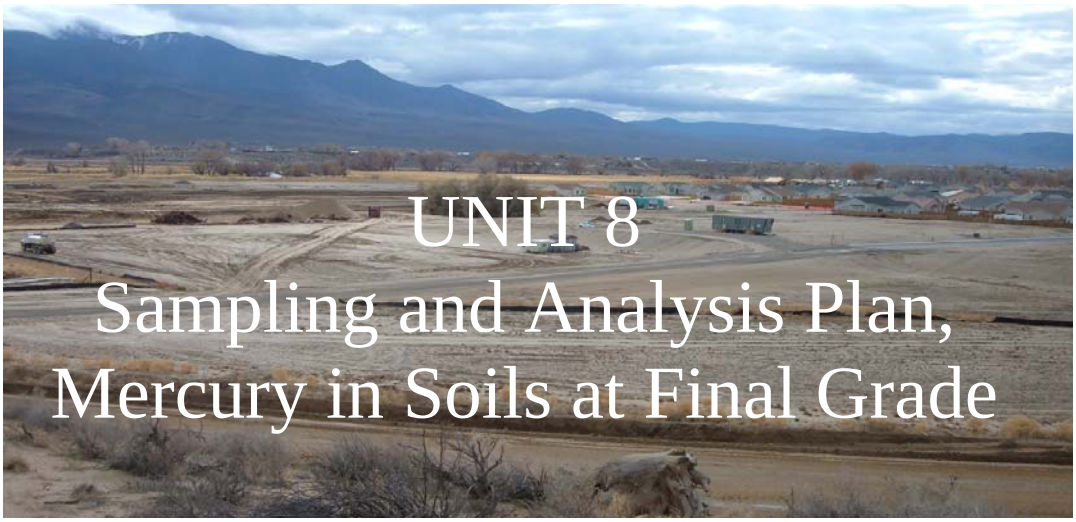
Reynen & Bardis

Riverpark Subdivision

Dayton, Nevada

December 2004



UNIT 8
Sampling and Analysis Plan, Mercury in Soils at Final Grade

Prepared For:
Reynen & Bardis
1380 Greg Street, Suite 230
Sparks, Nevada 89431
Attention: Ed Davis

and

Nevada Division of Environmental Protection
Bureau of Corrective Action – Superfund
333 West Nye Lane
Carson City, Nevada 89706

Prepared By:

ENGINEERING ✧ PLANNING ✧ RESOURCE MANAGEMENT

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File Doc: SAP Unit 8 012605 rpt 04248.2 re-jm log 1-32.doc

1.0 INTRODUCTION

1.1 Background

Historic placer mining in Gold Canyon and Sixmile Canyon (The Comstock Lode) began in 1850. Ore was originally shipped to San Francisco for processing. Beginning in 1860, 186 on-site commercial and private mills were constructed along the Comstock to facilitate extraction of precious metals (Figure 1). The mills first crushed wet ore that was charged with mercury allowing an amalgam to form with the gold and silver, effectively separating it from the slurry. The precious metals were then separated from the mercury, and the processed slurry and mercury were discharged to drainages as a waste. Amalgamation continued as the primary ore processing procedure until about 1900, when it was replaced with cyanide leaching and flotation. It is estimated that approximately 14,000,000 pounds of mercury were discharged between 1860 and 1900. Large quantities of low-grade ore were extracted from the Comstock through 1950. After 1950, mining operations decreased dramatically.

Mercury laden slurry was transported downgradient from the Comstock by five methods:

1. fluvial transport of mercury laden sediment and soil;
2. fluvial transport of dissolved mercury;
3. air transport of particulate mercury;
4. air transport of volatile mercury; and
5. percolation of elemental mercury and/or amalgam.

Typical areas where mercury has deposited and accumulated over the past 144 years include:

- mill sites and tailing piles that were part of the Comstock Lode;
- tributaries that drain from the Comstock Lode, such as Gold Canyon and Six Mile Canyon;
- alluvial fan deposition areas associated with tributaries and drainages from the Comstock Lode area;
- flood plain associated with tributaries and drainages from the Comstock Lode area and the Carson River;
- Carson River sediments and biota;
- Lahontan Reservoir sediments and biota;
- Carson Lake sediments;
- Stillwater Wildlife Management Area sediments and biota;
- Indian Lakes sediments and biota; and
- Washoe Lake sediments and biota.

Elevated levels of mercury were first discovered by the USGS in the 1970's, while sampling in the Carson River drainage. Subsequent studies in the 1970's and 1980's further delineated the extent of mercury contamination in the Carson River drainage. Based on this information, the Carson River below New Empire was added to the National Priorities List in August 1990, due to the widespread occurrence of mercury.

The 1990's saw several remedial activities coordinated by the USEPA, including:

- Removal of tailings along US Highway 50,
- Remediation of several residential yards and a playground; and
- Sampling and analysis to facilitate a Human Health Risk Assessment.

