majority of analytical results were significantly below these maximum concentrations for all three analytes.

The Santa Maria Ranch Phase II subdivision was investigated on a preliminary pre-construction basis by the developer in 2009. Because other phases of this subdivision had been developed years earlier and the developer had some familiarity with the soil investigation process, the developer initiated this Phase II preliminary investigation before getting NDEP approval of the SAP. Because the proposed Phase II does not have any residential parcels located in the FEMA 100-year flood plain or near any historic mill sites, the developer believed it would be satisfactory to collect samples on what they identified as the most probable source. This is a portion of an irrigation ditch which runs from a point west of the site upstream on the Carson River through the Phase II portion of Santa Maria Ranch to a point east where the recent development of Santa Maria Ranch Phase I has removed the ditch.

The developer's investigation focused on collecting soil samples at nine locations from the bottom of the dry irrigation ditch along an approximate 300 foot section that runs through the proposed subdivision. Each location was sampled to a depth of 2 feet and two composite samples were analyzed, representing 0 to 1 foot and 1 to 2 feet below ground surface. NDEP reviewed the work submitted and accepted this approach , but required the developer to collect samples up to a depth of 2 feet at five other locations, including two locations along the Daney Canyon drainage, two locations within the 100-year flood plain, and one location from an historic mill site. None of the parcels where these samples were located are proposed for residential development. The maximum mercury concentrations detected in these samples was from the 0 to 1 foot depth range in the former irrigation ditch with a high of 26 mg/kg and typical results of about 24 mg/kg.

No groundwater, surface water, or sediment data were reviewed, as these media are not media of concern for CRMS OU1.

6.5. Site Inspection

A site inspection was conducted at the CRMS on November 29, 2012. The site inspection was conducted by EPA, USACE Seattle District, and NDEP. The site inspection commenced with a meeting at the NDEP office in Carson City to discuss the CRMS and new site developments since 2008.

After the meeting at NDEP, the site inspection team drove to the sites (MS001, MS002, and MS004) that were remediated pursuant to the ROD to determine whether significant changes occurred that would cause the remedy to be unprotective. The following summarizes observations made during the site visit:

- MS001. This site consists of a long and relatively thin swath of land that was excavated and capped running between the Carson River and the back yards of several residences along Railroad

Street in Dayton. No disturbance or erosion was evident. Sage and other scrub brush was present in areas that were likely remediated, and large trees were present on both sides of the likely remediated area.

- MS002. When remediated, the site was within a trailer park; however, the trailer park no longer exists. The trailer park has been replaced by a credit union to the north of the remediated area and a new Dayton post office to the south. It is likely that parts of the remediated area were altered by elevated grading associated with construction of the paved parking areas for both new buildings; however, the remediated area and surrounding land is no longer used for residential purposes, which is a key to the area remaining protective.

- MS004. Remediated areas included parts of individual residence lots, a gravel-graded lot that appears to serve as outdoor seating and a potential "overflow parking area" adjacent to a former mini-mart that is now a Quiznos sandwich shop, and a retaining wall erected during the remediation phase to prevent disturbance to remediated areas. All remediated areas of MS004 appeared to be in good condition, with no signs of excavation or recent disturbance to the soil cap material other than a small concrete pad poured for the outdoor dining table.

Remediated site MS030 in Silver City was not visited during the site inspection because all mercury-contaminated soil above 80 mg/kg was excavated and disposed off-site, and hence there would be no depth-limiting restrictions to land use in this area.

Overall, no significant changes were observed in the remediated areas that would cause the remedy to be unprotective.

EPA and USACE personnel drove through Silver City, Gold Hill, Virginia City, and Six Mile Canyon. Some of the Comstock Mining, Inc. claim and activities were viewed from the road (Route 341), including observation of active haul trucks and the large pit mine beside the roadway near Silver City. Personnel drove through Virginia City to gain perspective on the extent of historical mining during the Comstock era, and drove along Six Mile Canyon to view the canyon in which numerous mill sites were located, including the foundation remains of an old mill site near Flowery Peak.

The site inspection checklist and a record of the site inspection activities (trip report) are presented in Appendix D.

6.6. Interviews

During the FYR process, interviews were conducted with parties impacted by the CRMS, including community members and regulatory agencies involved in site activities or aware of the site. The purpose of the interviews was to document the perceived status of the site and any perceived problems or successes with the phases of the remedy that have been implemented to date. Interviews were conducted in February 2013 by Jere Johnson and Leana Rosetti, both with EPA Region 9. The interviews are summarized in Appendix C.

6.7. Institutional Controls (ICs)

The ROD-selected remedy includes the "Implementation of institutional controls to ensure that any residential development in present open land use areas known or suspected to be impacted by mercury includes characterizing mercury levels in surface soils and, if necessary, addressing impacted soils. These institutional controls will be referred to as the "Long-term Sampling and Response Plan."”

The 2011 draft LTSRP is currently implemented by NDEP. The processes for NDEP implementation are as follows:

- For residential developments with greater than one acre or more than five residential units, the developer is referred to NDEP Bureau of Corrective Action (BCA) via NDEP water pollution control permits.

- For developments with less than one acre or less than five residential units: building permit seeker is referred to NDEP BCA via county building permit process. Also, if a homeowner wishes to excavate greater than three cubic yards (e.g., for swimming pool, foundation, etc.), county building permit process should refer them to NDEP BCA.

- Environmental Covenants (ECs). Previously there was no central repository to search for deed restrictions on CRMS-impacted properties; therefore this information was not readily accessible to the public. NDEP is in the process of placing implemented ECs on their website.

- NDEP and the Nevada Attorney General's Office have drafted ECs for the areas in Dayton remediated pursuant to the ROD where mercury contamination below the 2-foot cleanup depth limit was left in place. EPA and NDEP will be contacting the current owners of the properties to request that they grant NDEP an EC. If a property owner declines to grant the EC, the property will still be subject to the sampling and response provisions of the LTSRP. The LTSRP requirements will assure the continued integrity of the 1998-1999 clean up, but will not grant the access assurances for the periodic inspection recommended in the previous FYR. Those inspections will need to be conducted by requesting permission from individual property owners, or by visual inspection from an adjacent public roadway. These ECs are in draft form and have not been implemented to date.

A title search has been conducted on a random sampling of single parcels within each of three residential subdivisions which contain ECs that are available on the NDEP website based on soil sampling results. The subdivision names and respective parcel numbers selected were: Riverpark Units 11 & 12, parcel number APN 0029-413-19; Riverpark Units 13 & 15, parcel number APN 0029-513-04; and Onda Verde, parcel number APN 010-603-25. The results of the title search indicated that ECs have been recorded with Lyon County for the Riverpark Units. No ECs have been recorded with Churchhill County for the Onda Verde parcel. Appendix F provides the title search review reports for these parcels.

7. Technical Assessment

7.1. Question A: Is the remedy functioning as intended by the decision documents?

The remedial action for the CRMS OU1 consisted of excavation and off-site disposal of mercury-impacted surface soils from several residential parcels, and implementation of ICs. The remedy at the CRMS was enacted to ensure new residential development within the boundaries of the site is protective of human health and environment, to ensure remediated residential areas remain protective, and to ensure that controls are in place to make certain that protective areas do not become unprotective through subsequent actions by landowners or acts of nature.

The active remedy of excavation and off-site disposal of impacted soil was effective and –continues to be operating and functioning as designed. The site inspection found that no apparent excavation has occurred to expose non-excavated soil greater than 2 feet in depth.

The extent of current O&M activities includes the inspection every five years, as part of the FYR process, of the areas which underwent remedial action in 1998-1999 to ensure no disturbance has occurred which could affect the remedy's protectiveness. As indicated above, no disturbance to remediated areas was observed during the site inspection; therefore, the effectiveness of the response action has been maintained. Until the final ECs are in place on the remediated properties, the FYR site inspections serve the purpose to assess continued protectiveness.

Institutional controls were implemented as part of the remedy to ensure that any residential development within the CRMS boundaries is characterized for mercury levels in surface soils, and if necessary, impacted soils are addressed. The initial draft LTSRP process involved residential developments with more than five units and larger than five acres (now one acre). Since the last FYR when the less than five unit or five acre (now one acre) process oversight was acknowledged, the counties and NDEP informally worked together to ensure new smaller residential construction within the CRMS follows the intent of the LTSRP to make sure all residential properties are protective of public health.

Riverpark and Onda Verde, the two residential developments to receive permits and begin construction since 2008, are in compliance with LTSRP requirements and no remedial action was necessary for surface soil. Administrative actions are being taken to optimize the ICs component of the remedy. These actions include placement of a recorded EC (a form of IC) onto NDEP's website to make them more publicly accessible. NDEP continues to add content to their website as it becomes available, and as ECs on CRMS-affected property are finalized. NDEP has also refined the CRMS boundary map using a Geographic Information System (GIS)-based platform as new historic mill site sampling data become available.

Appropriate ICs have not yet been implemented to prevent exposure to mercury that exceeds cleanup levels in subsurface soils greater than 2 feet in depth in areas in Dayton remediated pursuant to the ROD in 1998-1999. Site inspections conducted during the FYR qualitatively evaluate that no disturbance occurs; however, NDEP is currently working on ECs to be placed on these parcels to more effectively

address this gap in the ICs. This IC, once finalized, will enhance the protectiveness evaluation currently assessed during the FYR site inspection.

Based on the information above regarding the remedial action, as well as implemented and in progress ICs, the remedy is functioning as intended by the decision document.

7.2. Question B: Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

There have been changes to the cleanup standards identified in the ROD. Current cleanup levels adopted in the 2013 ESD are more stringent than cleanup levels identified in the ROD.

An active mine is currently operating within the boundaries of the CRMS. This operation is being regulated by NDEP. Overall land use remains unchanged from the ROD. There have been no changes to exposure pathways discussed in the ROD and summarized in Table 5. There have been no changes to risk assessment methodologies.

Toxicity values, used to calculate risk and summarized in

Table 6, have changed since the ROD. Arsenic toxicity has changed, indicating a slightly lower cancer risk from oral exposure than previously considered. Site cleanup levels for soils have been updated in the 2013 ESD and are based on the EPA risk assessment for mercury, the 95th percentile of normal distribution of 397 sample locations throughout the Carson River basin for arsenic, and the EPA RSLs for lead. The cleanup levels for arsenic and lead are more stringent those presented in the ROD and are considered protective for both cancer and non-cancer effects. Once final, the LTRSP will have updated cleanup levels consistent with NAC 445A.2272.

The remedy is progressing as expected. Progress made in the last five years include: correcting process issues so the draft LTSRP is applied to residential developments of five acres or less and/or five units or less, as intended in the ROD; working toward finalizing the LTSRP; advancement of formal ICs; making ICs information more accessible to the public; and providing a more accurate and restrictive delineation of the CRMS boundaries.

The exposure assumptions and remedial action objectives selected at the time of the remedy are still valid. Although cleanup levels, ARARs/TBCs, and toxicity values selected at the time of remedy have changed, these changes do not affect the protectiveness of the remedy. The cleanup level for mercury remains the same, the level for arsenic is lowered to be more protective, and a value has been established for lead. The mercury cleanups conducted by EPA in the late 1990's addressed the presence of contaminated tailings in residential areas. The excavation, removal, and covering of the contaminated tailings provide public health protection for the elevated levels of mercury, arsenic, and lead that resulted from the ore milling process and are protective for both the original cleanup goals and the standards adopted in the 2013 ESD.