As a result of these efforts, the Carson River Mercury Site limits include the 100-year flood plain of the Carson River and tributaries associated with the Comstock mining era. The risk-based human health regulatory limit for mercury in soils is 80mg/Kg.

1.2 Regulatory Directive

The EPA Record of Decision (1995) recommended "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."

On September 15, 2004, the Nevada Division of Environmental Protection (NDEP) directed Reynen & Bardis to develop a Sampling and Analysis Plan (SAP) for Units 8 and 9 of the Riverpark Subdivision, due to its proximity to the Carson River floodplain (Figure 2). Based on additional information and discussions with NDEP, it was decided that initial sampling would be limited to Unit 8 only.

1.3 Project Area

Riverpark Subdivision is located between the Carson River and U.S. Highway 50, just West of the junction of Six Mile Canyon Road and Fort Churchill Road, on the site of the old Rolling A Ranch (Figure 3). The subdivision is comprised of 19 Units, a school site, wastewater treatment facility, and agricultural fields for effluent disposal, and encompasses a total of approximately 560 acres. One major drainage traverses the development, which based on the 7.5 minute quadrangle, is the historic drainage of Six Mile Canyon. The property is also traversed by the Cardelli Ditch.

The subject property, prior to grading for the subdivision, consisted of agricultural lands South of Cardelli Ditch to the Carson River, and open land with three residential structures North of Cardelli Ditch to US Highway 50 (Figure 3).

Unit 8 lies close to the Carson River, and is composed of 55 individual residential lots that collectively comprise approximately 22 acres (Figure 4). This property lies within the 100 year floodplain of the Carson River. As such, the potential exists for elevated mercury in surface soils.

The overall grading plan for Riverpark transported soils from North of Cardelli Ditch to lots South of Cardelli Ditch. Soils North of Cardelli Ditch are associated with the 100 year floodplain of the historic Six Mile Canyon drainage. As such, the potential exists for elevated mercury in surface soils.

2.0 STATISTICAL CONCEPTS AND ATTAINMENT OBJECTIVES

2.1 Risk-Based Standards

The regulatory clean-up standard for mercury in soils within the CRMS is Risk-Based, and was developed using:

- The magnitude of the concentration threshold level;
- The method for obtaining data (Sampling Plan); and
- The evaluation scheme (Decision Rule) that will be used to compare the data with the threshold level.

This process evaluates the breadth of the contamination, considers appropriate sampling methods, and uses a method of evaluation that provides confidence in the conclusions.

Sampling in newly developed areas within the CRMS requires an approach that delivers a reasonable level of confidence that mercury in soils, if present, will not pose a threat to human health or the environment. Since it is not practical to sample all of the soil in the project area, a method should be used to develop data, that when evaluated, will demonstrate the presence or absence of a threat to human health and the environment from mercury in soils within the project area.

No matter how stringent a sampling method is, the potential exists to over or underestimate contamination.

2.2 Attainment Objectives

Attainment objectives are the procedures and criteria that must be defined to guide the process of sampling and data analysis, in order to judge a site sufficiently remediated. The steps in defining Attainment Objectives include defining sample areas, determining handling and collection procedures, parameters of concern, clean-up standards, and probability that the site is clean (Figure 5).

2.2.a Definition of Sample Area

The sample area includes all of Unit 8 of the Riverpark Subdivision, which was constructed over agricultural fields associated with the Rolling A Ranch. Unit 8 encompasses a total of approximately 22 acres, and has been divided into 55 residential lots with associated paved roadways and infrastructure (Figure 4). As of December 2004, all 55 lots have homes under construction. One of the homes has been sold, and is occupied by the new owners.

2.2.b Sample Handling and Collection Procedures

Sample handling and collection procedures (Section 3.0) are consistent with standard practices of the industry and appropriate for the parameter of concern. All work shall be conducted under the direction of a Nevada Certified Environmental Manager. Any analytical laboratories used in this project shall be currently certified by the State of Nevada for the parameter of concern.

2.2.c Parameter to be Tested

Total mercury in soils less than two feet below grade (fbg) is the only parameter to be tested under this SAP.

2.2.d Clean-up Standard

The U.S. EPA has set 80mg/Kg total mercury in soils as the risk based health standard for residential lots, and 300mg/Kg for parks and schools.

2.2.e Decision Making with Uncertainty

Unit 8 of the Riverpark Subdivision was constructed on soils identified within the Carson River floodplain by importing soils from within the Six Mile Canyon Drainage flood plain. Prior to grading, the distribution of mercury in these areas would have been based on channel morphology, historic hydrology and floodplain patterns. However, due to the degree of grading and mixing of soils that has occurred with this development, it is not possible to predict where mercury contaminated soils, if any, are present within Unit 8. The sampling approach in this instance involves setting up a grid in an attempt to disclose hot spots that may exceed the regulatory limit of 80mg total mercury per kilogram of soil. Potential hot spots are likely to be small, with mercury concentrations lower than might have been identified in undisturbed soils.