7.3. Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No lead cleanup levels were provided in the ROD. However, the 2013 ESD includes cleanup levels for lead.

No additional information is known that could call in to question the remedy's protectiveness.

7.4. Technical Assessment Summary

The remedy is functioning as intended by the decision document, based on the information reviewed during this FYR, to include the implemented and in progress ICs. The exposure assumptions and remedial action objectives selected at the time of the remedy are still valid. Although cleanup levels, ARARs, and toxicity values selected at the time of remedy have changed, these changes do not affect the protectiveness of the remedy. No other information has come to light that could call into question the protectiveness of the remedy.

8. Issues

Table 7 summarizes the current issues for the Carson River Mercury Superfund Site.

Table 7. Current Issues for the Carson River Mercury Superfund Site

Issue	Affects Current Protectiveness (Yes or No)	Affects Future Protectiveness (Yes or No)
Several documents intended to formally finalize the ICs and revised cleanup levels have been drafted but not completed. These include: 1) the revised LTSRP process to include residential developments of five units and/or five acres or less; and 2) ECs on remediated properties to prevent disturbance of subsurface soils.	N	Y

Significant progress has been made in the last five years toward finalizing the draft LTSRP and the draft ECs on remediated areas. In addition, progress has been made toward better CRMS boundary definition and documenting the changed cleanup levels for arsenic and lead through the 2013 ESD. These administrative actions and documents are a positive step toward evaluating and mitigating risk associated with CRMS contaminants of concern. Current protectiveness is not considered to be affected because progress has been made through GIS mapping of the site through incorporation of new sampling data, coverage of developments five units and/or five acres (now one acre) or less via informal communication between the counties and NDEP during permitting processes and FYR site inspection to assess the remediated parcels.

9. Recommendations and Follow-up Actions

Table 8 provides recommendations to address the current issues at the Carson River Mercury Superfund Site, with milestone dates provided.

Table 8. Recommendations to Address Current Issues at the Carson River Mercury Superfund Site

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Yes or No)	
					Current	Future
Several documents intended to formally finalize the ICs and revised cleanup levels have been drafted but not completed.	Finalize the administrative ICs and revised cleanup level documents (The LTSRP, and ECs on remediated properties).	EPA (LTSRP); NDEP (LTSRP and ECs)	NDEP, EPA	01/2014	N	Y

Included below are additional recommendations that do not affect protectiveness of the remedy.

1. The title search for the Onda Verde parcel did not find recorded ECs even though the NDEP website provides a link to properties with ECs, which this parcel is included. NDEP should verify that ECs have been recorded prior to inclusion on the website.

10. Protectiveness Statement

The remedy at the Carson River Superfund Site is currently protective of human health and the environment in the short term. The contaminated surface soils at four properties have been removed, and institutional controls were put into place to prevent exposure to contaminants remaining on other properties. In order to be protective in the long-term, the following actions need to be taken: 1) finalize the Long-Term Sampling and Response Plan, and 2) finalize the Environmental Covenants on remediated properties.

11. Next Review

The Carson River Superfund Site shall require ongoing FYRs since the selected remedial action resulted in hazardous substances, pollutants, or contaminants remaining at the site at levels above those that would allow for unlimited use and unrestricted exposure. The next FYR will be due in 2018 within five years of the signature date of this FYR.

Appendix A: List of Documents Reviewed

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List of Documents Reviewed

NDEP, 2012. (Nevada Division of Environmental Protection). *Draft* Long-Term Sampling and Response Plan. September 2012.

NDEP, 2012. Carson River Mercury Superfund Site Risk Area Boundaries Map. January 2012.

EPA, 2012. (Environmental Protection Agency) . *Draft Memorandum* – Management Adjustments for the Carson River Mercury Site. September 2012.

EPA, 2012. *Draft* Explanation of Significant Differences for Carson River Mercury Site. August 2012.

EPA, 2011. Archaeological Studies of Historic Mill Sites Factsheet. April 2011.

EPA, 2008. Second Five-Year Review Report for Carson River Mercury Site, Cities of Dayton and Silver City, Lyon County, Nevada, 30 September 2008.

EPA, 2003. First Five-Year Review Report for the Carson River Mercury Site, Dayton and Silver City, Nevada, Lyon County, Nevada. September 2003.

EPA, 1995. Record of Decision, Carson River Mercury Site OU1. 30 March 1995.

Appendix B: Press Notices

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pay off the existing mortgage on Piper's Opera House to the USDA and take over sole possession of the Comstock icon.

"We have a unique opportunity," began Superintendent Dr. Rob Slaby, "as we took over operation of the building about 18 months ago, and it has been very successful."

Slaby pointed to the academic upgrades taken by the district such as the STEM lab as well as athletic upgrades that have included the football field, the baseball field, weight training facilities and more.

"We have a unique opportunity to have a historic building for the fine

we were told we would lose money but with Toni's (McTimmond) help, we are up $25,000. We don't pay people to perform, and we don't do anything on a loss basis.

Slaby said the school district puts $13,500 per year toward the mortgage as does Storey County. Approximately $258,000 is owed USDA. Every year, $20,000 of the $27,000 goes to interest and unlike residential property, the interest is not deductible.

"Rather than pay USDA, we can put that money back into us and in 10 years, pay it back to us. Some people have voiced concerns like have a building with a bar in it. The Corner Bar was there before

"We're going to maintain the non-profit board of directors. Money from the bar lease will go to the Piper's board for its insurance, we need liability insurance."

Slaby also pointed out that in the last five sessions of the Nevada Legislature, the state has tried to abolish the Storey County School district and take students to either Lyon or Washoe counties.

"If that were to happen, we would give Piper's back to the Piper's Foundation so it would stay with local ownership, it would stay with the non-profit board."

He said documents would be drawn up by District Attorney Bill Maddox.

"It's cost effective, it ensures the kids will have a stage." Previously in the district's long-term goals, building a performing arts facility was a topic.

Slaby said the district will apply for grants to restore the building back to its glory of the 1880s. But right now, the building is safe and secure.

to make sure the building would not become a liability. She questioned fire suppression.

James pointed out that Piper's board members were in attendance: Marilow Walling, Rae Maeder Owen, Sheriff Gerald Antinoro and Commissioner Marshall McBride. James also is on the Piper's board and said she would be abstaining from the vote.

"This is a win-win situation for Storey County School District and Virginia City," said McBride. "This organization was put together 15 years ago, and it secured financing through USDA. They didn't have a long-term plan for funding this. The building was becoming dilapidated. They did a good effort of grant writing and received several million dollars. The building is now stable with fire suppression, wiring, wall stabilization, a lot of other work.

"For the school to go forward, this is one of the greatest buys ever."

Echoing McBride were Walling and Maeder-Owen as they said the Piper's

PUBLIC NOTICE
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
BEGINS FIVE-YEAR REVIEW OF CLEANUP AT
CARSON RIVER MERCURY
SUPERFUND SITE

The United States Environmental Protection Agency (EPA) has begun the third five-year review of cleanup actions undertaken for Operable Unit 1 of the Carson River Mercury Superfund Site in Nevada. The review will evaluate whether the cleanup actions for the site are protective of human health and the environment.

Specifically, EPA will look at the integrity of the cleanup that was conducted in the late 1990's in the Dayton area, the application and monitoring of legal documents regarding property restrictions, changes in scientific knowledge about site contaminants and exposure pathways, and changes in regulatory standards. The review will not cover Operable Unit 2, which consists of the downstream contamination of the Carson River and Lahontan Reservoir.

When completed, a copy of the final report will be placed in the information repositories listed below.

COMMUNITY INVOLVEMENT

EPA is always interested in hearing from the public. If you have any issues or concerns about the site's cleanup, and particularly if you have direct knowledge regarding the status of the cleanup remedy, EPA would like to talk with you. Please contact Jere Johnson, EPA Project Manager. To receive future fact sheets, please contact Leana Rosetti.

FOR MORE INFORMATION

Please visit the SITE website at:
www.epa.gov/region09/carsonrivermercury

Or visit the information repository to review the administrative record or contact EPA representatives.

INFORMATION REPOSITORIES:
Dayton Valley Library
650 Highway 50, Space 6
Dayton, NV 89403
775-246-7444

Nevada State Library
100 Stewart Street
Carson City, NV 89710
775-687-5160

Churchill County Library
553 South Maine Street
Fallon, NV 89406
775-423-7581

EPA Superfund Records Center
95 Hawthorne St.
San Francisco, CA 94105
(415) 536-2000

CONTACT INFORMATION:
Jere Johnson
Remedial Project Manager
75 Hawthorne St. (SFD 8-2)
San Francisco, CA 94105
(415) 972-3294
Johnson.jere@epa.gov

Leana Rosetti
Community Involvement Coordinator
75 Hawthorne St. (SFD-6-3)
San Francisco, CA 94105
(800) 231-3075 or (415) 972-3070
Rosetti.leana@epa.gov

CNS#2441986

Date of Publication: February 15, 2013

COMSTOCK CORNER CAFE
HOMEMADE BREAKFAST, LUNCH & DINNER
Open at 7 AM Monday thru Friday
Special Valentine's Dinner February 14 to February 17
Dinner Menu at 5 pm
Salmon Madelaine or
Rib Eye Steak or Double Bone Smoked Pork Chop or
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Appendix C: Community Interviews

Thirteen individuals were interviewed for the Five Year Review:

Ed James and Brenda Hunt, Carson River Subconservancy
Office of Nevada State Epidemiologist
Dean Haymore, Director of Community Development Department, Virginia City
Austin Osborne, Senior Planner, Storey County, Virginia City
Juan Guzman, Carson City Parks and Recreation Department, Open Space Division
Glenn Miller, Natural Resources and Environmental Science Director, University of Nevada, Reno
Jeff Page, Lyon County Manager
Member, Dayton Regional Advisory Board
Shaun Griffin, Community Chest, Virginia City
Rich Wilkinson, Dayton Conservation District
Paul Pugsly, Carson Valley Conservation District
Tom Minor, Resident of Dayton

Question 1: Are you familiar with the long term sampling and remediation plan, and its sampling requirements for residential development? If not, what would be a good way to inform people?

No (7)
Yes (6)

- Yes, heard about the mercury removal at Santa Maria. General community outreach would be a good way to inform people.
- Yes, aware because of working with NDEP. Individuals whose properties were cleaned up should know.
- Yes, has vaguely talked with NDEP about it. The existing plan will require help from NDEP.

Question 2: What effects have site operations (removals and LTSRP) in OU1 had on the surrounding community?

- None. (2)
- Many people are new to the area and don't realize the cleanup was done, or know about the site. In the 90s, the Dayton population was only 2500; it is now 15,000. (3)
- Has affected community attitudes regarding listing of Anaconda Yerington. (1)
- Just remember the controversy surrounding the listing. EPA was not very popular at the time, as it was believed to be unnecessary. (1)
- Didn't know about the cleanup. (1)
- No comment/Don't know. (5)

Question 3: Is there any other information you'd like us to consider in determining whether the chosen remedy is functioning as intended, and is protecting human health and the environment?