The degree of site development should also be addressed, as it limits the area that is accessible for sampling. Construction on individual lots naturally divides each parcel into three areas:

1. Front yard;
2. House; and
3. Back yard.

As proposed, each lot will be sampled twice, with one sample from 0-1 feet below grade (fbg), and one sample from 1-2fbg. Lots will alternate sample depths in the front and back yards to provide a two-level data grid across Unit 8. Two lots (target parcels) have been selected for additional sampling: 0-1fbg and 1-2fbg samples will be collected in both the front and back yards (Figure 6). Crawl spaces will not be sampled due to the very limited amount of time spent in this area in the average home, and the subsequent reduction in risk of exposure to mercury. Paved streets provide a strong institutional barrier between mercury contaminated soils and occupants, and will not be sampled.

A total of 114 samples will be collected across Unit 8. Each sample will represent approximately 617 cubic yards of soils that may or may not contain mercury. The analytical data will be developed using a test method reporting limit over two orders of magnitude less than the regulatory limit. This will allow for the following conditions of approval by NDEP for site occupancy without threat to human health or the environment:

- If all of the samples collected are below the reporting limit, Unit 8 shall be declared as "not posing a threat to human health and the environment."
- If any of the samples collected are at or above the regulatory limit, additional sampling in that area shall be conducted to direct excavation and backfill to mitigate the potential threat to human health and the environment.

As proposed, this SAP will provide sufficient sampling to determine the presence or absence of a "threat to human health and the environment."

3.0 SAMPLING AND ANALYSIS METHODS

3.1 Sampling Plan

The Riverpark subdivision layout serves as the sampling grid for the Unit 8 SAP. Each lot is further subdivided into a front yard, house, and back yard. Crawlspaces and paved streets are not included in the sampling areas.

Each lot will contribute two soil samples to the overall database. One sample will be collected from the front yard, and one from the back yard. One sample will be collected from the 0-1fbg depth, and the other sample will be collected from the 1-2fbg depth, as outlined in Figure 6.

Samples from either the 0-1 or 1-2fbg sample interval will be collected using a shovel, and placed into a clean plastic bucket. The soil will be mixed for a period of 2 minutes using a hand trowel, at which time a minimum 100 gram subsample will be collected and placed into a clean Ziploc baggie. The sealed baggie will be placed into a cooler for transport to Sierra Environmental Laboratories for analysis.

Between sample sites, shovels, buckets and hand trowels will be washed with an Alconox solution, then triple rinsed with distilled water.

Personal protective equipment shall be Level D, including boots, latex gloves, and safety glasses. Latex gloves shall be changed between each sample point.

3.2 Analytical Methods

All soil samples will be analyzed for total mercury using EPA Method 245.5. The reporting and detection limits shall be set at from 0.05 mg/Kg – 0.5 mg/Kg, depending on sample concentration. Two sets of duplicate samples shall be collected from the 0-1fbg level and from the 1-2fbg level, and one duplicate from a random lot picked by the laboratory shall be analyzed. Laboratory Quality Assurance and Quality Control shall be in conformance with the requirements of the State of Nevada, as directed in the laboratory certification program. The analytical laboratory shall demonstrate proof of current certification in the target method.

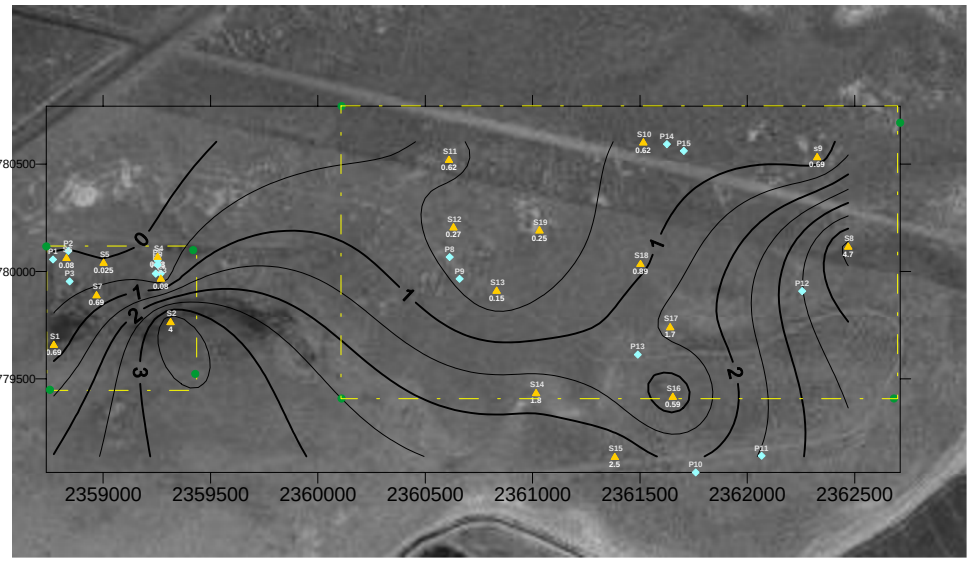
4.0 GEOSTATISTIC ANALYSIS

The analytical data shall be evaluated by two methods:

1. Comparison to regulatory limit of 80mg total mercury per kilogram of soil; and
2. Geostatistic analysis using Surfer® Software (Golden Software, Inc.), if data above the reporting limit is identified.