- Pick and specify an ending date for the cleanup, or make clear what the end would look like even if you don't know the date. (3)
- People are concerned about millsites in Six Mile and Gold Canyons. Some people believe they are suffering from health effects due to the contamination.
- It would be easy to implement the long term sampling plan if you include the building inspectors in the process. This should result in little resistance.
- It would be helpful to get on the planning commission agenda for Virginia City/Silver City. Also inform Leon Thomas from the Bureau of Land Management; BLM present issues for the commissioners to vote on.
- Nevada may be the biggest source of airborne mercury in the U.S., resulting mostly from roasters in the ore and carbon kiln.
- It would be good to not allow people to build in the flood plain.
- An improved fish advisory awareness and signs should be considered.

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Appendix D: Site Inspection Checklist

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Site Inspection Checklist

I. SITE INFORMATION	
Site name: Carson River Mercury Site	**Date of inspection:** 29 November 2012
Location: Dayton & Silver City, Lyon County, NV	**EPA ID:** NVD980813646
Agency, office, or company leading the five-year review: US Army Corps of Engineers for US EPA Region 9	**Weather/temperature:** Partly cloudy, windy, 55 degrees Fahrenheit

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☐ Monitored natural attenuation

☐ Access controls ☐ Groundwater containment

☒ Institutional controls ☐ Vertical barrier walls

☐ Groundwater pump and treatment

☐ Surface water collection and treatment

☒ Other: *Past removal and/or capping of surface soils contaminated with mercury-laden mine tailings from the Comstock Mining Era*

Attachments: ☒ Inspection team roster attached ☐ Site map attached

Inspection Team: Jere Johnson (US EPA), Marlowe Laubach and Jefferey Powers (USACE), also accompanied by David Friedman and Jeff Collins (NDEP)

II. INTERVIEWS

No formal interviews were conducted at the time of the site inspection. A meeting was convened with NDEP officials listed under "Inspection Team" above for State of Nevada FYR input.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED

No site documents or records are maintained "on-site." Documents and records are maintained at 1) the Nevada Division of Environmental Protection (NDEP) Bureau of Corrective Actions (BCA) office in Carson City, 2) on the NDEP website, 3) at the US EPA Region 9 Superfund Records Center in San Francisco, and 4) at these additional public information repositories: Dayton Valley Library (Dayton), Nevada State Library (Carson City), and Churchill County Library (Fallon). The following documents or records were verified to be on the NDEP website (http://ndep.nv.gov/bca/carsonriver/criverwhatsnew.htm) as of 11/29/12:

1. Comstock Mining District – Permitting Activities
2. Result of Environmental Finding for the Cabin in the Sky Area
3. Work Plan for Fill Removal and Mitigative Measures, Gold Canyon Creek Area Comstock Mining Inc. Gold Hill, NV
4. CRMS Informational Powerpoint
5. Comstock Mining Inc. Sampling and Analysis Plan (includes figures, site map, addendums, results)
6. Response to Comstock Mining Inc. Sampling and Analysis Plan Comments
7. NDEP Sampling and Analysis Plan Approval Letter to Comstock Mining Inc.
8. Entire CRMS Risk Area Topo Map
9. Environmental Covenants
10. CRMS Long Term Sampling and Response Plan (LTSRP)
11. Screening/Action Level for Arsenic in Surface Soil in the Carson River Basin
12. CRMS Management Strategies and Goals Presentation
13. Mill Site Archaeological Study Fact Sheet
14. Updated Mill Site Location Map
15. Updated Risk Zone Orthophoto Map
16. Updated Risk Zone Topographic Map

IV. O&M COSTS

There are no formal operations and maintenance costs associated with the Institutional Controls remedy of the site. There are some costs borne by US EPA on this EPA lead site such as the cost to conduct this FYR, and EPA and NDEP shared costs such as for the implementation of the sampling requirements in the LTSRP, and coordination and execution of Environmental Covenants. No costs are believed to be excessive.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A

Remarks. <u>There is no "site fence."</u>

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A

Remarks_____

_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by): Drive by of remediated sites requiring ICs, NDEP website search of residential subdivisions within CRMS with existing ICs_____

Frequency: Once during FYR_____

Responsible party/agency: NDEP_____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☒ No ☐ N/A

Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☒ No ☐ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A

Other problems or suggestions: ☐ Report attached

Execution of Environmental Covenenants (ECs) on CRMS-affected or remediated properties is in progress by NDEP but not completed, hence reporting is incomplete on their searchable website. Requirement in ROD for ICs is being addressed by NDEP via ECs.

2.	**Adequacy**	☐ ICs are adequate	☒ ICs are inadequate	☐ N/A

Remarks. The path forward on obtaining ECs on necessary properties is adequate; however, at the time of the site inspection, ICs are not considered adequate due to incompleteness of EC acquisition.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks_____

_____

2. **Land use changes on site** ☐ N/A

Remarks. Since the last FYR, active exploration, mining, and ore processing on land holdings of Comstock Mining Inc. is occurring in parts of Silver City and Gold Hill.

3. **Land use changes off site** ☒ N/A

Remarks_____

_____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☒ N/A

Remarks. There are no roads that are solely attributable to the CRMS; however, numerous improved and unimproved roads run through various parts of the site. The roads mainly occur in the populated areas of Dayton, Silver City and Gold Hill. All roads traveled on during the FYR were adequately maintained for purposes of viewing site-related features.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

Remediated areas have either been capped with clean soils, or excavated and capped; however, these areas are not considered landfill covers, and there was no evidence of erosion of clean soil cap material during site inspection. Not applicable.

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

There is a concrete retaining wall constructed as part of the removal and capping remedy at MS004; however, this is not considered a vertical barrier wall. Not applicable.

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

Groundwater is not a medium of concern at the CRMS. Not applicable.