In the Fall of 2004, soil samples were collected from 90 acres North of the Riverpark Subdivision, on the South side of US Highway 50. The data were evaluated using Surfer® 7 software. The draft output file, which was layered over a recent aerial photograph of the site, appears as follows:

Figure 7
Century Oak Undeveloped Property
Sample and Investigative Site Locations and Analytical data over Aerial Photograph



Phase I ESA - Reynen & Bardis - Century Oak

Resource Concepts, Inc.
January 2005

The map generated by Surfer® Software will be presented to NDEP for review and consideration prior to submission of the final report.

REFERENCES

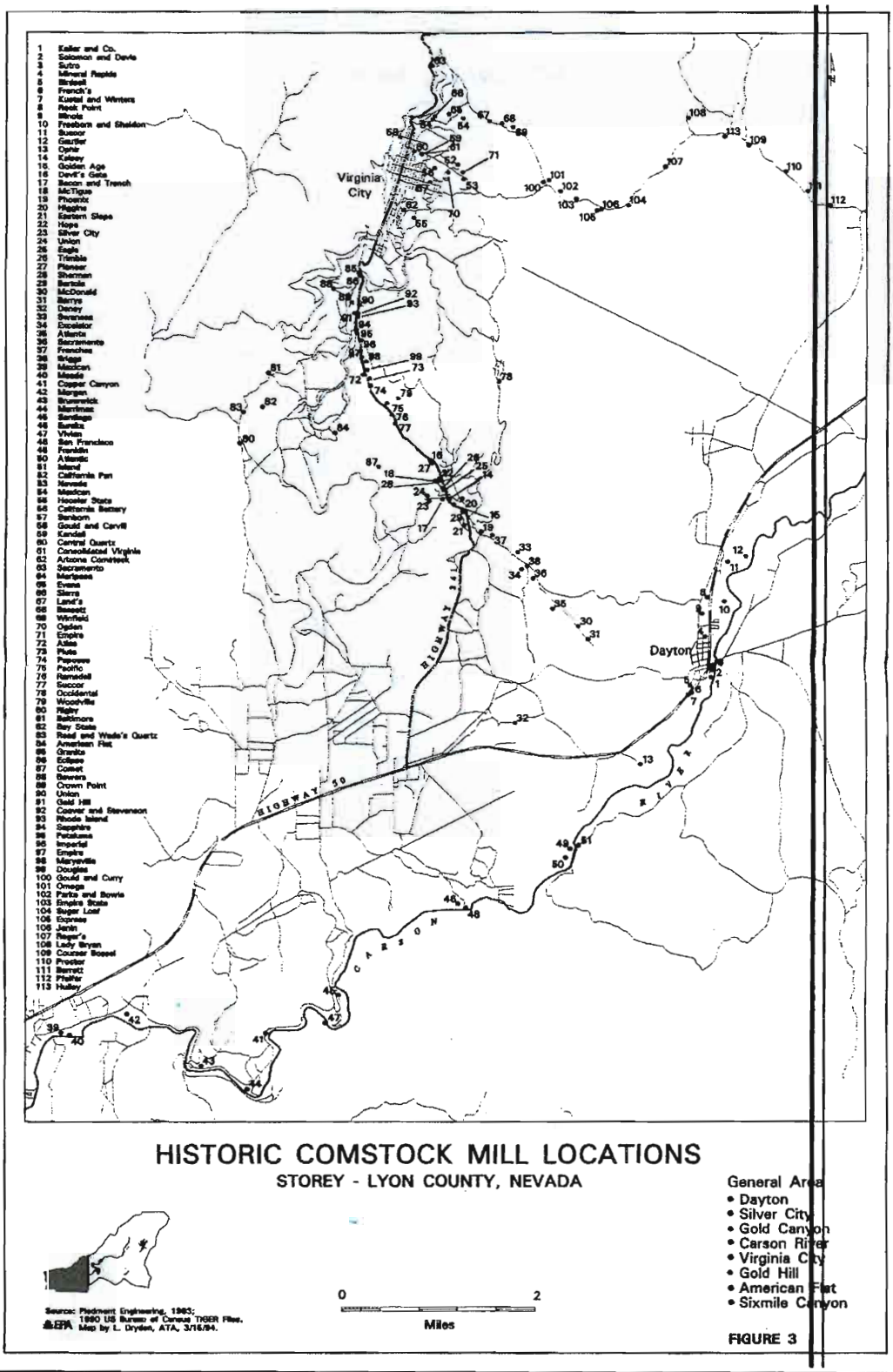
U.S. EPA (1989). *Methods for Evaluating the Attainment of Cleanup Standards, Volume 1: Soils and Solid Media*. Office of Policy, Planning and Evaluation, Washington, DC 20460. EPA 230/02-89-042, February 1989.

U.S. EPA (1995). *EPA Superfund Record of Decision: Carson River Mercury Site*. EPA ID: NVD980813646, OU 01, Dayton, Nevada. EPA/ROD/R09-95/134, 1995.

FIGURES

Figure 1 – Mill Sites in the Comstock Area

Riverpark Subdivision, Dayton, Nevada



Project area located East of map limits, at Occidental and US Highway 50.

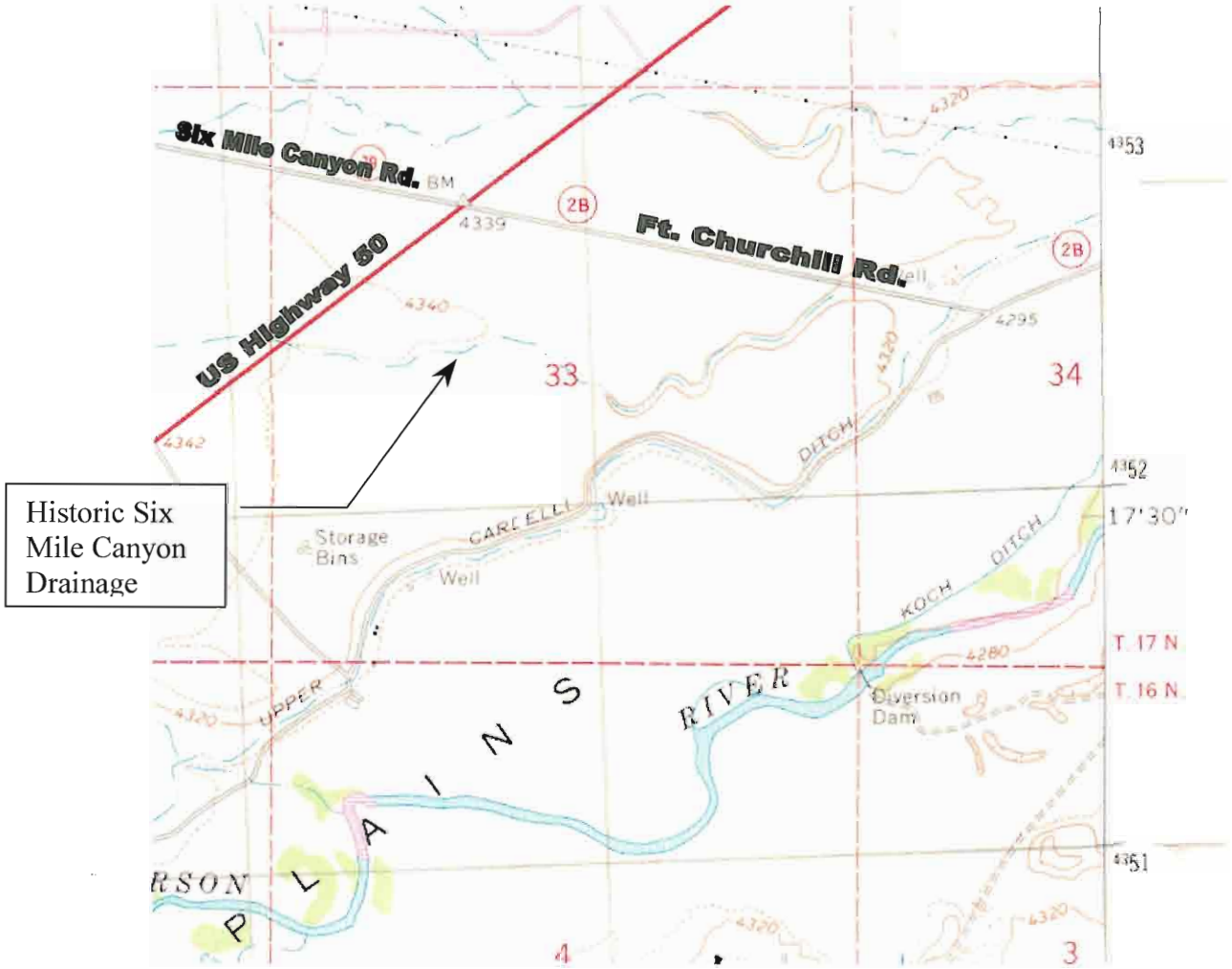
Figure 2 – Riverpark Subdivision

Riverpark Subdivision, Dayton, Nevada

Township 17 North, Range 22 East, Section 33
Township 16 North, Range 22 East, Section 4

Riverpark Subdivision encompasses the newly constructed homes on Occidental (*), and land to Carson River. Unit 8 is generally outlined by the oval.