11.1. X. OTHER REMEDIES

No other remedies.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

The purpose of the remedy is to ensure new residential development within the boundaries of the CRMS is protective of human health and environment, remediated residential areas remain protective, and controls are in place to ensure protective areas do not become unprotective through subsequent actions by landowners or acts of nature. Overall, progress is being made on the implementation of the remedy via administrative Institutional Controls (specifically, by Environmental Covenants) to educate the public on affected and/or remediated property.

B. Adequacy of O&M

The only component of the Institutional Controls remedy that may be considered O&M is for periodic inspection of the remediated areas in which soil greater than two feet depth may still be above the site-specific mercury cleanup level of 80 mg/kg. If such areas are excavated (for example, for swimming pool construction) then the remedy may become unprotective. In this case, O&M inspection occurs at the time of the FYR site inspection and is considered adequate for the intended purpose.

C. Early Indicators of Potential Remedy Problems

There are no indicators of potential remedy problems.

11.1.1. D. Opportunities for Optimization

Prior to this FYR, opportunities have been identified to make CRMS information, including ICs data, more accurate and accessible. NDEP has created a searchable public database on their website. NDEP continues to add content as LTSRP-required sampling results become available, and as Environmental Covenants on CRMS-affected property are finalized. NDEP has also refined the CRMS boundary map as new historic mill site and sampling data become available.

SITE INSPECTION TRIP REPORT

CARSON RIVER MERCURY SITE

DAYTON & SILVER CITY, LYON COUNTY, NV

(EPA ID: NVD980813646, Region 9)

---

1. INTRODUCTION

a. Date of Visit: 29 November 2012

b. Location: Carson City, NV; Dayton and Silver City, Lyon County, NV

c. Purpose: This site inspection was conducted to meet the needs of the third Five-Year Review.

d. Attendees:

Jere Johnson	US Environmental Protection Agency (EPA), Region 9	(415) 972-3094
Marlowe Laubach	US Army Corps of Engineers (USACE), Seattle District	(206) 764-4480
Jefferey Powers	USACE, Seattle District	(206) 764-3561
David Friedman	Nevada Division of Environmental Protection (DEP)	(775) 687-9385
Jeff Collins	Nevada DEP	(775) 687-9381

2. SITE VISIT SUMMARY

Ms. Laubach and Mr. Powers ("USACE team") arrived in Reno, NV at approximately noon on Thursday, 29 November 2012 via air travel from Seattle, WA. The USACE team met up with US EPA Remedial Project Manager Ms. Johnson, who then drove from Reno to the Nevada Division of Environmental Protection (NDEP) office in Carson City. On the way to Carson City the group drove by Little Washoe Lake, which is part of the Carson River Mercury Site (CRMS) because historic mill sites were once located along streams which drained into the lake. While at NDEP, the aforementioned group was joined by David Friedman and Jeff Collins, both with NDEP Bureau of Corrective Actions (BCA).

At the NDEP office from approximately 1 p.m. to 2:15 p.m, the full group of NDEP, US EPA and USACE personnel met to discuss the CRMS and new site developments since 2008, the date of the previous Five-Year Review (FYR) in support of this, the third, FYR to be completed by 30 September 2012. Discussion topics of the meeting included the following:

- NDEP maintains a unique website devoted to the CRMS and posts the latest site-related information here: (http://ndep.nv.gov/bca/carsonriver/criver_1.htm).
- NDEP Archaeological Survey. Field survey of more than 200 historic mill sites is largely complete. The next step is to sample all the historic mill sites, likely in a phased approach due to the sheer magnitude of the sampling effort. The results of the survey and sampling efforts are to be incorporated into an updated GIS-based site map.
- NDEP has refined the site boundary as represented on the GIS-based site map. They provided a 2-page summary to the FYR team entitled, "Carson River Mercury Superfund Site Updated Boundary Development Rationale – 6/16/2010."
- Comstock Mining, Inc. This mining company is currently active in and around Silver City and Gold Hill within the boundaries of the CRMS; they were not actively operating at the time of the last FYR.
- Current Institutional Controls (ICs) process for residential development sites within CRMS site boundaries. Residential developments with greater than five acres or more than five residential units: developer is referred to NDEP BCA via NDEP water pollution control permits. For developments with less than five acres or less than five residential units: building permit seeker is referred to NDEP BCA via county building permit process. Also, if a homeowner wishes to excavate greater than three cubic yards (e.g., for swimming pool, foundation, etc.), county building permit process is also supposed to refer them to NDEP BCA.
- Environmental Covenants (ECs). Previously there was no central repository to search for deed restrictions on CRMS-impacted properties and so this information was not readily accessible to the public. NDEP is placing ECs on their website; they are not all are there yet but progress being made.
- There has been only one large-scale residential development (named "Riverpark") permitted/partly constructed since the economic recession that began in late-2008; therefore, only this one development has required sampling under the LTSRP since the last FYR. No soil samples were above the 80 mg/kg cleanup level for mercury, although sampling occurred only down to two feet below land surface (so still requires EC for soil greater than two feet depth). Also of note, only two sample locations had arsenic greater than background level of 32 mg/kg where mercury was also above background of 1 mg/kg.

After the meeting at NDEP, the group drove to Dayton in two vehicles to view the remediated sites which required remedial action in accordance with the Record of Decision. The drive to Dayton was via Highway 50, which parallels the Carson River and its floodplain associated with Operable Unit 1. The route passed by the town of New Empire, which was the location of the most upstream mill sites along the Carson River that contributed to the mercury contamination, and the Santa Maria Ranch residential subdivision, which was sampled for mercury prior to 2008 under the provisions of the Long Term Sampling and Response Plan (LTSRP).