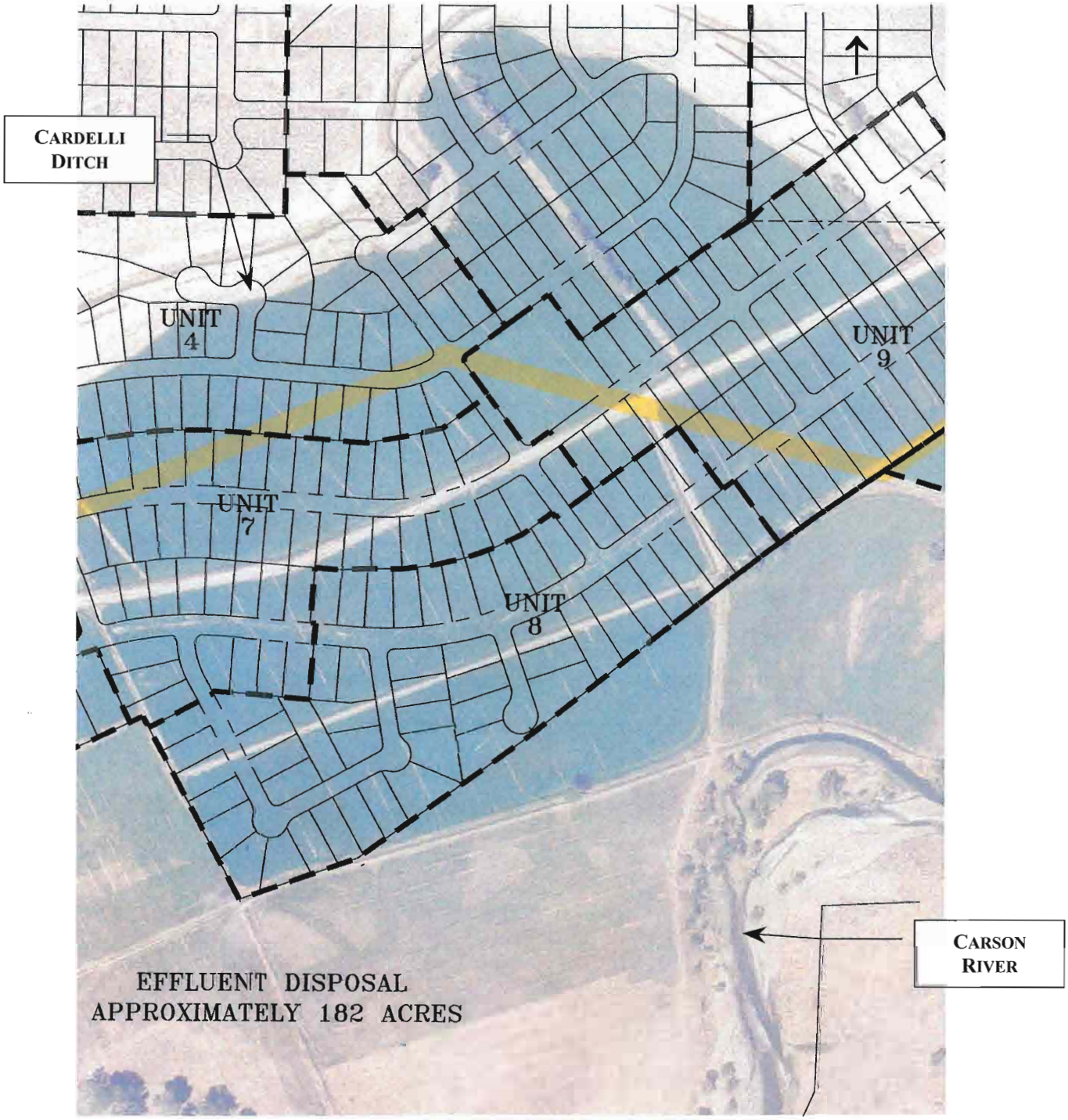
Figure 3 – 7.5 Minute Quadrangle
Riverpark Subdivision, Dayton, Nevada



Historic Six Mile Canyon Drainage

Township 17 North, Range 22 East, Section 33
Township 16 North, Range 22 East, Section 4

Figure 4 – Unit 8
Riverpark Subdivision, Dayton, Nevada



NOTE: Yellow line indicates limit of 100 year floodplain for the Carson River.

Figure 5 – Steps in Defining the Attainment Objectives
Riverpark Subdivision, Dayton, Nevada

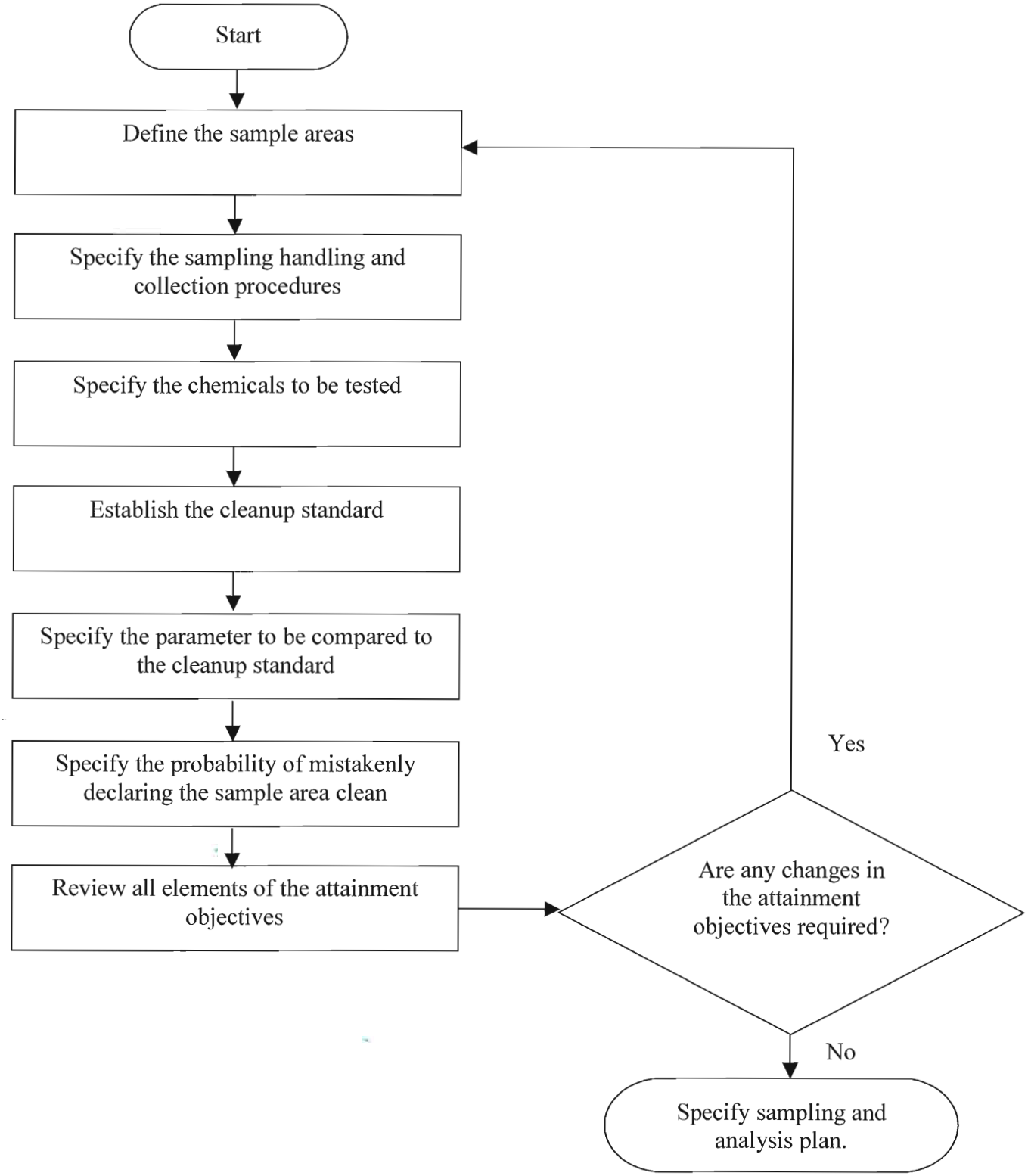
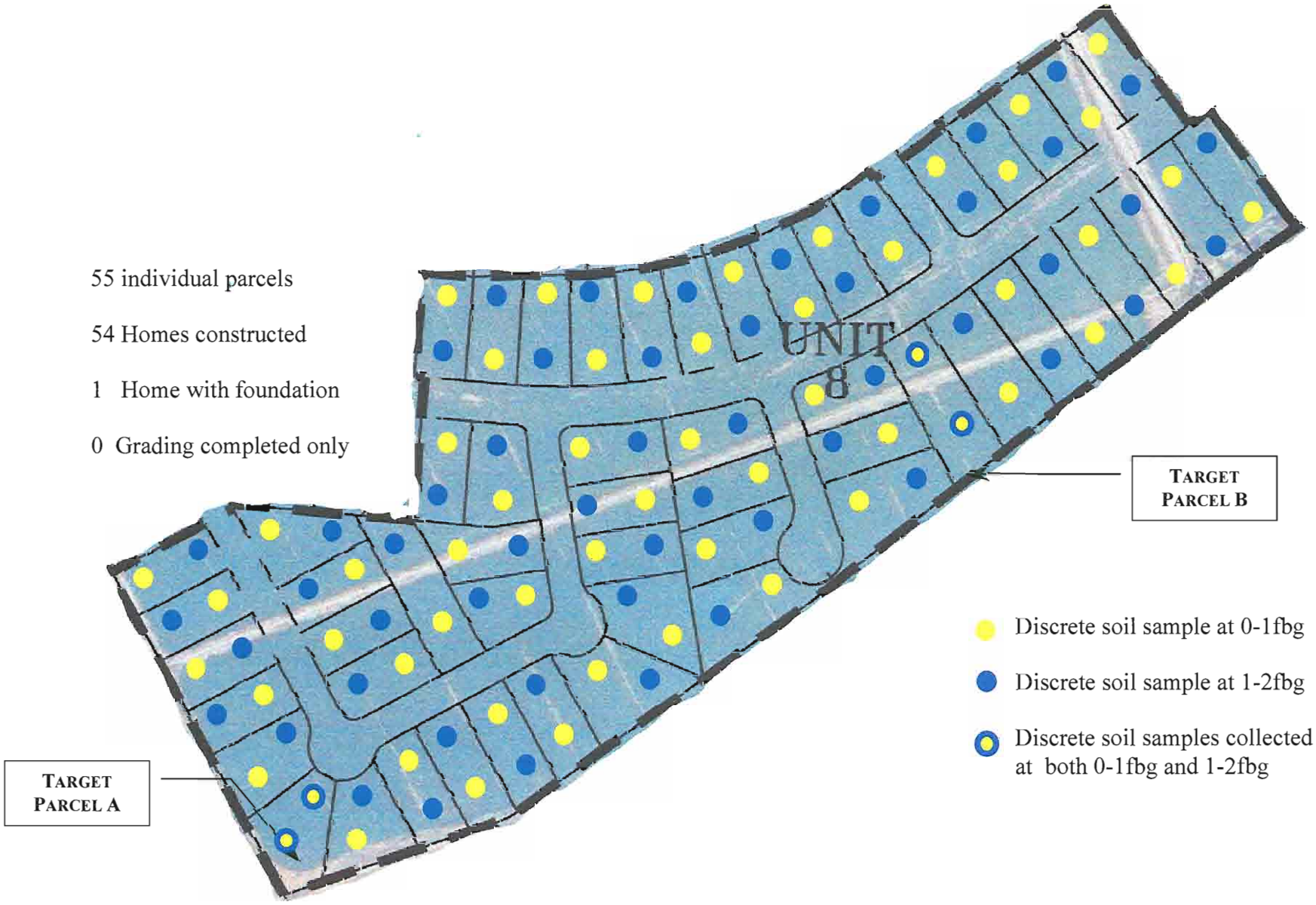