MS004 was the initial remediated site visited in Dayton. MS004 remediated areas included parts of individual residence lots, a gravel-graded lot that appears to serve as outdoor seating and a potential "overflow parking area" adjacent to a former mini-mart that is now a Quiznos sandwich shop, and a retaining wall erected during the remediation phase to prevent disturbance to remediated areas. All remediated areas of MS004 appeared to be in good condition, with no signs of excavation or recent disturbance to the soil cap material other than a small concrete pad poured for the outdoor dining table.

The second remediated site visited was MS001, which consists of a long and relatively thin swath of land that was excavated and capped running between the Carson River and the back yards of several residences along Railroad Street in Dayton. No disturbance or erosion was evident. Sage and other scrub brush was present in areas that were likely remediated, and large trees were present on both sides of the likely remediated area.

MS002 was the third and final remediated site visited in Dayton. When remediated, the site was within a trailer park; however, the trailer park no longer exists. The trailer park has been replaced by a credit union to the north of the remediated area and a new Dayton post office to the south. It is likely that parts of the remediated area were altered by elevated grading associated with construction of the paved parking areas around both new buildings; however, the remediated area and surrounding land is no longer used for residential purposes, which is a key to the area remaining protective.

No property owner was disturbed during the site visit and private property was not entered. Overall, there does not appear to be significant change to the remediated areas that would cause the remedy to be unprotective. After visiting MS002, NDEP personnel departed and US EPA and USACE personnel drove through Silver City, Gold Hill, Virginia City, Six Mile Canyon, and then on to Reno. Some of the Comstock Mining, Inc. claim and activities were viewed from the road (Route 341), including observation of active haul trucks and the large pit mine beside the roadway near Silver City. Personnel drove through Virginia City to gain perspective on the extent of historical mining during the Comstock Era, and drove along Six Mile Canyon to view the canyon in which numerous mill sites were located, including the foundation remains of an old mill site near Flowery Peak.

Appendix E: Photographs from Site Inspection Visit

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Photographs from Site Inspection Visit

SITE INSPECTION PHOTOGRAPHS
CARSON RIVER MERCURY SITE, CARSON CITY, NV
(EPA ID: NVD980813646, Region 9)

Photo 1. MS004, retaining wall.

Photo 2. MS004, north end of city park.

Photo 3. MS004, lot west of sandwich shop.

Photo 4. Access route to MS001.

Photo 5. MS001, remediated area facing south.

Photo 6. MS001.

Photo 7. MS002 foreground, credit union background.

Photo 8. MS002 limit, new post office to left.

Photo 9. Raised land grade beside MS002.

Photo 10. Raised land grade beside MS002.

Appendix F: Real Estate Title Reports

REVIEW OF TITLE EXCEPTIONS
CARSON RIVER MERCURY SUPERFUND SITE

This is a title review of a single tax parcel of land in the City of Dayton, Nevada (Lyon County) in support of the Carson River Mercury Superfund Site project. The tax parcel involved in this review is currently owned by Lennar Reno, LLC, owner of Riverpark Subdivision, and is as follows:

- APN 029-513-04

Review performed May 22, 2013

Title Exception Number	Owner	Recording Information	Instrument Type and Rights Granted	Impact to Environmental Covenant, recorded May 26, 2010
1 - 8	Lennar Reno, LLC	Not Applicable	General and special taxes and assessments and declaration statements	None
9	Riverpark Properties, et al	Instrument No. 308856, recorded November 21, 2003	Easement Agreement (Roadway and Ditch Easements and Abandonment of Upper and Lower Cardelli Ditches) granted to property owners to establish easements as it pertains to owner's respective property.	Construction and maintenance of roadways and ditches create a potential risk for exposure to contaminated soil
10a	Riverpark Properties	Instrument No. 383200, recorded May 30, 2006	Declaration of Covenants, Conditions and Restrictions for Riverpark Landscape Maintenance Association.	No impact – this is landscape maintenance association regulations for the Riverpark Development
10b	Riverpark Properties	Instrument No. 430697, recorded August 21, 2008	Assignment of Special Declarant's Rights designating Columbus Riverpark, LLC as a participating builder for Riverpark Subdivision.	No Impact
11	Lennar Reno, LLC	Instrument No. 459627, recorded May 26, 2010 *(previously recorded as Inst. # 399104 (1/19/2007), Inst.# 401012 (2-21/2007)*	Environmental Covenant to ensure protection of human health and the environment as a result of mining activities from the discharge of mercury into the Six Mile Canyon drainage and the Carson River.	This is the referenced Covenant
12-15	Lennar Reno, LLC	Not Applicable	General declaration statements	No Impact

REVIEW OF TITLE EXCEPTIONS
CARSON RIVER MERCURY SUPERFUND SITE

This is a title review of a single tax parcel of land in the City of Dayton, Nevada (Lyon County) in support of the Carson River Mercury Superfund Site project. The tax parcel involved in this review is currently owned by Raymond E. and Ann M. Ryhal, and is as follows:

- APN 029-413-19

Review performed May 24, 2013

Title Exception Number	Owner	Recording Information	Instrument Type and Rights Granted	Impact to Environmental Covenant, Instrument No. 459627, recorded May 26, 2010
1 - 8	Raymond E. and Ann M. Ryhal	Not Applicable	General and special taxes and assessments and declaration statements	None
9	Riverpark Properties, et al	Instrument No. 367415, recorded November 08, 2005	Easements and Dedications Agreement granted to property owners to establish roadway and utilities easements and dedications as it pertains to owner's respective property.	Construction, operation and maintenance of roadways and utilities create a potential risk for exposure to contaminated soil.
10	Lennar Reno, LLC	Instrument No. 459626, recorded May 26, 2010 *(previously recorded as Inst. # 393191 (10/13/2006)*	Environmental Covenant to ensure protection of human health and the environment as a result of mining activities from the discharge of mercury into the Six Mile Canyon drainage and the Carson River.	This is the referenced Covenant.
11	Christo D. Bardis, et al	Instrument No. 403377, recorded March 20, 2007	Easement Agreement (River Parcel Slope and Drainage Facilities) granted to Riverpark Properties, LLC, for the purpose of constructing, operating and maintaining existing slope and storm water drainage.	Construction, operation and maintenance of drainage facilities create a potential risk for exposure to contaminated soil. But subject to notice imparted by prior recording of Environmental Covenant on 10-13-2006.