Figure 6 – Sample Grid for Unit 8
Riverpark Subdivision, Dayton, Nevada



ATTACHMENT

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(775) 687-4670
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DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION
333 W. Nye Lane, Room 138
Carson City, Nevada 89706

February 3, 2005

Mr. Ed Davis
Riverpark Properties, LLC
9848 Business Park Dr., Suite H
Sacramento, CA 95827

RE: Development of Unit 8 – Riverpark Subdivision, Dayton, NV

Dear Mr. Davis:

On January 26, 2005, the Nevada Division of Environmental Protection (NDEP) received the report 'Reynen & Bartis Riverpark Subdivision, Dayton, NV, Unit 8 Sampling and Analysis Plan, Mercury in Soils at Final Grade' prepared by Resource Concepts, Inc (RCI). The plan was prepared to address the NDEP's sampling requirements outlined in a September 15, 2004 letter. This sampling requirement applies to any residential development in the Carson River Mercury Site (CRMS). Developers of residential areas within the CRMS are required to demonstrate that a minimum of 2 ft of clean fill (<80 ppm mercury) exists throughout the development at final grade.

The NDEP has reviewed the plan and concurs with the sampling approach outlined by RCI. If all analyzed soil samples indicate less than 80-ppm mercury and the properties in Unit 8 are accompanied by the institutional controls outlined in this letter, the NDEP will concur that Reynen & Bartis has demonstrated that Unit 8 of the Riverpark Subdivision does not pose a threat to human health. The long-term institutional controls that would apply to Reynen & Bartis and residents of the proposed development are: prospective homeowners must be notified that their home is on an NPL site and what remedial actions have been taken to limit their exposure to mercury contamination; properties at Unit 8 will be subject to future soil mercury testing if the NDEP has reason to believe that fluvial deposits of potentially contaminated material has occurred; and homeowners performing activities that involve excavation of deeper than 2 ft must follow guidelines provided by US EPA.

Alternatively, Reynen & Bartis may choose to demonstrate that the top 8 feet of soil does not contain soil mercury at greater than 80-ppm and that controls are in place to ensure that future fluvial deposition will not occur. In this case, no long-term institutional controls will be necessary.

If you have any further questions, or if I can be of further assistance, please do not hesitate to contact me at (775) 687-9381.

Sincerely,

Samuel Jackson
Brownfields/State Response Supervisor
Bureau of Corrective Actions

cc:
Nick Malarchik, Community Development Director, Lyon County Community Development, 27 S. Main St., Yerington, NV 89447
Chairman, Lyon County Board of Commissioners, 27 South Main St, Yerington, NV 89447
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Sam Jackson, Supervisor, NDEP-Superfund Branch
Cliff Lawson, NDEP- Bureau of Water Pollution Control