Title Exception Number	Owner	Recording Information	Instrument Type and Rights Granted	Impact to Environmental Covenant, Instrument No. 459627, recorded May 26, 2010
12	"Parties" (Lyon County and the State of Nevada)	Instrument No. 421409, recorded February 28, 2008	Non-Revocable Agreement to Restrict Property entered into between the Parties to utilize the Carson River Corridor only for the purposes of developing land/water rights, and/or providing recreational facilities.	No impact – restricts use to construction, operation and maintenance of recreational facilities. Subject to notice imparted by prior recording of Environmental Covenant on 10-13-2006.
13	American Pacific Mortgage Corporation	Instrument No. 481746, recorded September 16, 2011	Deed of Trust establishing the sale of property to the Borrower (Raymond E. and Ann M. Ryhal)	No impact
14-17	Raymond E. and Ann M. Ryhal	Not Applicable	General declaration statements	No Impact

REVIEW OF TITLE EXCEPTIONS
CARSON RIVER MERCURY SUPERFUND SITE

This is a title review of a single tax parcel of land in the City of Fallon, Nevada (Churchhill County) in support of the Carson River Mercury Superfund Site project. The tax parcel involved in this review is currently owned by Jenuane Communities Onda Verde, LLC, and is as follows:

- APN 010-603-25

Review performed May 28, 2013

Title Exception Number	**Owner**	**Recording Information**	**Instrument Type and Rights Granted**	**Unable to locate institutional controls for specific parcel under review, however, National Division of Environmental Protection (NDEP) map indicates Environmental Covenants in place *(see attached)*.**
1 - 8	Jenuane Communities Onda Verde, LLC	Not Applicable	General and special taxes and assessments and declaration statements	None
9	State of Nevada	Instrument No. 14698 of Patent Records, Book 1, Page 78, recorded January 18, 1909	Patent No. 6254, granting 160-acre tract of land to Charles C. Stump, outlining mineral rights, reservations, easements and exclusions.	No Impact
10	State of Nevada	Instrument No. 38089 of Patent Records, Book 2, Page 146, recorded August 6, 1925	Patent No. 10382, granting 160-acre tract of land to Barbara Ann Brown, outlining mineral rights, reservations, easements and exclusions.	No Impact
11	John Oats	Instrument No. 3746 and 3750, Book 8, Pgs 540 and 543, recorded September 1, 1906	Deed Record conveying to the United States of America that certain strip of land and appurtenances known as the "S" line canal.	Although no specific Environmental Covenant is in place for the location under review, contaminated soil has been identified in other locations associated with the Carson River Mercury Superfund Site. Construction, operation and maintenance of drainage facilities create a potential risk for exposure to contaminated soil.

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Title Exception Number	Owner	Recording Information	Instrument Type and Rights Granted	Unable to locate institutional controls for specific parcel under review, however, National Division of Environmental Protection (NDEP) map indicates Environmental Covenants in place *(see attached)*.
12	Willis Brown	Instrument 3750, Book 8, Pgs 543-544, recorded September 1, 1906	Deed Record granting to the United States of America a perpetual right-of-way for the construction of any and all canals, drains or ditches on the property.	Although no specific Environmental Covenant is in place for the location under review, contaminated soil has been identified in other locations associated with the Carson River Mercury Superfund Site. Construction, operation and maintenance of canal facilities create a potential risk for exposure to contaminated soil.
13	Milton H. and Michelle Wallace, et al	Book 177, Page 432	Certificate of Amendment for easements, dedications, reservations provisions, relinquishments, recitals, building set back lines, certificates and other matters.	Although no specific Environmental Covenant is in place for the location under review, contaminated soil has been identified in other locations associated with the Carson River Mercury Superfund Site. Construction, operation and maintenance of facility/utility easements create a potential risk for exposure to contaminated soil.
14	Onda Verda, LLC	Instrument No. 381102, recorded April 25, 2006	Water Right Agreement granted to Truckee-Carson Irrigation District	No impact – does not affect specific parcel under review.

Title Exception Number	Owner	Recording Information	Instrument Type and Rights Granted	Unable to locate institutional controls for specific parcel under review, however, National Division of Environmental Protection (NDEP) map indicates Environmental Covenants in place *(see attached)*.
15	Onda Verda, LLC	Instrument No. 390940, recorded April 13, 2007	Agreement for Reservation of Right to Use of Water between the owner and Churchill County, acknowledging that Owner will dedicate sufficient water rights to the County in support of development of the Onda Verde Subdivision	No Impact
16	Onda Verda, LLC	Instrument No. 400816, recorded June 5, 2008	Declaration of Covenants, Conditions and Restrictions for Onda Verda Subdivision Association.	No impact – this is building and landscape maintenance association regulations for the Onda Verda Subdivision.
17	Onda Verda, LLC	Instrument No. 403647, recorded October 20, 2008	Record of Survey showing existing FEMA Flood Plain	No impact – parcel under review is outside of the flood plain
18	Onda Verda, LLC	Not Applicable	General declaration statements	No Impact
19	Onda Verda, LLC, et al	Instrument No. 431506, recorded December 28, 2012	Deed of Trust establishing the sale of property to Saltern Investments.	No impact
20-23	Saltern Investments	Not Applicable	General declaration statements	No Impact